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ON GEOLOGICAL CHRONOLOGY, AND THE COGENCY OF THE ARGUMENTS BY WHICH SOME SCIENTIFIC DOCTRINES ARE SUPPORTED. (*In reply to Professor Huxley's Discourse delivered at Sion College, on Nov.* 21*st*, 1867.)

By JAMES REDDIE, ESQ., HON. SEC., VICT. INST.

AS this Paper comes before the Institute under somewhat peculiar circumstances, I beg leave to occupy your attention with a few words of explanation.

So lately as a month ago it was utterly improbable that I should have written the first Paper of the present Session. It had even been settled not to commence our meetings till after Christmas; and I myself suggested to the Council the desirableness of putting forward a programme of Papers entirely by new authors. I was therefore looking forward to a little rest, or the pleasure of only listening to Essays written by others. I shall only further premise that when I found it necessary unexpectedly to intrude this paper upon your notice, I begged for an extra night, so as to disturb our preceding arrangements as little as possible. I also asked for an early evening, because the matter that has forced me to write was one that did not brook delay. And I submit that if this Institute is to be of use with reference to those grave questions where science and Holy Scripture are alleged to be at issue—if, in short, the founding of the VICTORIA INSTITUTE was not a mistake—it is unquestionably our bounden duty to deal with the subject I am now about to bring before you.

PROFESSOR HUXLEY AT SION COLLEGE.

On 21st November Professor Huxley delivered an extempore Discourse in the hall of Sion College, the subject of which was announced in the following terms, in a printed circular issued

by the Rev. William Rogers, the President of the College:—"In opening the discussion on Thursday next, Professor Huxley will draw attention to the difference supposed to exist between scientific and clerical opinion, and inquire into the cogency of the arguments by which some scientific doctrines are supported."

The specific subject of the distinguished Professor's remarks was the evidence which he considered to be adducible,—from the civilization of Egypt at the time when the Hebrew Joseph was made Governor by Pharaoh,—from the Pyramids, and the mud-deposits of the Nile-valley,—from the nummulitic rocks and some other strata, and from the chalk formations,—against the chronology of *Genesis*. In other words, it was intended to be a brief summary, though certainly a new version, of "the testimony of the rocks," against what is popularly supposed to be the teaching of the Bible regarding the age of this world.

The greater part, however, of the Professor's address was occupied with an admonitory and apologetic exordium, followed by frequent subsequent remarks of the same kind, relating to the utter divergence he said there had grown up, and which he considered to be increasing, between what he called scientific and clerical opinion, or the habits of thought of the philosophers and the clergy of this country. This classification was questioned by several speakers and humorously criticised by some as "a rather strange division of the human race;" but as the learned Professor appears only to have adopted it *pro re nata*, as a tribute to the *genius loci* and while addressing "his hosts, the clergy," in Sion College, its propriety need not further be canvassed. From the discussion that followed, it was chiefly evident that the greater part of the Professor's address might have been spared, as it appeared to be founded upon a misapprehension of what really is the attitude of the clergy towards science; and so, we may give our attention rather to what he thought proper to say on behalf of himself, as representing the "men of science" or "philosophers." His professions of earnestness and honesty may be succinctly summed up in a noble sentence for which the meeting was indebted to Professor Tyndall, who afterwards spoke, and who told us, if I understood him aright, that it was a sentiment of Professor Huxley's own—namely, that he *would rather die than lie*. This is, I repeat, a noble sentiment, and it is one not more solemn than became the theme, when the issue, as it was then put forward, involves nothing less than the truth or falsehood of the Holy Scriptures.

As a layman, however, myself, I feel bound to say, on behalf of the Christian clergy, that this is surely a sentiment

which their predecessors in the faith have previously taught the world, and that not merely by precept and profession, but also in their persons by example, as confessors and martyrs for truth. Even if it be urged that there has sometimes been an unworthy exception, it may also be replied, there has been a glorious self-revenge,—as, for instance, in the case of Archbishop Cranmer, who thrust into the fire the hand that had signed a temporary recantation of what he had been persuaded was true. All men must admire such a spirit of self-immolation, whether holding Cranmer's opinions or not. On the scientific side, I must say, I neither know of such an "army of martyrs," nor of any such penitent heroism. Galileo, who is perhaps the most popular of the "martyrs of science," preferred "to lie" rather than to suffer or to die; and—unfortunately for his reputation—he preferred "to lie" most consciously, by profession and act and deed, for he did it the very moment before he meanly whispered to his friend, his notorious *E pur si muove!* On the other hand, Copernicus, who never thus disgraced himself, was an ecclesiastic; and his great work which propounded what he considered to be the truth relating to the universe, was, after he had suffered much on account of his opinions, and after he had been satirized upon the stage, actually given to the world at the instigation, and by the encouragement, of a cardinal of the Church of Rome.

But, in truth, to die for one's convictions, when that dire issue is forced upon men in the face of their fellow-men and before the world, is not the rarest of virtues; but whatever be its value, it is one of which "men of science" have had little or no experience. In this country absolutely none. There have been minor persecutions, no doubt, for the sake of science. I know those who have suffered them in England, even in these enlightened days; but they have not, so far as I remember, been encountered by the recognized professors of science. Davy, in his early days, and when opposing some scientific doctrines, was considered "a very troublesome fellow," and snubbed; not by the general public, however, or even by the clergy, but by a "professor" of chemistry.

I must not omit to notice here the once despised philosopher Socrates, a genuine martyr for truth and for freedom of thought. And who were his persecutors? The professors of his day, who pretended to know everything, and went about giving lectures and teaching for profit their deleterious sophisms. I trust such a state of things is not in store for us! Should it come, be assured we shall want our Socrates Redivivus!

Martyrs have often died for truth; but let us not forget there have also been martyrs of delusion all over the world. A higher and surer test of honour and of nobleness, a better proof of honesty in man, must be looked for, and can only be found, in his every-day, straightforward candour towards those from whom he differs, and in the patience with which he bears neglect, misrepresentation, or even contempt. It is also to be seen in the openness with which a man fights chivalrously under his true colours, and the frankness with which he makes admissions, when, instead of having always been right, he knows he has often been wrong. And, indeed, upon the whole, in England, men who honestly have acted thus, have generally been duly respected. In our own day we have seen two brothers, both highly distinguished in their university, one leaving the Church of England for the Church of Rome, the other renouncing Christianity altogether; and yet, though both have written bitterly against and ridiculed what they have repudiated, with all the earnestness of eager converts to new opinions, they are generally honoured and respected, and even sympathized with, by those who in controversy have been their uncompromising opponents. And this is what ever ought to be. If the names of others who have also changed their views, and denounced their former professions, have been held in less respect by their fellow-men, it is not because of their changes of opinion, or for the plainness with which they have spoken or written, but entirely upon other grounds, which I need not now particularize.

I am sure that Professor Huxley needed not, in order to satisfy the clergy or any other honourable and fairly-educated class of the community, to make the least apology for speaking fully and fairly his convictions. I am quite sure the clergy as a body are as free from what was styled a "sort of conventional dishonesty of society," as any other class amongst us. And I venture to think that it was an unfortunate error on Professor Huxley's part—though it was explained to have been done for courtesy, and in order not to offend prejudice—that he failed to speak all he thought bearing on the subjects to which he called attention. Where he spoke plainest I feel certain he gave least offence; while his hinted reticence of expression and assumed moderation—as if something dreadful were kept back—only served to give an almost intolerable air of patronage to his tone, and converted what every one could see were intended to be his arguments, into a sorites of insinuations.

After these remarks, I need scarcely add, that on the present occasion I intend to use all plainness of speech,

though to speak with all due courtesy; and while I shall keep nothing back essential to my argument, I shall make no insinuations either that I might have said more, or that others mean more than they have said. I shall try to meet the issues fairly; and I shall now begin by saying what those issues are. In the first place it must not be supposed that I am about to attempt to establish the truth of the Bible chronology, or even to state what the Bible chronology is. What I have written is "in reply to Professor Huxley." The subject is strictly an inquiry into the cogency of the arguments *he* adduced in support of some doctrines of geological chronology which *he* considers to be scientific, and which *he said* are contrary to the Bible chronology. I shall simply follow his line of argument, with the view of showing chiefly, without implying intentional unfairness, that he did not place the issues, nor even the facts that bear upon those issues, fully or fairly before his audience; also that his arguments were loose instead of being cogent, and that sometimes they were self-contradictory; and that, therefore, he did not succeed in upsetting the chronology of *Genesis* as interpreted by himself. If besides this I happen to make out a *primâ facie* case in favour of the particular Scriptural chronology which Professor Huxley denied to be true; and if the doctrines of geological chronology which he professed to believe are shown to be utterly disentitled to the term "scientific" in any sense; or if men of science are proved to be at issue about those doctrines;—all that will be more than might be demanded in a reply that will not go unnecessarily beyond the line of the arguments which had been advanced to establish the very opposite conclusions. For a fuller consideration of the various arguments, *pro* and *con*, relating to this great subject, I must refer you to some former papers in our *Journal of Transactions*, but especially to the comprehensive discourse upon "The Past and Present Relations of Geological Science to the Sacred Scriptures,"* by Professor Kirk. It could not be expected—as I ventured to tell Professor Huxley in Sion College—that the large issues involved could be satisfactorily disposed of in a single unreported discussion arising upon an extempore address. Nor, of course, can they be disposed of in this reply. Fortunately for my line of argument, I do not think that much, if anything, will depend upon nice verbal accuracy as regards Professor Huxley's statements; but, fortunately also, in case that might be thought of importance, a gentleman who took down the principal parts of Professor

* *Journal of Transactions*, vol. i. p. 331, *et seq.*

Huxley's discourse at the time, having seen in the *Record* newspaper a letter from me to the President of Sion College on this subject,* has kindly forwarded to me his notes, and of these I have gladly availed myself.

THE TEACHING OF THE CLERGY.

Professor Huxley, having finished his exordium, thus opened the issues of discussion :—

"You [the clergy] tell your congregations that the world was made 6,000 years ago, in six days, and that all living animals were made within that period," &c.

Then he added :—

"I am bound to say, I do not believe these statements you make and teach ; and I am further bound to say that I cannot call up to mind amongst men of science and research, and truthful men, *one* who believes those things, but, on the other hand, who does not believe the exact contrary."

Now, even here, without going further, I must ask, Is the Professor's statement accurate? Is it true that there is, or ever has been, such a uniformity of opinion among the clergy or other students of Scripture as regards the chronology of *Genesis?* Surely he knows something of the literature of the other side. Discarding altogether the interpretation now held by very many (as was stated by the Rev. Simcox Lea, in Sion College), namely, that the first verse of *Genesis* probably relates to a time at an immense chronological distance from the verses that follow; discarding also other modern interpretations, such as those of Mr. Rorison, Professor Challis, Dr. M'Cosh, and others, it is surely a well-known fact, that long before there were supposed to be any difficulties with science as regards this popular chronology of the Bible, the "days" of creation were by many interpreted as signifying lengthened periods, and not literal days of twenty-four hours. It is also a fact that the Hebrew, Samaritan, and Septuagint versions of Genesis all differ, as regards the chronologies of Chapters v. and xi.; and many chronologers would be found to give about 8,000 years, as more probably the age of the world as literally deducible from *Genesis*, than the 6,000 years of the Vulgate and Archbishop Usher. I am quite aware that 2,000 years is of little account in "geological chronology," as set forth by Professor Huxley; but then such a period might be of conse-

* *Vide* Note A, p. 370.

quence to the other side. If we will only think soberly as to what is now being discovered by the Palestine explorations, to remind us how much may happen, in much less than 2,000 years, to change the face of a country and bury its massive structures deep under ground;—if we will think of the West Indian hurricane two months ago, and the earthquakes since, also of the recent East Indian cyclone and of Vesuvius as it is in eruption now; and if we will pay but the slightest attention to the innumerable historical records of still more destructive cataclysms, by water, wind and fire, during the present era, and even within a few generations, we shall be all the better prepared to think wisely as to the overwhelming power of nature to transform the face of the earth, and to estimate more truly the value of time in a *non*-uniformitarian world, subject to such marvellous changes as we know to have been accomplished within the historical period, and almost under our eyes.

But we have now to examine into the implied agreement among the clergy in holding to the 6,000 years of the vulgar era. So far is it from being true that there has been this agreement, that Mr. Goodwin, in the *Essays and Reviews*, actually pointed scornfully to the variety of conflicting opinions, and to "the trenchant way in which the theological geologists" (as he called them) "overthrow one another's conclusions." So notorious is the difference of opinion that has prevailed as to this, not merely among the clergy, but among all who instinctively cling to the notion that the Bible is true, while still inclined to follow the teachings of human science, that in the valuable paper read by Mr. Warington* at the first ordinary meeting of this Institute, he pointed out that, not only was it not settled among theologians what was understood by the word "day," but, with an extreme impartiality, he described the defenders of Scripture—not as bigoted and serried in prejudice and all of one mind—but as "a motley and discordant set, at war among themselves as fiercely as with the enemy." I quote this strong language to show, that we are not afraid of plain speaking in this Society. We think the truth should be spoken—the whole truth, and nothing but the truth;—because truth alone will last. Mr. Warington also pointed out, that as the arguments of some of the defenders of Scripture are mutually destructive, "a proportion of them must be wrong, and that the defence they make is, therefore, a source of weakness, and not of strength." He goes on:—

* *Journal of Transactions*, vol. i. p. 85, *et seq.*

"It behoves the advocates of Scripture to consider this well."—I venture to interpolate that *both* sides should keep it in mind.—"We hear much now-a-days [he continues] of the contradictory hypotheses of science, and of the constant flux of opinions in the scientific world. . . . But are there no contradictory hypotheses among the defenders of Scripture? Is there no flux of opinion in orthodox views? . . . Ay, truly, and that to a far greater degree, and of a kind far more inexcusable. Does the gradual unfolding of new facts cause scientific theories to be perpetually changing, and allow, for the time being, of the existence of many conflicting hypotheses? Well, be it remembered that every one of these theories and hypotheses has its advocates and representatives also among the defenders of Scripture." (p. 100.)

This, you will observe, is a very different state of things to that described by Professor Huxley. Which is the true description? Some may think Mr. Warington was rather hard upon the defenders of Scripture, among whom, no doubt, the great body of the clergy will be found. It may be thought that it is somewhat unkind now, to reproduce such a graphic picture of "a house divided against itself." But, let me ask, Is it not well to know the truth? And will it not also be profitable, if this may help us to discover the great cause of these disagreements, and to trace the main source of this internecine war among the defenders of Scripture? Well, then, we have this well explained, in few words and in popular language, in the *Saturday Review* of 30th November last:—

"Professor Huxley and Professor Tyndall after him" (says the Reviewer) "were exceedingly cogent in their demonstration that, if science and the clergy are to get on together, the clergy must take their scientific facts from science. But the truth is, this is just what they do already."

This, you will perceive, quite agrees with what Mr. Warington says, as to the various conflicting hypotheses and perpetually changing scientific theories having found but too ready acceptance among the defenders of Scripture, and tempted them to these varying interpretations. But the Reviewer—almost unconscious of the importance of his reproving words—also says this:—

"However ludicrous the readiness of the clerical mind to accept such conciliations may seem; however absurd it may be in men to find rest, now in a gap between two verses, now in the hypothesis of visions, and now in a theory of pure poetry, the readiness certainly does not prove any attitude of determined hostility towards science; . . . The clergy, in fact, float along with the stream of general opinion, and, considering the necessary

hitches, it is no discredit to them if now and then they float a little slower than other people. . . . When Professor Huxley holds one view about the number of centres of human origin, and rival professors hold another, it is open to the general public to advance a third if it likes ; but when all the professors in the world announce a certain order of geological succession, the general public simply hears and believes."

It will now be evident why I have quoted from Mr. Warington and the *Saturday Review*, to correct Professor Huxley's statement. It is, that such of the clergy, and any others, who have been led by scientific theorists into holding conflicting hypotheses about the creation, may recognise whom they have to thank for inducing them to adopt what are now sarcastically styled only "ludicrous" and "absurd" interpretations. But seeing that all these variable opinions exist, the next question is, which interpretation ought I to defend in replying to Professor Huxley? My answer is very simple—I trust it will not startle "the clergy" who may be present this evening:—I must defend what Professor Huxley attacked. If my reply is to be cogent, it must go to prove that Professor Huxley did not succeed in discrediting the 6,000 years of Usher, which alone he argued against. It would not really be fair to meet the Professor's arguments with a profession of faith in periods as elongated and indefinite as his own. If I could do no better than that, I might as well astonish you, by saying with the *Saturday Review*,—"The lecture was admirable, the illustrations perfect, "the argument conclusive, and, unluckily, there is no one to "argue with!"—But let us now proceed to examine the Professor's first argument.

THE ARGUMENT FROM THE CIVILIZATION OF EGYPT IN JOSEPH'S TIME.

As it was the first time that Professor Huxley had addressed a body of the clergy, he said "he would therefore deal with "the subject in their own familiar method. He would take a "text, and give them a scientific 'exegesis' drawn from the "text." He selected this passage from *Genesis* (ch. xli., verses 42, 43)—"*And Pharaoh took off his ring from his "hand, and put it upon Joseph's hand, and arrayed him in "vestures of fine linen, and put a gold chain about his neck; "and he made him to ride in the second chariot which "he had.*"

"Now I ask you (said the Professor) to depict to yourselves that marvellous valley of the Nile, where these events took place 1,800 B.C. No doubt the passage is historical; that is to say, that the Pharaoh therein spoken of, who had at his disposal so great wealth, and who was master of the civilization of the world at that time, thought fit to elevate one of his slaves, invest him with symbols of authority, and make him to ride in the second chariot of the land,—placed him in position, power, and authority next to himself. These things indicate great advances in civilization, and refinement, and luxury. Certain monuments of that era show horse chariots sculptured upon them, as in Joseph's time, when there must have been a great civilization. Before that there existed a people highly civilized, but with whom are no traces of chariots or domestic horses: thus we suppose a great interval elapsed. Now, when we examine the records of the past, more than 2,000 years before the Christian epoch, we find at Memphis, in the oldest pyramids, records indicating the high cultivation which existed then as now by the overflow of the Nile," &c.

He afterwards quotes Herodotus as saying—

"that this Nile valley was once a great arm of the sea, filled up in process of time by mud brought down by the Nile—this great Nile valley, 1,200 miles long—filled up by mud forced down the Nile. And unless you are prepared to deny this condition of things, that in the time of Joseph, and long before, this Nile valley must have been essentially what it is now, ask yourselves what period of time this process of filling up this huge arm of the sea must have taken."

In order to bring in this last allusion to the time of Joseph, I have extended this quotation beyond what strictly belongs to the present branch of our inquiry. But having done so, I feel some difficulty in commenting upon the strange matter it contains. I would fain copy from the moderation of Professor Huxley, when his "courtesy" (says the *Saturday Reviewer*) "became almost distressing as his sense of truth "forced him to unroll the long series of geological formations "which had preceded the chalk." Only, I require all the courteous moderation I can command, to contract and roll up again, into rational and actual dimensions, the Professor's extraordinary extension of the land of Egypt, and the stretching of all that Herodotus has said, or could have conceived, about the valley of the Nile. The whole of Egypt, as well described by Herodotus, from the city of Elephantine to the sea, extends only from about 24° to 31° 30′ N. Lat., *i.e.* to less than 8 degrees, or about 480 miles! And instead of Herodotus dreaming that "1,200 miles of the valley of the Nile" was ever "an *arm* of the sea," what he distinctly says is, that *the space between the mountains below Memphis* seems to him to have been formerly "a *bay* of the sea" (*Euter.* ii. 10); or, as in another passage, "the land below Lake Mœris," and perhaps a little above it (*Ib.* ii. 4); and in another place, "a bay extending southward, and approaching, per-

haps, so as to meet each other, and to overlap to some small extent the Arabian Gulf" (*Ib.* ii. 11). Now, probably the whole extent of country that Herodotus intended to indicate was not a hundred miles in length, being merely the Delta and the flat region round about Heliopolis and below Memphis; and even if we measure from the position of the artificial Lake Mœris, and suppose that the head of the Arabian Gulf did not formerly extend north of 30°, still the whole length of the district indicated would be considerably under 200 miles. It is almost absurd to suppose that Herodotus imagined the mountains between Lake Mœris and Memphis, and those on the other side of the river were part of this "bay of the sea;" his whole language evidently referring to the Delta and the low alluvial flats "between the mountains." Thus he says, "for the Delta, as the Egyptians themselves acknowledge, and as I think, *is alluvial*, and (if I may so express myself) *has lately come to light*,"—meaning, as "land acquired by the Egyptians, and "a gift from the river" (*Ib.* ii. 15 and 5). Again, one of the reasons he gives for crediting this opinion is, that "Egypt projects beyond the adjoining land" (*Ib.* ii. 12). Now, any one may see, by a glance at a map, that the extent to which Egypt does so project is not half the length of the Delta, or less than 60 miles. What, then, to make of Professor Huxley's imaginary long "arm" of "1,200 miles," I am at a loss to know. It is just about ten times longer than any "bay" which Herodotus can have conceived; and fond of high figures as the ancient Egyptians were, (like some now among ourselves!) I am very sure that the learned Professor did not get any hint of his modern measurement of the Egyptian Nile-valley in the pyramid-records of those old "land measurers" who founded Memphis!

Then as regards the pyramids themselves, he spoke of them as built more than 2,000 years before the Christian epoch, or about 300 years before Joseph's time, and 200 before the time he himself assigned to Joseph; whereas the usual chronology makes the pyramids 200 years *after* Joseph's time, or 1,500 B.C. As I do not know where he gets these unusual dates, I shall only further observe, that although the founding of Memphis is given by some as in 2,188 B.C., the building of the pyramids is generally given as 700 years later, or B.C. 1,492.

But the principal argument relied on, in this part of Professor Huxley's discourse, was the evidence of great civilization in the text he quoted, and the supposed long time required for the attainment of this condition, but especially before chariots could have been invented by the Egyptians. As,

however, he very plainly said, that this great lapse of time was merely supposed, there is here no argument to examine. But it would have been well, if he had given the supposed dates of the two classes of sculptured monuments from which he derived his negative proof of the non-chariot period in Egypt. If found in the Memphis monuments "2,000 years B.C.," *i.e.* at the time the city was founded, and it being admitted to be history that in Joseph's time there were chariots, then the "supposed great interval," that it is assumed must have elapsed, is not really so great after all,—certainly less than 300 years, even if we further suppose that chariots were just invented at the time when Joseph was made governor; which is not probable.

As to the argument that the Egyptians were without domestic horses at the time when no chariots are represented in their sculptures, I will only say, that if we adopt the usual genealogy of the Egyptians as being the descendants of Mizraim, the grandson of Noah and the founder of Memphis, then we can scarcely imagine them to have ever been ignorant of the use of horses. But as to this, and also as regards the great advance supposed to be made by them in civilization when they built their chariots, I would suggest that the simple explanation of the meagre facts upon which all this speculation is based, may be, that the tribe of Mizraim did not find carriage-roads ready-made in the valley of the Nile when they founded the colony of Egypt! Hence the very natural delay that may have occurred before they introduced chariots after building Memphis. To us who are accustomed to read in earlier chapters of *Genesis*, of earlier periods still in man's history, and of his primal condition as being one of high elevation and of great capacity, the early civilization of Egypt presents no difficulties. In *Genesis* chap. iv. we are told that Cain, the very first man born in the world, built the city he called Enoch after his son; and we read then of men who handled the harp and organ, and of artificers in brass and iron. In *Genesis* chap. vi. we also read of the ark of Noah, a hundred years before the building of Babel, nearly 1,000 years before the Egyptian pyramids. And we know from the modern science of ship-building, and the proportions given for Noah's ark, that its construction bears testimony to a marvellous knowledge of mechanical principles, far exceeding any amount of skill required for the construction of chariots.

In homely phrase, "the cart is put before the horse" throughout this argument, deduced from the civilization of Egypt. Whatever we may think of the theory of development in organic life, or of "the number of centres of human

origin," Professor Huxley cannot be at issue with us on that account with respect to Egypt. We have certainly to account for the chariots there, but we have neither to wait for the development of the horses nor of the men! The Egyptians were clearly immigrants, attracted to the fertile valley of the Nile, *after*, we may presume, its supposed recovery from the sea—that is, if it be not maintained that the muddy-looking Egyptians suddenly started from the Nile-mud itself; for the only other alternative would be, that they were "sea-born" like the fabled Venus!—But, if immigrants or colonists, what becomes of the gratuitous assumption of enormous time for their civilization? The whole cogency of the argument will depend upon the condition of the tribe of Mizraim when they colonized the Nile-valley. And surely the men who at once proceeded to build Memphis would have been able then to make chariots; and if they did not, we may believe they only sensibly waited till they had constructed tolerable roads for them to run on.

But let us take an illustration as to this, from a state of things of which we have certain knowledge. Let us suppose some grand convulsion of nature to affect Australia, analogous to that which may have raised the nummulitic rocks about Egypt, from the bottom of the ocean, where they were no doubt prepared and formed. Let Australia be cast into the sea or submerged, for some generations, and in process of time raised up again above the waters. And then suppose some future archæological geologist to discover there the evidences of the savage condition of the aborigines, as well as of the civilized colonists, side by side, or, merely in the cities of the latter, the traces of their early and their existing condition. What speculations might not then be indulged in, what unlimited drafts upon time might not be devised, to account for the great advancement in civilization and refinement and luxury in Australia, upon the theory that its present civilization had a savage origin!

But then the cogency of the argument would all depend upon that assumed theory being true. And, I will say this, that if man was originally a savage, or a speechless nondescript animal somewhat lower, (which we know is, or was, Professor Huxley's own opinion as published to the world not many years ago,) then I think the learned Professor will require considerably more time than he hinted would be necessary, and infinitely more than the facts and dates, as he stated them, can possibly furnish him, to account for the civilization of Egypt. He or we, it seems, are as yet at liberty to indulge in our respective views upon this point, if we like. But

I do contend, that in bringing these matters before the public in popular lectures, the real state of the question should be made known. Professor Huxley spoke in the name of science and of men of science; and he left it to be inferred that there were not two opinions as regards the doctrines he put before the clergy in Sion College. Now, I am obliged to ask, whether that is true? And I venture to say—though I trust that truth in science is not to be settled by majorities—that not even a majority of those who are reputed to be men of science hold the same opinions as Professor Huxley, as to man's origin or his advancement to civilization. At the British Association, in 1865—

"Professor Rawlinson publicly protested against the assumption that human beings were originally in that poor and destitute condition which had been described, and that they all rose from a state of barbarism. He held the very opposite opinion, viz. that they were created in a state of considerable civilization, and that while most of the races had declined into absolute barbarism, some races had never done so. The Egyptians, Babylonians, and Jews had never so declined."

You will observe I am not asking your assent to Professor Rawlinson's views, any more than to Professor Huxley's; but only endeavouring to show that you ought not to accept as "Scientific Doctrine" all that has been professedly put forth as such at Sion College. I do not know whether you will consider that the doctrines there professed, so far as we have yet examined them, were supported by cogent arguments or not. But at any rate you must reject, as not a fact, that fanciful "huge arm of the sea" 1,200 miles in length; as being a stretch far up the river Nile, nearly three times beyond the whole length of Egypt; and as a notion not imagined by the acute Greek "Father of history," or dreamt of in the days of the Hebrew, Joseph.

You must remember also that the argument, that a long time must have elapsed after Memphis was built before its founders advanced to build chariots, is entirely based upon a mere assumption, which is not yet accepted by the most credulous, as a "scientific doctrine," and which indeed is self-destructive of their faith in the fact they argue from, namely, the existence of Memphis itself.—And now let us go on to the Professor's second position.

THE ARGUMENT FROM THE MUD DEPOSITS IN THE VALLEY OF THE NILE.

It was perhaps because it was here that Professor Huxley intended to found one of his strongest points against the

6,000 years of *Genesis*, that he did not pay sufficient attention to the geography, topography or geodesy of Egypt, and gave but a weak "exegesis" of Herodotus. Let us therefore give all the more careful attention to his argument from the Nile-mud deposits. This mud deposit, he said, was very old, older than the pyramids which he said were built upon it; and in order that those who heard him might never forget this assertion, he thought it proper to anticipate (very properly only to ridicule) the objection, should any one advance it, that the mud might have been afterwards put under the pyramids, instead of their being built upon it! But the only objection he heard from the clergy was, that he was wrong in his statement that the pyramids stood on the mud! He was told they were built upon rock, when he only ventured to suggest that they stood "upon rock *and sand*." But he added that it did not signify to his argument upon what they stood, as he only wished to prove, from the Nile-mud being older than the pyramids, what a long period must have elapsed before Joseph's time and before the pyramids of Egypt were built. He said:—

"These monuments,—built on the site of the Great Valley of the Nile, fertilized then as now by the deposits left by that overflow of the mud which became the source and cause of the land's fertility and produce,—these monuments evidently existed *after* this great deposit of mud, upon which they stand; and what is this Egyptian mud?"

Then follows the passage I have already quoted referring to the opinion of Herodotus. After which the Professor goes on:—

"Various estimates have been made as to the quantity of mud which is brought down year by year. I will rather understate than overstate the results. The general estimate of the process of filling gives *five inches in a century*. This no doubt is a correct estimate, but let us take the quantity to be 12 inches or 1 foot in every century, so that there may be no room for cavil. Borings were made, and it was found that in the valley of the Nile we could bore to 70 feet through this Nile-mud. Now 70 feet at 1 foot for every 100 years gives at once 7,000 years, a longer period than has elapsed according to the received chronology of only 6,000 years since the creation of the world."

Now, I think we may well object to this average for the Nile-deposits of 1 foot in a century, for two very cogent reasons, and not because inclined to cavil. Because (1st), if five inches is the correct and general estimate, it ought on that account alone to be preferred; and (2nd), because the one foot

in a century is incredible, and upsets Professor Huxley's own arguments. Let us deal with the last objection first.

Unless then the Professor is prepared to adhere to the position that all this "70 feet of mud" was deposited prior to the founding of Memphis and the building of the pyramids; unless he will now admit that it was not all deposited 2,000 years B.C., then we must clear away no less then 3,800 years' deposit,—that is 20 feet before the Christian era and 18 feet since, together 38 feet,—or considerably more than half the depth of the whole existing deposit, in order to know what the valley of the Nile was like at the founding of Memphis.

But prepared as we might be upon reflection to reject such an extravagant estimate, as almost tantamount to clearing out the Nile valley altogether, and leaving no sufficient extent of well-watered alluvial plain remaining, that would have been worthy of attracting the descendants of Ham to settle there; we must not forget that this argument is based upon the fact that the Nile deposit is going on still; so that, whatever be the true rate of deposit, we *must* clear away what was deposited from the days of Mizraim and Memphis to our own. Let us therefore now, in the second place, take what Professor Huxley calls the general and "correct" estimate of five inches in a century; and let us then see "the results." The deposit in 38 centuries, at 5 inches in a century, would give 190 inches, or 15 feet 10 inches, which must be taken off from the whole upper surface of the Nile valley, in order to know something of what it was like when Memphis was built. With this Herculean labour before us, it is well that we have been able to reduce the superficial dimensions of the length of the valley of the Nile to something less than 1,200 miles! But the whole breadth of the Nile valley at Heliopolis, *i.e.*, about eight miles above the apex of the Delta, is only some sixteen miles; and at Memphis it is but five. At both these places "borings" have been made; and one of them was certainly said to be 70 feet deep,—or rather it was 72 feet;—but that was in the deepest part of the valley—assuming water to find its level—within 200 metres of the river itself! But what of all the other borings, as to which Professor Huxley was silent? As the case was put at Sion College, you have to imagine an enormously extended valley, 1,200 miles long, and nothing less than 70 feet deep, filled up to the brim with mud! The conception is truly sublime, and on the largest scale. In comparison with it the real facts are almost contemptible. But we are bound to deal with the facts. Let me cite them from a small work by Archdeacon Pratt of Calcutta, that it may be known that all the teachings of Sion College must not

count universally on being accepted by the clergy! The Archdeacon observes, "The thickness of the Nile mud is very different in the several excavations in the same neighbourhood."* At spots 3,100, 784, and 1,215 yards from the obelisk at Heliopolis, and having different bearings from it, the thicknesses were found to vary from *less than 7 feet to upwards of 14 feet!* The precise measurements he quotes are 9·92, 13·25, 14·25, 14·8, and 6·67 feet, and they are taken from Mr. Leonard Horner's memoir in the *Philosophical Transactions* for 1855, pp. 132-136. In the borings made westward from Heliopolis towards the centre of the valley the depth increased, and the excavations were made on a pretty large scale up to depths of 16 and even 24 feet; beyond that they were more literally "borings," and the mud was found to be 60 feet deep near the centre of the valley. The width of this deepest part I do not know; but I have cited enough, I think, to show that —as might have been supposed—the basin of the Nile valley is quite irregular in its surface, and slopes gradually on each side towards the centre or channel of the river. It must be evident therefore that if we take off 15 feet 10 inches deep of mud all along the upper surface, we must very greatly reduce the width of the valley from what it now is. But we must do this if we would know what it was like 2,000 B.C. The valley must then be narrowed at the edge near Heliopolis by some two or perhaps three miles, for no sounding within 3,100 yards of that city was deeper than 14¼ feet, and there the valley is very flat, just as it is described by Herodotus. We must correspondingly take off some two or three miles from the opposite or western side; and this will reduce the expanse of the valley at Heliopolis, or eight miles above the Delta from its present 16 miles to 10 or 12. Of course as the valley narrows towards Memphis it may be deeper and less shelving at its sides, and the clearing of 15½ feet of the upper mud will make comparatively less difference there in the width of the valley. But still the difference will be very great.

Let us now consider another result that follows from the facts we are dealing with. If 5 inches deep of mud are now ascertained to be deposited in a century over the whole expanse of the Nile valley as it now is, when 16 miles wide at Heliopolis; then supposing the river to bring down no more mud now than it did when its width there was only ten or twelve miles; let me ask, Are we to be visited with the dreadful penalty of being considered *not* "scientific," if we say that, therefore, the deposit must have been much greater in depth

* *Scripture and Science not at Variance.* Fifth edition, p. 138.

(if there is any cogency in these arguments at all) at the time of Joseph, and deeper still 2,000 years B.C.? If it is argued that the *quantity* of mud which the Nile deposits in a century now, it must always have deposited in each preceding century; and if that is to be regarded as a cogent argument capable of giving a firm foundation to "scientific doctrine;" then, I say, this requires you also to admit (whenever you pay attention to the dimensions and the form of the basin in which the deposit is to be laid down,) that the *depths* of the deposit *must* vary greatly as we go back in time, and *must* have been very much greater in the long past than now. If that be so, we cannot concede, (as Professor Huxley required of the clergy at Sion College,) that "in the days of Joseph this Nile valley must have been essentially what it is now"! That there was then a fertile valley there, we may readily concede; for what else could have induced the tribe of Mizraim to settle on the banks of the Nile? But we *cannot* believe the valley was then so extensive, or that all its "70 feet deep" of mud was deposited 2,000 years before Christ. *Professor Huxley cannot believe that himself!* And he will find that if 5 inches of mud are now deposited in a century, and if merely the *same quantity* has for many centuries past been depositing, that this valley will rapidly narrow as he goes down, and he will soon come to the surface of the basin and channel of the river, with no fertile alluvium on its banks! When he comes to this, let him propound a theory, in accordance with *his* philosophy, that will account for the existence in that condition of the heaved-up and divided mountains or scooped-out rocks that form the basin of the Nile valley; or that will account for the river, that flows along for more than 1,200 miles from its still probably undiscovered sources. For my own part, in pursuing this inquiry I have been forced to think, that the fertile valley of the Nile must have had its beginning when the waters subsided after the great Deluge, and returned from covering the face of the earth, though since then probably the greater part of the Delta has been formed, and the valley of the Nile has continued to fill up and to increase in breadth. But I must object to the notion of its filling up uniformly at the rate of 1 foot in a century. The estimate is outrageously extravagant. Even that of 5 inches in a century, *as the present rate*, is more than we shall know what to make of, when the valley narrows as we descend in depth, and as we go back in time. I should rather be induced to accept the estimate of M. Rosiere of 2 inches and 3 lines in a century, that is, less than half the 5 inches announced by Professor Huxley as no

doubt the "correct" rate. But whatever be the rate we may think probable, judging from recent observations—and even as to this, let me observe, all men of science have certainly not come to one conclusion—very sure I am of this, there will be difficulty experienced in all our calculations from the depths of the past deposits, if we will measure them by those of the last 2,000 years, or even since the time of Herodotus. Sooner or later, as we clear away in our imaginations the surface of this mud-deposit, century after century, we shall approach to the end of the series, and find it a much harder task to conceive how the deposits began, than to count up their accumulations. It is fortunate for us that we are obliged by our reason to know, that even the Nile deposits must have had a beginning; so that we cannot be satisfied with a speculation that speedily runs itself out and ends in a beginning that is simply an utter blank.

Here I think I might quit the argument from the Nile mud, having shown it to be not one whit more cogent than that advanced from the monuments of Egypt. But I confess I am loath to omit some notice of what is to be found in old Herodotus, about the pyramids and the valley of the Nile, sufficient to have rendered impossible such arguments as we have been examining, in favour of such "scientific doctrines"!

Let us then see what may be learnt from the old Greek historian. Professor Huxley asserted that Herodotus says that the Nile valley was once a great arm of the sea filled up in the process of time by mud brought down by the Nile. This was put forward as if Herodotus had testified this, and as a fact which had been ascertained. But that is not the case. What he says is, that the priests informed him that the greater part of the country had been acquired by the Egyptians (from the sea); which he says *appeared* to him to be the case; and his reasons for this opinion are worth attending to. He says—

"I therefore both give credit to those who relate these things concerning Egypt, and am myself persuaded of their truth, when I see that Egypt projects beyond the adjoining land, and that shells are found on the mountains,"* &c.

I need quote no further here, because you will observe Herodotus has already proved more than enough. He has proved, not that *the valley* had been under the sea, but *the mountains* that form its basin; though he probably was not

* *Euterp.* ii. 10, 12.

aware that the nummulites embedded in those mountain ridges had once lived in the waters of the ocean. I am not you will understand endeavouring to show that there is no evidence that all the land of Egypt, with all its high hills as well as its plains, was once for a time under water. The testimony of Herodotus as regards the shells found upon the mountains is valuable, whatever we may think of his deduction, that "the valley below Memphis was once a bay of the sea." If masses of sea-shells had been discovered in the Nile mud, and in the sand which is mixed extensively with the mud, that might have gone far to prove the conjecture of Herodotus to be right; and it would be adverse to the usual supposition that these layers of sand have been blown over the mountain-sides from the inland deserts. It would also have given some show of cogency to the argument of Professor Huxley, which at present it seems utterly to want. I say "some show of cogency" only, for here, though the evidence that no sea-shells are recorded as being found in the deposits, is very significant, their presence (at least to some slight extent) might be accounted for, as having been blown from the tops of the mountains into the valley along with the sands; and therefore would not quite establish that the valley had been once either an arm or "a bay of the sea."

Let us, however, proceed with Herodotus, and attend to some more of his actual facts, regarding this great valley of the Nile. After giving the whole length of the coast of Egypt as in his day 3,600 stades, he goes on:—

"From the coast, as far as Heliopolis, inland, Egypt is wide, being all flat, without water, and a swamp. But from Heliopolis upwards Egypt is narrow, for on one side there is the mountain of Arabia extending from north to south and south-west, stretching continuously upwards to the Red Sea; in which mountain are the quarries whence the stones were cut for the pyramids at Memphis, &c. And on that side of Egypt which borders upon Libya there extends another rocky mountain, covered with sand, on which the pyramids stand," &c.; and a little after he says, "Above this, Egypt again becomes wide."*

This passage would seem to be the ancient source whence Professor Huxley derived the idea that some of the pyramids are built upon "rock *and sand.*" In Mr. Cary's English translation of Herodotus, published by Bohn, the words, "a "rocky mountain and covered with sand, on which the "pyramids stand," might for a moment just suggest this notion, which however a second moment's reflection ought to

* *Euterp.* ii. 6, 7, 8.

dissipate. The passage, read anyhow, ought to have been sufficient to put any one on his guard against transporting the pyramids from their real position on the *rocks* "on which they stand," into the valley of the Nile!

Here I must for a moment leave Herodotus, in order to allude to one other consideration affecting this important question, and which might of itself have been advanced as a sufficient argument against any assumed uniform rate of mud-deposit in the Nile valley. I refer to the great probability that the general level of the country of Egypt has been subjected to elevations and depressions, which of course would materially affect the rate of the Nile's deposits. It appears that Sir Gardner Wilkinson was led to infer that there has been a sinking of some parts of Egypt, judging from the present position of the tombs in the Delta called Cleopatra's Baths. These, he thinks, could not have been originally built so as to be exposed to the sea, which now fills them; but must have stood upon land once above the level of the Mediterranean. Sir Gardner adduces as additional signs of subsidence, some ruined towns now half under water on the Lake of Menzaleh, and channels of the ancient arms of the Nile itself, now submerged with their banks below the level of the water of that lagoon. Professor Huxley did not think it necessary to notice these facts adduced by Sir Gardner Wilkinson, nor the seemingly "cogent arguments" Sir Gardner founds upon them. No doubt it is much easier to settle complicated questions off-hand, in "professorial style," and "to snatch a verdict," especially when it may be done "with benefit of clergy!" But is this fair to one's audience, or to the public, or to Truth? Is that the way we are to teach our children "science," in the days to come, in our halls and universities?

But to revert to Herodotus. He tells us that in his day, that is, about five hundred years B.C., the Egyptians inclosed within embankments the areas upon which they had built their temples and monuments, and that these spots appeared to have sunk, and could be looked down upon from the surrounding grounds.

This is adduced by Mr. Brodie* as an argument in favour of a depression having taken place of the sites on which tho temples stood, subsequent, of course, to their erection. No one will readily believe that the architects of Thebes or Memphis would have built city after city and temple after temple in positions where they would be annually flooded; and indeed there is a passage in Herodotus which shows that

* *The Antiquity, &c., of Man*, p. 56.

the cities were in his day still standing generally upon elevated foundations or on rocks in the valley. He says :—

"When the Nile inundates the country the cities alone are seen above its surface, very like the islands of the Ægean Sea; for all the rest of Egypt becomes a sea, and the cities are alone above the surface. When this happens, they navigate no longer by the channel of the river, but across the plain. To a person sailing from Naucratis to Memphis, the passage is by the pyramids; this, however, is not the usual course, but by the point of the Delta and the city of Cercasorus; and in sailing from the sea and Canopus to Naucratis across the plain, you will pass by the city of Anthylla and that called Archandropolis,"* &c.

Well, this being the case in the time of Herodotus, let us remember, that if we take Professor Huxley's rate of deposit for the mud as a foot in a century, all these cities if standing at the present day would have been 23 feet nearer (if not below) the surface of the water than when Herodotus wrote;—or on the more moderate and "correct" calculation of 5 inches deep of deposit now in a century (and adding nothing to this depth for the narrowing of the valley), they would be some $9\frac{1}{2}$ feet less above water now, than twenty-three centuries ago.

Herodotus further mentions that—

"the priests had told him that in the reign of Mœris, when the river rose at least eight cubits, it irrigated all Egypt below Memphis; and yet [he adds] Mœris had not been 900 years dead when I received this information. But now, unless the river rises sixteen cubits or fifteen at least, it does not overflow the country. It appears to me, therefore, that if the soil continues to grow in height, in the same proportion, and to contribute in like manner towards its increase, those Egyptians below Lake Mœris, who inhabit other districts and that which is called Delta, must, by reason of the Nile not overflowing their land," suffer for want of water.†

Leaving out his mere speculations and looking at his facts, they would seem to indicate that at this time the city of Memphis was not liable to be flooded as it is now; but only the whole country *below it* (or of a *lower level*) towards the sea. That of course is perfectly consistent with the lower ground much further up the valley and all round about, being more or less irrigated by the rising of the river.

So much then for the argument from the mud-deposits in the valley of the Nile.—And now for Professor Huxley's next point—

* *Euterp.* ii. 97. † *Euterp.* ii. 13.

THE ARGUMENT FROM THE NUMMULITIC ROCKS OF THE NILE-BASIN AND THE CHALK FORMATIONS.

I am glad that here we have no important question of fact to occupy our time. The character of the Nummulitic limestone strata may be admitted, as lucidly described by Professor Huxley, with a very slight qualification. He says the existence of the nummulites, and of other organizations of sea-habitants embedded in these strata, affords evidence that this nummulitic limestone was formed at the bottom of the sea. He also speaks of it as having been "deposited" there; and it is that word deposited which requires to be accepted cautiously, as we shall yet see. But he goes on,—

"Therefore before the Nile valley was formed, the land of Egypt [meaning this nummulitic formation] was down at the bottom of the sea; raised by subterranean forces; and must have existed not only 7,000 years, but all that epoch which by slow accumulation would have furnished such a mass of nummulitic rock, spreading as it does from Hampshire to China."

Then he asked, "How many years would this take? Thirty thousand?" And he replied, "More. The time which this process occupied was an enormous period. And even this is but as it were an incident in the history of this earth—no more than the shadow of a cloud passing over the history of the world." Then the Professor proceeded, (as described in the *Saturday Review*,) "to unroll the long series of geological formations which had preceded the chalk." Next he compared the old chalk formations to the chalk-ooze of the Atlantic now; and reminded his audience that chalk is one mass of the exuviæ of foraminifera and other organisms that once lived and could only have existed at the bottom of the sea under the same conditions as they exist now. After which he said:—

"A million years could not have produced this chalk deposit of 1,100 feet thick,—whether less or more it makes no difference,—but it is clear that this world was *not* made 6,000 years ago."

I trust I have fairly epitomized Professor Huxley's statement. Now, I wish you to analyze it, and see clearly how much of it is certain, and how much is merely conjectural. In the first place we must take away the 7,000 years, he thought he had proved, for the previous mud deposit of the Nile; and therefore it is *not* certain that the nummulitic rock must have existed all that time. But then he says, we have all the long epoch required for "the slow accumulation" of the mass of

nummulitic rock. He omitted, however, to prove anything as to the rate of its formation. He assumed it to be a mere deposit, and that its accumulation was so slow as to take 30,000 years; but the whole of that is mere assertion and conjecture. He may be right or he may be wrong; but he advanced no argument whatever in support of *this* Scientific Doctrine. Well, how can we examine whether an argument is cogent or not, when we have no argument to examine? Might not that reply be now sufficient? Whenever he "brings forth his strong reasons," would it not be time enough then to consider them? When he dealt with the length of Egypt, with the Nile valley, with Scripture, with Herodotus, and with the time required for the mud-deposits, and gave us something tangible to examine, I think I did not shrink from the task. But what can I reply to this mere *ipse dixit* that more than 30,000 years were required for the formation of the nummulitic strata? Had he been nearly right on the simpler problems of geography and history he began with, and somewhat fuller in his statements of the facts bearing, for instance, upon the deepness of the scientific borings in the Nile valley, we might have been inclined to trust him more easily here. But, if he has been both reticent and wrong, and has signally failed, as I do think he has, to help us to discover anything like the probable time required for a mere surface deposit of mud, we cannot be predisposed now to accept his mere off-hand estimate for solving this deeper problem.

But do not think I am saying this in order to escape the necessity of saying more. I only wish to show, that I must now take another line in my reply, when there are no real facts to dispute, and no arguments of any kind to answer. At the same time I do not think it would be profitable to meet assertions merely with assertions; while still less could I presume to offer any mere assertions of mine against those of so distinguished a professor. I have indeed an advantage in knowing that it would be useless for me to attempt to palm off upon your understandings here, any mere vague and extravagant doctrines, without the least proof, and expect you to give them credit. Not being a "scientific authority," I can only expect your assent to what I may prove or disprove, or can show to be probably true.

Well, I think there is something to be advanced in reply to Prof. Huxley, which must lead you to reject the Geological Chronology which he chiefly relied on for discrediting the chronology of *Genesis*. He thinks nothing of 6,000 years. Even the 30,000 assigned to the nummulite formations alone, he considered as not worth regarding, when compared with the

enormous periods required for the other successions of strata all deposited and laid upon one another; but especially as unworthy of notice when compared with the chalk. For his culminating assertion was, "a million years could not have produced this chalk deposit of 1,100 feet thick." He seemed prepared to rest his whole case upon this; so here then let us now join issue. But I select the chalk not only as his strongest point, but also because, as regards the chalk, he favoured us with some show of argument, deduced from the analogy of what we know of the present chalky ooze of the Atlantic. I accept the analogy as a fair one, upon which a cogent argument might be based, bearing upon the old chalk formations. Let us now therefore examine how much of cogency may be discovered in the argument of Professor Huxley.

But here I regret to be obliged to point out, that he was exceedingly chary and vague in the information he thought proper to communicate, in order to establish the probability of his scientific doctrine. Probably all who heard him knew long before 21st November last, that chalk is mainly made up of microscopical shells, and that in drawing a chalk-line upon the black board, as he graphically did, the white mark was almost literally "a line of skeletons."

Perhaps, also, most of those who heard him knew long ago, all that he chose to tell them then, about the ooze of the Atlantic. Whether it was that he considered the argument from the ooze to the chalk as too obvious to require to be fully stated, or whether it was that its whole import was so clear in his own mind that he forgot to give it expression; certain it is, that, except to say that the ooze is essentially a kind of grey chalk in the process of formation, and to call it a "deposit," he told us nothing. He told us nothing especially of the rate, either actual or conjectural, at which the ooze now accumulates in the Atlantic Ocean, though that was apparently intended to be the sole criterion for calculating the more than a million years for laying down the old chalk formations. Neither did he even hint to his audience *how* the Atlantic ooze is known or supposed to accumulate. Nor did he think it incumbent upon him to advance a single argument, whether cogent or not, to show that the old chalk formations must have been accumulated in precisely similar circumstances as the present ooze of the Atlantic,—except (about which there can be no question) that the one like the other accumulated at the bottom of the sea.

It was, therefore, in order to enable him to supply these omissions and to complete his own argument, that I ventured

to ask him at the time, to be good enough to explain, whether he thinks, or knows, that the foraminifera of the Atlantic ooze are merely deposited when dead, (for he had spoken of their "exuviæ,") and by simply sinking down in that condition to the bottom of the ocean; or whether he thinks, or knows, that they are still alive at the bottom, and propagating their species there; in which case, I pointed out, the so-called "deposit" of ooze would not be a mere sedimentary deposit; for it would then chiefly *grow* by accretions to its surface at the bottom of the ocean, though it might also be increased from the sediment in the waters falling down from above. I do not know whether the idea had ever before occurred to him. Perhaps—as a new idea coming from one not within his circle of "scientific men," it may have struck him as not worth considering, or as merely absurd to suppose that the foraminifera are actually breeding now at the bottom of the Atlantic. And perhaps they do not breed there. But, if not, they must have been bred elsewhere. They are living organisms; and they are of that lowest class that generally increase and multiply with the most marvellous fecundity. And what I wanted to know was, what is the "scientific doctrine" respecting the Atlantic ooze, in order to discover, whether there was a true analogy and any cogency in the argument, in favour of the "scientific doctrine" that the old chalk formations were formed, or "deposited," identically as the Atlantic ooze is now. Professor Huxley, I am sorry to say, did not favour me with any reply to this inquiry. Perhaps, like some other professors I know, he does not like to be examined!

In the absence, then, of Professor Huxley's express teaching, I may say, that I am told that one scientific doctrine about the ooze is, that the gulf stream carries into the North Atlantic great quantities of the foraminifera, which are partly caught by or cling to jelly-fish, and partly sink to the bottom. Perhaps it is not really known whether when in the ooze they are still alive, and able to reproduce themselves, or not. But, if not there, I must repeat, they must have been bred somewhere else; and I think it must be admitted, that where they breed there they must accumulate with an infinitely greater rapidity than where they, or their exuviæ, merely sink when dead to the bottom, after escaping the jelly-fish and such other inhabitants of the deep as may relish that kind of food. And again comes, of course, the question—towards the solution of which, however, Professor Huxley contributed nothing,—Is the old chalk merely also a deposit of dead foraminifera (if such be the character of the ooze of the

Atlantic); or, Is it a very different formation, that was accumulated by the fecundity and reproduction of living foraminifera that had never been washed away from their native beds in the bottom of the primeval seas where first they began to live? You will observe the two cases, as now supposed, are no longer analogous. If this supposition be wrong, and a true analogy can be established, it must be obvious that this will very materially affect the cogency of the argument in support of Professor Huxley's doctrine. The importance of having some actual knowledge to guide us by analogy, some real "science" of the formation of the Atlantic ooze, cannot be over-estimated. For there is still a further analogy, which Professor Huxley pointed out, between the chalk and nummulitic strata. Both have been evidently formed in the beds of the ancient oceans; for both are full of the dead remains of sea-inhabiting living organisms. It will make all the difference to our argument and analogy, as regards all such marine formations, if they grew up at the bottom of the seas, like coral reefs now, by the reproduction of their living foraminifera and nummulites, &c., *in situ;* and if these were *not,* after having grown and been reproduced and multiplied elsewhere—for I apprehend I may assume that foraminifera are not eternal atoms!—washed away from their beds, and carried hither and thither by some ancient gulf stream, to feed whales and jelly-fish, while only a remnant of them could escape to fall to the bottom as a sediment or deposit of ooze.

In asking Professor Huxley for merely a statement of the scientific doctrines as to these essential points, I ventured to hint at another analogy as regards the now admitted growth of peat, which—as "a word to the wise"—might have enabled him to understand the importance of my inquiry. At one time, and not very long ago, it was scarcely known as a scientific doctrine that peat really grew at all, and even now its rate of growth is kept well under check. One eminent man of science, (who for years was himself kept down by other men of science, though lately he has become almost "the rage,")—I mean M. Boucher de Perthes,—has taught that the growth of peat could only be computed at the rate of about the fifth of an inch in a century; whereas Sir Charles Lyell in his *Principles of Geology* alludes to the growth of a peat-moss in Loch-broom in Ross-shire, to such an extent of thickness, in "less than half a century," as to be fit to be dug for fuel by the inhabitants. He also mentions, in the same celebrated scientific work, that the Roman roads in Scotland are now in some instances covered over with peat-moss,

no less than eight feet in thickness.* According to M. de Perthes' doctrine these Roman roads must have been formed 48,000 years ago! So much for the unity and certainty of some scientific doctrines, as to the time required for nature's operations, even when "facts" are within our reach.

And here let me ask, Suppose Professor Huxley to agree with the eminent Frenchman, what might be thought were I to put to him the puerile and uncomplimentary question, whether he is prepared to argue that the Roman roads were made and "put under" the peat after it had grown, rather than honestly admit the fact that the peat has grown after the roads were formed?—He ought not, in my opinion, to have introduced that kind of interrogation, with reference to the Nile mud and the pyramids; and I make this allusion by way of warning that however eminent may be his position, it would really be for his own credit, and perhaps safer, to avoid that style of controversy. Even if our arguments fail, we may at least avoid mere gratuitous and unprovoked sneering.

To revert to the chalk and other sea-bottom formations. I believe that truly scientific men do not profess to know the probable rate of their growth. A calculation has however been made that taking one single shell of the foraminifera, only one ten-thousandth part of a cubic inch in size, and granting that from one such organism 10 only would be produced in the course of a whole year, and that the original progenitor would then die; and supposing each one of the 10 merely to multiply at the same exceedingly moderate rate, and to produce 10 each per annum;—and so of the 100, and of the 1,000, — 10,000, and 100,000 afterwards produced;—the result would be that in less than a single century,—in less than 100 years of such slow reproduction and growth,—a solid mass of the exuviæ of the chalk foraminifera would be produced more than equal to the cubic contents of the whole earth.

I know that for a moment this will appear incredible. I need only ask, Is it true? It is no mere vague conjecture. It is a matter of figures and computation and of absolute demonstration. It is not a mere vague assertion, of 30,000 or of a million years, without the least data to prove it. If it be said that the foraminifera or the nummulites cannot reproduce ten each of their species per annum, let "science" tell us that.

* Vide *The Age of Man, &c.* By Professor Kirk, Mem. Vict. Inst., pp. 75, 76. (Lond., Walford, Jackson, & Hodder.) I may add, on the authority of Professor Kirk, that certain moss-farmers say that the peat on their farms grows at the rate of 2½ inches *in a year.*

If the scientific do not know what is the fact, let them give any reason for thinking this rate improbable. If they say five only each in a year, we shall recast our figures; and even then we shall find, that we want neither a million, nor 30,000 years, not even more than a single century or two, to account for all the chalk and all the ocean ooze there is now in the world. If they will allow the foraminifera to breed at all, and at the rate of any of the other lower organisms of which they have the most perfect knowledge, and if they will grant us but one to begin with, we shall be able to refute these mere fanciful "scientific doctrines" that are totally unsupported by proofs or cogent arguments.

But those who cannot believe that even a single individual of the foraminifera could have come into being of itself, and who consequently believe in Creation, do not of course suppose that when the waters were commanded to "bring forth the living creatures after their kind," that only one or only a single pair of the foraminifera were then created. Consequently any calculation as to their subsequent reproduction that is based upon there having originally been only one, is a mere concession to the adversary, and no part of our own case. Most likely millions of such creatures would start into life at the first fiat of the Great Creator. And though probably the rate of their propagation is very much greater than was supposed for the sake of argument, they could not continue thus to go on increasing, from the want of food, or for want of carbonate of lime or the other material required for the formation of their shells. The watery "soil," if I may use the phrase, would after a time become exhausted here and there, while millions of them would be sucked up by jelly-fish or otherwise disappear, in the notorious "struggle for existence," which we may admit to be powerful to slay and destroy, though not to give life in this world. But, if we compliantly *suspend Theology*, and, as is now the fashion, leave out Creation altogether—although our reason cannot find any other probable beginning of things;—and if we merely commence with the "one only" of these atom-like foraminifera, got anyhow, we have seen how rapidly the chalk formations may have grown, and in that way become "deposited," at the bottom of the ancient seas. There the chalk no doubt once lay, and there—have we any reason to doubt?—the minute foraminifera, that built it up, once lived and increased and multiplied. Are we not now entitled to ask for some equally definite data and equally cogent argument from the other side, before we are expected to come to some contrary conclusion, and to believe in these indefinite thousands and millions of years?

And now it might well be supposed I have said enough, and that it is time to put the question, Have I answered Professor Huxley, or not? Well, I think I may claim to have shown that his 1,100 feet of chalk may have taken much less time to "deposit" than even the mud of the Nile! His million of years for the chalk may have been less than half a single century; and there is not any reason to suppose that when the nummulites lived in the ocean they were less prolific than the foraminifera. But he had one other argument still to complete his sorites. His arguments in detail may have broken down. But there were the arguments when all put together, and from all the strata heaped up and cumulating upon one another.—Let us now then look at this; namely—

THE ARGUMENT FROM THE SUPERIMPOSED STRATA AND THEIR FOSSIL REMAINS.

There was first the time required for the deposit of the mud. Before that, there was the time required for the formation of the nummulitic limestone; and before that, the time for each of the long series of geological formations which preceded the chalk; then the more than a million years required for the chalk alone. And even if we find, that we may reduce the period for the chalk to half a century, and so the time for each of the other formations in detail, with greater ease than the time required to lay down the superincumbent mud; still we are also required to observe, how these strata all come in succession, after and upon one another, and now we must count up the times required for all that. Not only so, but the learned Professor wound up his discourse in the following words, enunciating what must have been generally regarded as the most startling of the scientific doctrines which he put forth in Sion College,—I mean startling merely because enunciated by Professor Huxley,—for even it was "nothing really new":—

"There is positive proof (he said) of three successions, of three revivals of the living inhabitants of this world. Do we not see then the unknown previous duration of this earth?"

Afterwards he concluded his discourse as follows:—

"These views, of which I as the Minister of Science am the exponent to-night, are held by men who are as Christian in motive and practice as you. These doctrines are held by men who think deeply and who have children to come after them whom they desire to instruct wisely. They are held by the best of men; they are held out of no wantonness or irreverence or eccentricity. They are held by men who seek to discover to themselves and

to present to others Scientific Truth. I ask you to remember this, to consider this; and *then* I ask you to judge us."

I hope I may be pardoned for having read this last quotation, which goes beyond the point under consideration. The fact is, I could not refrain from giving you the pleasure of hearing—even if it may be of hearing over again—this eloquent peroration, this admirable appeal to the highest feelings of our nature as men. But having done so, I would respectfully say, let us on the other side be judged as considerately and fairly. I will further say this, I do not know a person who would dare to reject a single scientific doctrine which he really believed to be true. I do not even understand how it would be possible for a man to do so. Men may shut their eyes, I know well, to proofs or arguments on either side. On both sides they may often take their science or their theology, perhaps contentedly, at second-hand. But those who enter the lists to discuss those matters have nothing to do with such.

I trust it has been thus far seen that I do not shrink from looking all the facts and issues fully and fairly in the face. Were it not that it was next to impossible to go over the whole system of nature in a single lecture, we might even complain that Professor Huxley went no lower than the chalk deposits,—the mere commencement of the Cretaceous system, or the surface of the Secondary Formations. For we must also remember the fact that, below the Cretaceous beds (that is, if the usual order of formations has not recently been "turned upside down"!) we come to the Wealden, the Oölitic, the Triassic, the Permian, Carboniferous, Devonian, and Silurian Systems; all these having each their numerous subdivisions; and, after these, we have still to go deeper and deeper, till we come to the Crystalline rocks, and the "fundamental Granite," belonging to what was once called (if I may now mention them) "the Azoic ages"! Well, then, how are we to deal with this great world, if, beginning with its surface, we proceed to strip it successively in imagination of all its various strata, one after another, as we stripped the Nile valley of its paltry annual deposits of mud; and if afterwards we essay to get rid of the non-sedimentary conglomerates and other masses that lie below? I know that, as regards all living organisms of the earth, Professor Huxley, in his *Man's Place in Nature*, has announced *his* readiness to begin them all with an atom-like "egg"! But, then, surely he does not believe that the marvellous, hidden life within such eggs could produce the least visible growth of the organisms unless there were pre-existing materials which it could appro-

priate and convert to its use? There was, I am quite aware, an ancient theory that began the world or the universe itself, with an egg, and made it thus to grow from almost nothing, I don't know how, to its present dimensions. That was a *thorough* Darwinian system! But, then, it was invented before the modern scientific doctrine, that matter can neither be lost nor destroyed, was put forth as scientific truth. Now, as regards this doctrine, that matter in our experience is never increased, nor decreased, nor destroyed, as it goes through its varying phases or Protean changes, I am glad to be able to say,—"heretic" as I am accounted, and truly am, as regards some of the most important scientific doctrines,—that I consider this particular doctrine as nearly absolute scientific truth as anything ever propounded in philosophy.

Well then, accepting this doctrine, let us now strip the world of its mud, and of its strata, and its crystalline rocks, down as deep and as far as we please—for this we may do *in our imaginations!*—and what can we make after all, even in imagination, of the matter we thus strip off and try to get rid of? Was it nowhere,—was it not in existence,—before it was laid down as now, in its beds of strata or in the rocks underneath? Let Professor Huxley tell us that! If his answer is,—(and it is the *only* answer he can possibly give, if he will not tell us that new matter can grow and comes into being day after day,)—that all of it must have existed in the world, in one form or another, before it was arranged under present conditions,—then, that is just *our* argument who believe in One Creation of matter, or "of all things visible"! Men may imagine as they please, what has been laid down here or there, at this time or that, but all material things so arranged must still have before existed. I find, however, that I am diverging into considerations quite beyond the limited range of Professor Huxley's lecture; to which I must therefore return.

And now as to the last of the scientific doctrines of which the learned Professor called himself the exponent. No doubt you are well aware of the doctrine of special creations deduced from the apparent succession of life upon the globe. And this doctrine the Professor's words do seem to teach. But perhaps you had reason to think this was a doctrine that had been given up, or (as it has been euphemistically described) one "which was slowly yielding to other views." It was at any rate something new, to understand that it, or anything like it, was held by Professor Huxley! However, if he has adopted it (as he has some other new "scientific doctrines," within not many years), that may by some persons be regarded as a testimony to its probability. But if I remember aright, and

have correctly quoted his words, I must observe that the extent of the Professor's conversion is extremely slight. There were once no less than twenty-nine supposed successions of life on this earth. Six special creations at least were long in favour, of course with enormous intervals between. Professor Huxley only speaks, however, of "three successions—three revivals;" and it is fair to observe that *he* does not say "creations." We, however, have not so much to do at present with his full opinions as to this; but only with what he chose to enunciate as proved by science, and what he advanced as deducible therefrom.

His argument was that there were proofs of *three* successions or revivals of life in this globe, because of the differences found in the fossil organic remains in the strata superimposed upon one another. But I think you will admit that this is a subject far too large to be entered upon minutely at the end of this already only too long discourse. Yet still I must endeavour to convince you, that at the present time it would be most unwise to allow our children to be taught that even "three revivals" is really "scientific doctrine." But as "time hastens on,"—and I, unfortunately, have not unlimited periods of time at my disposal,—I must, in despair, at last have recourse to "scientific authority."

Well, one President of the Geological Society of London, Mr. Hamilton, thus expressed himself in his annual address in 1865:—

"We are daily becoming more convinced that no real natural breaks exist between the Faunas and Floras of what we are accustomed to call geological periods."*

So he does not agree with Professor Huxley!

Another President of the Geological Society, in his anniversary address in 1862, called in question the contemporaneity, or identity of date, of what are called the *same* strata, in different parts of the globe; and he went so far as to urge also this:—

"Those seemingly sudden appearances of new genera and species, which we ascribe to new creation, may be the simple results of migration."

But the President of the Geological Society, who thus expressed himself in 1862, was the same Professor Huxley who taught the doctrine of "three successions—three revivals," to the clergy at Sion College last month! Are then the doctrines of migration and revivals reconcilable? It is not for me now

* Vide *Journ. of Trans. of Vict. Inst.*, vol. i. p. 38.

to prove that they are utterly repugnant. If I only succeed in convincing you, that neither the one nor the other ought to be absolutely accepted as "scientific truth," at least without further inquiry, I shall have done enough. For it is only our duty, you may remember, "*simply* to hear and believe,"—"*when* all the professors in the world announce a certain order of Geological succession!"

It is the fashion now, as we very well know, among a certain class of scientific men, to deny that some great convulsions of nature or cataclysms may have changed the face of the earth,—as by throwing down mud and other materials, perhaps like the masses of whole continents at a time,—or by rending the earth asunder and swallowing up tracts of country, not merely like that now forming the great sea-channel between the chalk cliffs of England and France, but even spaces of world-wide magnitude, as between Europe and America,—and thus leaving, like upheaved mountains, sometimes tilted rock-ridges, as of the nummulitic strata that form the basin of the Nile, or the steep and perpendicular cliffs of the old red sandstone, now lashed by the angry waves of the Atlantic, and the roll of the North Sea waters, at Cape Wrath and on the coast of Caithness.

But if, on the other hand, the mountains of the world be, as they are by some scientific men regarded, literally "upheavals" that have been erupted by the force of subterranean or volcanic fires, then the convulsive force required for this must be regarded as still infinitely greater; and the fearful chasms and terrific cataclysms that would be consequent upon this tearing of the earth's crust asunder, when heaved into larger space and stretched upwards and outwards, we may easily perceive, upon reflection, must be inconceivably greater than upon the more probable supposition of an occasional falling in of the earth's crust and filling up and consolidating its interior. The waters alone which spring among the hills of ten thousands of rivers that pour their floods into the seas, must operate with the mighty force of an infinitely powerful hydraulic engine, which day by day, and ever, is pumping and working, and gradually undermining the earth, and changing the local intensity of the pressure of that most powerful of material agencies, the constant force of terrestrial gravitation.

But if the idea that many of those apparently successive generations were possibly contemporaneous and embedded in different places about the same time, and that the strata containing them may have afterwards been transported somehow, during some ancient convulsion of nature, and laid upon one

another,—if this, I say, appears to any too startling a conception; let me quote briefly the words of some other eminent geologists, as to the startling changes that are *known* to have taken place in the strata of this earth. In Professor Ramsay's address to the Geological Section of the British Association at Nottingham, in 1866, he says:—

"The Silurian strata in North Wales are now to a great extent intermixed with igneous rock. . . . All the rocky masses of which the region consists, both igneous and aqueous, have been disturbed and thrown into sweeping undulations formed of curved strata thousands of feet thick, by those agencies, whatever they may have been, that at a later date produced disturbance."

He goes on to say, that even those who have witnessed these contortions, can have no conception how still more marvellously the strata have been disturbed elsewhere, as in the Alps:—

"There (he says) we find areas as large as half an English county, in which a whole series of formations has been turned upside down."*

And what is now the scientific doctrine respecting the so-called igneous rocks mentioned in the above quotations? At one time, you may remember, it was taught as "scientific truth" that granite had an igneous origin; and it was upon "the fundamental granite" that the sedimentary strata used to be laid down. Can any geological "exponent" now tell us, upon what the sediments of the seas are even conjectured to have been deposited? I am not aware that even speculative geology has yet invented a bottom for the waters of the globe, since the fundamental granite failed them. For what is this granite now found to be? In a paper read by Mr. Geikie in the Geological Society, and in a paper in the *Geological Magazine* for 1866, he says, that the sand-stones and clay, as well as limestone in Ayrshire, can be seen passing into trap and granite; and he adds:—

"At last I am therefore forced to conclude that the crystalline rocks described above have resulted from the alteration, *in situ*, of certain bedded deposits."

In like manner writes Mr. Hamilton in his annual address, already quoted:—

"It was formerly supposed that the crystalline rocks, particularly the granite, owed their origin to igneous action. Now it is well known that these

* *Report of Brit. Ass.*, 1866, pp. 46, 47; and *Journ. of Trans. Vict. Inst.* vol. i. p. 370.

granites are chiefly arranged in layers. The granite passes into gneiss, and gneiss into mica-schist and talc-schist; and this is again closely connected with the green and grey slates; and it is well known that many of these rocks formerly considered as plutonic [*i. e.*, by the scientific doctrinaires] are really metamorphosed rocks."*

Sir William Logan also confesses, when speaking of the Laurentian limestones:—

"We do not yet know with certainty either the base or the summit of the series."†

In the *Geological Magazine* for January, 1865, we also find the following:—

"Judging from analogy, then, the Eozoön rock of Canada was the foraminiferous formation in one part of an ocean which elsewhere may have borne manifold and higher species, and buried them in sands and muds, that have since lost all form and feature by the metamorphosis of age and pressure, or which were altogether shorn away by wave and weather when the old ocean-bed was lifted up."

I might quote more, but your patience must be wellnigh exhausted. I have made these quotations chiefly from our own *Journal of Transactions*, expressly to show that in this Institute we have here an antidote to such mere *quasi* "doctrines of science" as have been preached at Sion College. We have all moralized with Shakspeare as to the transformation of "the dust of Alexander" into loam that may have been used to "stop a beer-barrel." Geology now forces us to reflect, that the very granite of "the everlasting hills" may have originally been built up by foraminifera in the lowest depths of the seas! But that need not disturb the faith of the Christian clergy or of any other believer in the old Sacred Scriptures. On the contrary, it rather suggests to me a text, if you will allow me now to take a text, at the end of my discourse, on the promise that I shall attempt no "exegesis." It has come to my mind more than once, as I have followed Professor Huxley from the nummulitic limestone and other strata down to the chalk, and at last to "the fundamental granite." It is this:—

"THE EARTH IS THE LORD'S, AND ALL THAT THEREIN IS; THE COMPASS OF THE WORLD, AND ALL THAT DWELL THEREIN:—*FOR HE HATH FOUNDED IT UPON THE SEAS, AND PREPARED IT UPON THE FLOODS.*" ‡

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* *Journal of Trans. Vict. Inst.*, vol. i. p. 32.
† *Ib.*, p. 357. ‡ Psalm xxiv. 1, 2.

CONCLUSION: THE PRACTICAL LESSON.

In conclusion, I must crave your indulgence to be allowed still some little time, in order to answer Professor Huxley quite completely as to the issues of this great question, as he was pleased to put them before the clergy in Sion College. I have done the learned Professor the justice to say, that nothing could exceed the earnestness of his tone; and I am sure that he did not in the least exaggerate the importance of the fact, that there are two adverse schools of thought, which exist among us, and which do rather tend to diverge more and more from one another. Being a distinguished leader of opinion in one of those schools, I think he undertook a solemn duty, in endeavouring to explain to the clergy the nature of the arguments from which he has arrived at his convictions. It was, however, absurd to suppose that such a mighty question could have been put upon a satisfactory footing in a single unrecorded discussion. The only fair and almost rational course, I ventured to point out; but Professor Huxley said he thought it would be inconsistent with his dignity to appear before what he called "the tribunal" of the Victoria Institute. In inviting him to come here, no idea of any tribunal ever entered my mind, except that of the reading and intelligent public; and were these polemical discussions at Sion College to be reported fully and printed, they might of course be as useful there as in any other place.

But I venture further to say, that Professor Huxley made another and a serious mistake, which still more lessened the usefulness of his address, in so utterly underrating the mental capacity and knowledge, and seemingly the honesty, of those whom he addressed. Consequently, while he did but scant justice to his own side of the question, he utterly misapprehended, and so completely misrepresented, the other. The tone of his whole address became therefore (though as was very evident unintentionally) offensive. It seemed as if he thought, that only himself and those who think with him were honest and well instructed as to a few quite notorious geological facts; and that the clergy were very ignorant, and not quite candid, nor willing to admit the force of evidence, or to give credit to scientific men for the honesty of their convictions. While he wasted great part of his time in raising imaginary difficulties which nobody felt, and in demonstrating simple points which no one would dispute, he said little or nothing to justify the larger issues involved, or to prove the necessity

for his constant demands for the illimitable periods of time which constitute the whole of his geological chronology.

I have already called attention to his utter silence as to the well-known differences there are, and ever have been, as regards the chronology of Genesis. I must also notice his tone throughout, as if there were absolute certainty in every professedly scientific conclusion he chose to urge against the Bible. The omission to state fully his opponents' case, was as nothing to the still more one-sided manner in which he advocated the views of the mere *party* whom he truly represents.

Those ominous warnings to the clergy, to remember that the Bible chronology must yield to the certainty of scientific opposition, followed by his but ill-sustained appeal to the Nile-mud and some of the sedimentary rocks, are not without a parallel, which as a scientific man he ought himself to have kept in mind, and perhaps, with the perfect candour he professed, to have brought to the remembrance of his audience. Surely Professor Huxley has not already forgotten the same kind of ominous warnings, in Dr. Temple's and Mr. Goodwin's contributions to the *Essays and Reviews*. True the Mosaic cosmogony of "the Hebrew Descartes" was not then said to be in danger from mud and chalk, or the latest scientific convictions of Professor Huxley. But the danger was declared to be quite as imminent; the warning, quite as peremptory, was boldly put in print; and it was the hot-fused granite of Laplace that was then to pour destruction upon the earth and waters as created in *Genesis!* And how has the old-fashioned world passed through that fiery ordeal, and withstood "the jostling" with which it was threatened "from sturdy growths of thought"? Most bravely, as you know! Where is now the "scientific doctrine" of the *Essays and Reviews?*—the doctrine that regarded this earth as "once fluid with intense heat, spinning on its own axis and revolving round the sun"? Was ever any doctrine regarded as more absolutely "certain"? Some of the well-meaning clergy actually believed it to be scientific truth! For in the *Replies to Essays and Reviews*, one writer, who is both clergyman and astronomer, considered it even "important to observe that the earth was once in a fluid state!" And yet, in 1864, Sir Charles Lyell, as President of the British Association at Bath, described this important doctrine as merely a "theory" that was "altogether delusive!" And so, too, it will probably be with Mr. Huxley's mud and chalk theories, and the millions of years he demands of our faith, for his uncreated, bottomless deposits. As yet he has not even attempted any proof so imposing as that which Laplace put forward, as mathematical

demonstration, for the nebular hypothesis. The more definitely he states his views, however, the more rigidly he works out his principles, and the plainer he announces his conclusions, the better will all who differ from him, I am very sure, be pleased. Let him tell us how he begins his world, now that the fiery granite-mist has turned out to be a "delusive" foundation. Let him step in where Laplace and Mr. C. H. Goodwin did not fear to tread, and give us something rational to fall back upon, before we quite give up the time-honoured Mosaic cosmogony. If he can't, let him say he can't; and, meanwhile, let "the clergy" *wait*. And if Professor Huxley will twit them with their Thirty-nine Articles; let them ask him to produce a Fortieth, being a coherent "scientific doctrine," that even attempts to explain the existence of the world; and which he can truly say has been held by six men of science, taking these at his own estimation, or even by himself, for no longer time than merely the last six years! Let him do this in the noble spirit of a man who would "rather die than lie;" and let him keep nothing back either of his past or present beliefs, that the clergy and the public may know with what constancy and cogency of arguments he has taught and still teaches "scientific doctrine." The clergy and the Christian laity have long had their duty inculcated in the manly sentence of one who knew what it was to suffer and to die for truth's sake:—*Prove all things; hold fast that which is good.* Be assured, that this comprehends the range of "all things" which we call nature. Did not the grand old Hebrew prophets, long before, denounce the vain teachers of their day, *who regarded not the works of the Lord, neither the operations of His hands?* There is another old sentence to encourage us, *Magna est veritas et prævalebit.* By the clergy especially, permit me to say (since they have had lay-advice elsewhere), this ought to be well remembered; for to them has been especially committed the teaching of that Truth, which, here, we still hope "may flourish forth in the earth." They should take heed what they put in its place, or venture "to preach from their pulpits." They should especially "take heed to the doctrine" they teach, when they have it in their power to know, that again, and again, and again, what has passed for a time among men as "the *wisdom* of this world" has been afterwards proved to be *foolishness.*

On the motion of the CHAIRMAN, a cordial vote of thanks was passed to Mr. Reddie for his paper, and to the Rev. Dr. Thornton, who had read it in the absence of the author.

Rev. Dr. IRONS.—I rise, although the hour is somewhat late, because I was present at the meeting to which the paper refers, when Professor Huxley addressed the clergy at Sion College. I do not know whether that gentleman is here to-night: if he be, I should prefer at once to resume my seat, and to hear what he has to say in reply to what I believe to be the unanswerable paper of our Honorary Secretary. (Hear, hear.) If he be not here, however, I do hope that he will be duly informed by scientific and other friends who may be present, that we shall be happy to see him at our next meeting, that we will give him the most cordial reception, and that he shall here be allowed to state, as definitely as he can, what are those positions of a scientific kind which he imagines the clergy to repudiate, and which he asserts that we regard as entirely contrary to Holy Writ. I, for one, am not aware of any such fixed scientific truths which I and my clerical brethren, who have carefully considered these subjects, repudiate. (Hear, hear.) And I rise for another reason; and that is, to protest against the kind of issue which has been raised by Professor Huxley, and admirably met, I think, by Mr. Reddie's paper. It is an unfair thing for a man to stand up in the midst of his brethren and to say that he will not there declare his own opinions on a particular subject, but will only say to a certain extent that which he thinks he may venture upon, leaving his hearers to guess the rest. That was the position which Professor Huxley assumed at Sion College. With respect to the particular questions which he raised, there was no time then, any more than there is now, after an address which lasted about the same time as the paper which has just been read, to enter into a detailed discussion; but the injustice which had been committed was so deeply felt by me at the time, that I was obliged to ask Professor Huxley whether he meant to say that the clergy were fools or knaves? Whether we were so idiotic that we could not comprehend the arguments to be deduced from scientific facts, or so thoroughly dishonest that, comprehending them, we would not own the truth? He said he meant to make neither of those charges. I accepted his statement, and thanked him for the disclaimer, but I asked him further, what it was that he did mean? (Hear, hear.) If he were here, he might tell us now what he did not tell us then. You will recollect, Sir, for you were there then, as well as on another occasion, when Mr. Huxley was with us, that an answer was given to him which I think he had not expected. We showed him, I mean, pretty clearly that there is no truth which has been put before the mind of the thoughtful Christian philosopher in any age which he has ever been wont to shrink from. (Hear, hear.) But we are probably most of us acquainted with the statement of Sir W. Hamilton, that there is a certain class of scientific persons who, being engaged in a very limited circle of studies, hold exclusively to a few ideas, and almost lose their logical faculty. I could not help being reminded of that when I heard Professor Huxley's address, because he entirely confounded two things which the logical mind would have distinguished from each other and kept entirely apart. He confounded hypotheses and facts. (Hear, hear.) If there be anything which a clear-headed scientific man ought to be qualified

to distinguish in science, it is between that which is theory and that which is fact. One who was present at Sion College went so far as to demand—and I say it with regret, because I have a respect for him—that we should regard a scientific dictum as an oracle—the word "oracle" was used. I asked immediately, how were we to accept the oracle when it spoke in different senses? (Hear, hear.) We have had in our own lifetime a geological oracle giving us as absolute truth first a fiery theory, then a watery theory, and lastly, a very cloudy theory. (Laughter.) Which is the true one? (Hear, hear.) At present even Sir Charles Lyell himself is in doubt about it. What, then, are the unfortunate clergy to do under such circumstances? We read the books of scientific men, although they do not read ours, and we know something of both sides of the question, while they are ignorant of theology. We cannot understand what it is in this matter of geology which they wish us now to believe. As I said just now, they did not seem to comprehend the difference between hypothesis and fact. A hypothesis may be naturally and honestly held by any man. You have your opinion, I have mine, and another man has his, all of them different from each other. We all of us have a right to our own opinion; but if we choose to hold an opinion contrary to the facts, we must take the consequences. No man can ultimately escape, if he really will not accept the facts of the world. It is ridiculous, then, for scientific men to come forward and tell the clergy to accept, as the facts of science, what are really only the theories and hypotheses of scientific men. (Hear, hear.) They know very well that no man in his senses can deny a fact. The denial of a fact can be of but brief duration, but the denial of a mere hypothesis is the right of every intelligent being, if he chooses to exercise it. But not only do our geological friends hold certain hypotheses. Let us look at our chemical friends—another branch of scientific men. They told us, when we were boys, that the atomic theory—one very similar to that of old Epicurus—propounded with great authority by Mr. Dalton, a Quaker, was a chemical truth. The University of Oxford, that great obstacle of learning, as Mr. Huxley would conceive it to be, was so eager to meet even a Quaker with a scientific truth in his hand, that it summoned this Quaker, Mr. Dalton, to the University, and conferred on him—I was present at the time—the honorary degree of D.C.L. for his discovery. But at the last meeting of a great scientific society—the British Association—held in Dundee, in this very year, the president told us that the atomic theory is a mistake. Now, what are we to think of these scientific men? I call upon them not to blow hot and cold—not to say that we are to believe one thing in 1865, and another thing in 1867, on the same subject. When we protest that, after weighing their theories calmly, and giving them all our attention, we cannot accept them, they get very angry because we do not fall down and worship them as oracles! I think it is quite time that this tone should be entirely scouted. (Hear, hear.) It is time for scientific men to understand this 19th century in which they live. We are thinkers as well as they, and I would say to

them all, there are no books they publish which we do not carefully read, and very few truths in their geological studies which we may not remember to have found thirty years ago in Humboldt. We all welcome a theory when it comes to us, and give it the best attention and consideration in our power; but scientific men should not be angry with us for not at once accepting theory for fact. We repudiate, too, this trifling on the part of quasi-scientific men, who meet in hot crowds at Nottingham, Oxford, or Dundee, in order that they may be thought very learned or very clever. I say, we repudiate the notion that these men are to be our teachers because they choose to call themselves philosophers; but immediately we make the repudiation, then all these gentlemen are down upon us with Galileo. I know at once, when a scientific man gets up, that this is sure to come out; but there is something simply ridiculous in it. I am not aware that science has much to boast of in its martyrs, and that subject, I would tell them, is a question not of science, but of martyrdom. Whenever there is a shadow of a martyr in the distance for our scientific friends, they give a shout of exultation. They have got a case—a real case, and they bring it out with delight. They give a sort of feminine scream at the very thought of marshalling a scientific martyr against us. (Laughter.) But we have martyrs in theology as well. (Hear, hear.) If Professor Huxley had been present, I should have said a little more in pointing out what is unworthy of scientific men. We who are trained in the school of Christ, our Master and Lord, have a love of truth, because we have a love of Him. We know that what He has said will hold true; and when the scientific man tells me that his theories are sure to turn out right, and that the theologian must be convinced in the long run, I tell him that the very heaven he points to for astronomical truth, the very earth he digs for geological truth, will all pass away, but there is something greater which will not. "Heaven and earth will pass away, but my word," says our Master and Lord, "will not pass away." (Cheers.)

Rev. JOHN MANNERS.—I should like to add one or two words to what has just been said. I was not present at Sion College when Professor Huxley delivered his address, but I should much have liked to have been there, in order that I might, in a conversational tone, have asked a few simple questions, which I am sure we should all have been glad to have had answered in a straightforward and satisfactory manner. We are all actuated by the one object of desiring to ascertain the truth of these matters, and I am convinced we shall find that all scientific truth revolves round Christ as a living Centre. Just as all things had their origin from the eternal Word in the beginning, so we shall find that all true living science has its origin in Him, and is sustained by Him, who is the truth, the light, and the life of the universe. Without verging into theories of Pantheism or anything of that sort, we shall find this absolutely true, and if it were not now too late in the evening, we might throw out a few suggestions to show how all truth radiates round the One Centre, just as the sun's rays luminate from and radiate around the sun itself. Just one word about Cambridge and the ignorant clergy. It turns out, according to Professor Huxley and others—for

there are many of his way of thinking on the subject, and who regard us as either knaves or fools—some of the greatest astronomers and doctors in the highest branches of metaphysics at Cambridge have been clergymen. Take such instances as Challis and Earnshaw, who solved the difficult question of the differential calculus, and turned out some things that men of science have never been able to evolve from their manipulations. Take again such men as Whewell, Sedgwick, and Peacock, who were all clergymen; and a number of other men in orders, who never let a truth pass without giving it a most careful and searching examination. Take, again, our Chairman to-night—one of the highest authorities we have on the subject of crystallography. (Hear, hear.) I firmly and heartily believe that all the true principles of science are in accordance with the Bible, and are to be found to some extent there stated, though not in algebraic or analytical form, nor according to the forms of Euclid. And that has been necessarily so, because the scientific truths touched upon there, it was not necessary to state in detail. In the first chapter of Genesis there is the passage, "And darkness was upon the face of the deep." I should just like to ask Professor Huxley what is darkness, and what is real, true light; and if recent experiments with the spectroscope are reliable, it will be found that the Biblical account is in harmony with scientific investigation. I know that scarcely a scientific book of any character at all ever comes out without its falling under the close scrutiny and attention of the clergy, and I know they find that true science, and indeed everything else which tends to the healthy development of the mind, are all in perfect harmony with the living truth. (Cheers.)

Rev. DAVID GREIG.—I should like to make one observation which I think ought to be borne in mind as very important in discussing this so-called difference between science and religion. Geology is generally termed a science, but I would say that it is not, and never can be a science properly. (Hear.) It can never be more than the merest conjecture. It differs totally and essentially from mathematical science, from mechanical science, and from chemistry. It can never be more than conjectural, because you can only reason with certainty from cause to effect, and when you draw inferences from effect to cause, as in geology, you can only conjecture. (Hear, hear.) We only know the effect in geology—we have a succession of strata, and we can only conjecture as to the cause which gave them their peculiar formation and position. If you have historical testimony opposed to your conjecture, whatever be the value of that historical testimony, the conjecture must inevitably give way to it. I am not a geologist myself, and I have a very indistinct recollection of Sir Charles Lyell's description of the various strata; but I say that if you dig down three of those strata, said to have existed for countless ages, and find a trace of the old Greeks or Romans in the stratum below them, that historical fact would be sufficient of itself to throw overboard all the theories as to the immense ages during which the three upper strata were supposed to have existed. (Hear, hear.)——

The CHAIRMAN.—I may say that Herculaneum is a case exactly in point; that was the result of some of the excavations at Herculaneum.

Rev. DAVID GREIG.—Suppose the Bible tells us as an historical fact that the world was formed some 9,000 or 10,000 years ago, I say that fact must stand against the whole science of geology. (Hear, hear.) Geology is not science; it is pure conjecture.

Mr. HARTSHORN, of Ohio, U.S.—I have listened with great interest to the address which has been read to us, it being my business in America to teach natural science and geology. I do not intend to discuss the principles involved in the address at any length, but I wish simply to make one or two statements which may show in some degree how we stand in regard to this subject in the United States. I have conversed with many geologists on the Continent of Europe—in Germany, Russia, Austria, Italy, and France,—and I find that the best geologists and naturalists, whether believers in the Bible or not, generally admit that we have not as yet acquired sufficient geological data to justify us in all our conclusions. (Cheers.) The result is that we have different and often contradictory theories,—one theory to-day and another to-morrow; and in private conversation geologists will often admit frankly that which they will not put forward in their written works or in their public addresses. Many will acknowledge in the privacy of their own studies, that certain theories which they profess to hold have not yet been sufficiently tested by facts, and ought not to be taken for established science. Every geologist regards this subject of geology as in its infancy (hear, hear); and even the very best authorities that we have on the subject must acknowledge that certain positions which they now hold may be upset by facts which may come to light, and which may give a different direction to their present views. (Cheers.) I think those who believe in the Bible as the great chart leading to eternal life, need have no fear whatever with regard to geological discovery. (Cheers.) I am glad to see that the subject of geology possesses so much interest for the minds of Englishmen, and, I must say, I have never seen the subject so candidly, frankly, and truthfully approached as it has been to-night. I have no doubt at all that the future developments of natural science will only show that nature itself is but another page in the great volume of revelation. (Hear, hear.) Clergymen and Christians generally have an interest in this subject which no other people have, because they regard this earth simply as the handiwork and footstool of their Lord, and they feel they have a greater interest in becoming intimately acquainted with it than have other people. (Cheers.)

Dr. GLADSTONE.—I have listened with very great interest to what has been said this evening. I was not present in Sion College when Professor Huxley delivered his address; but I have been told since, that the matter seemed to fall rather flatly upon that occasion, because, although he might have expected that what he had to say would be in opposition to the views of the main portion of his hearers, it did really appear that a majority of them were ready to go to a great extent with him. Professor Huxley said—and it must have occurred to most of his hearers to dispute it—that in discussing the result of scientific investigation with the received chronology of Genesis, he was assuming that there was a Biblical chronology which was generally

received by theologians. Now, I maintain that there is no such thing. I think a truer view of the question is to be found in Mr. Reddie's address, that we are not dealing with theories which have been drawn from ascertained facts. I need scarcely remind you that there are very great discrepancies between the different versions of the Biblical chronology—discrepancies amounting to 1,250 years, or thereabouts. The chronology of the Bible rests upon one genealogical table, to be found in Genesis, and referred to in 1st Chronicles and the Gospel of St. Luke. But we find it was the habit of the Scriptural writers to make large gaps in their genealogical tables. The first verse in the New Testament is an instance of this, for we find two generations mentioned stretching over a period of nineteen centuries. We know, also, that in the continuation of that chapter various gaps are designedly made in the genealogical table; and we can so trace the habit of those sacred writers in such cases that we are led to conclude, where we cannot apply a test at all, that the genealogical tables are incomplete. Very few who have looked into the subject will place such reliance on the common Biblical chronology as Professor Huxley seems to suppose, and I think the issue which he has raised fails on that point. It has been stated to-night that geology is not a science. I cannot accept that at all. Certainly it is not a science of the same kind as mathematics or chemistry; but I believe it is nevertheless a science, and one which may lead us to very decided conclusions. (Hear, hear.) I believe myself that man has existed upon the earth for a great deal longer than 6,000 years; but I believe, at the same time, that that is in no way opposed to any statement which I am called upon to believe in revelation. (Hear, hear.) I trust this discussion will be marked throughout with courtesy, so that we may not seem to be endeavouring to pit one class against another—to pit geologists against the clergy, for instance; and I hope we shall all consider that though we may differ from Professsor Huxley's opinions, we ought to treat him courteously, and to consider his arguments and the whole question in all its bearings as becomes gentlemen and Christians. (Hear, hear.)

Dr. HAUGHTON.—As one of the foundation members of this Institution, I may perhaps be excused for making a remark as to the position we occupy and with regard to the resumption of this debate. We claim to be a scientific Institution, and I trust that whatever remarks may be made, the speakers will distinctly keep that in view, especially when we remember the tone which has been adopted towards us by certain public journals of no small reputation, and among others, by the *Saturday Review*. It should be distinctly borne in mind that we claim to be a scientific Institution, and therefore, that the speakers should confine their remarks to the points of the discussion. (Hear, hear.)

The CHAIRMAN.—Perhaps I may be allowed to make one or two remarks of a rather apologetic character for the subject which has been discussed this evening. It may not be generally known, even among the clergy, that the various meetings of Sion College, of which I am a fellow, were not express meetings of the fellows, nor are they convened by the Court of Sion College. They are convened entirely by the President of that body. The

President calls them, and the Court has nothing whatever to do with them, and the President invites whom he pleases to them. The gentleman who this year enjoys the privilege of being the President of Sion College thought it would be a revival of the meetings, which had been discontinued for some years, if he were to invite a number of eminent men to give papers upon different subjects. In the exercise of his own discretion he invited Professor Huxley, and, I suppose, allowed him to choose his own subject. Mr. Reddie, together with myself, was present on that evening; and I felt so strongly on the subject, after hearing Professor Huxley's address, that I asked to be allowed to make a reply, but was cut short by the President. I had followed up the attack by asking what it was that we were called upon to discuss? The subject, according to the programme, was :—"In opening the discussion on Thursday next, Professor Huxley will draw attention to the difference supposed to exist between scientific and clerical opinion, and inquire into the cogency of the arguments by which some scientific doctrines are supported." I complained that Professor Huxley did not tell the clergy what were his real opinions on these subjects, in the same manner in which he told them that no sensible man of science with whom he was acquainted, or any well-instructed person, believed in the ordinary chronology of the Bible. I denied that the clergy believed in the infallibility of Archbishop Usher's chronology; and I pointed out that elsewhere Professor Huxley had himself shown that there was a greater divergence between the opinions of scientific men than between the opinions of the clergy; and I brought forward a passage Professor Huxley had written and signed with his name in the *Fortnightly Review*, to prove this. The President, however, ruled that I was out of order in producing that which had been written by Professor Huxley elsewhere. I threw myself on the meeting, and said I thought I had a right to bring before my college brethren how great was the divergence between the opinions of scientific men, when Professor Huxley had himself stated in the *Fortnightly Review* that no man of science, and no well-instructed person, believed in the creation of Adam and Eve, using most offensive terms in doing so, and calling men who believed in that creation "Adamites, pure and simple." He there denied the special creation of Adam and Eve, because, he said, the very idea of creation itself was unphilosophical! (Laughter.) I pointed out that such diversities of opinion, sheltered under the name of scientific opinion, were far greater than those existing among the clergy, and I also pointed out that such differences were not simply differences between scientific men and clergymen, but between the faith of all Christendom and scientific men. (Hear, hear.) Mr. Reddie, like myself, felt strongly upon the subject, and he wrote to the President (understanding that there were only two meetings announced, and that we were promised other meetings after Christmas), to be allowed to reply to Professor Huxley at one of those future meetings. The President, however, wrote to tell him that the programme was filled up, and the whole of the lecturers appointed, and he therefore could not allow him to have the opportunity he desired. Mr. Reddie, however, felt that Professor Huxley had lectured the clergy in a rather

unmerciful fashion, with a quiet assertion that our Thirty-nine Articles were an impediment against our reception of truth, and that we were afraid of meeting the truth; and he thought this Institution was one which would very likely afford him the opportunity of replying to the Professor, and that the clergy would be glad to hear what could be said on the other side. We invite here the fullest discussion and the most open debate, and I am only sorry that to-night the debate has been so one-sided. (Hear, hear.)

Rev. Dr. IRONS.—In consequence of what fell from Dr. Haughton, I would simply remind him that in the course of the remarks I was obliged to make as a clergyman, in consequence of the tone adopted by Professor Huxley towards Christianity and the Church, I did say, and now repeat calmly, that if Professor Huxley or any of his friends will put down in clear, distinct words what those hypotheses are which they conceive the clergy contradict, or are disinclined to adopt, I now pledge myself to consider every one of these publicly, and to give them either the fullest admission or the most unsparing exposure. (Hear, hear.)

The discussion was then adjourned until the next Ordinary Meeting, on Monday, January 6th, 1868.