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JOURNAL OF THE TRANSACTIONS
OF
THE VICTORIA INSTITUTE.

VOL. X.

JOURNAL OF
THE TRANSACTIONS
OF
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OR,
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VOL. X.



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PREFACE.

THE Tenth Volume of the *Journal of the Transactions* of the VICTORIA INSTITUTE is now issued ; and the best thanks of the Members and Associates are due to the writers of the Papers it contains.

It is satisfactory to find the undiminished interest taken in the welfare of the Society by those who, at home and abroad, become its Members and Associates ;* for with them rests, in no small degree, the future of the Victoria Institute and the accomplishment of its objects.

The Institute has ever urged the value of accurate inquiry, rather than conjecture, in the work of elucidating scientific

* Let me offer my congratulations to the Society on its present position and prospects, and on the increasing consideration and respect with which its operations are regarded by men capable of judging. It has attracted to itself representatives in the various departments of science, well capable of defending the faith from the attacks of scientific scepticism, and standing so high in their several departments of science or literature, that their opinions *must* be received with attention and respect. No one also could, I conceive, deny that the philosophical character of the Society has been most severely maintained in all its papers and discussions, and that every theory opposed to the belief of the ordinary Christian philosopher has been treated with the most scrupulous fairness and respect. Personalities have been altogether avoided, and an example has been set of the proper way of conducting such controversies, which will, we may presume, have considerable influence for the avoiding of bitterness and unfairness for the future. (*Radcliffe Observer's Address*, 1875.)

truth. And in connection with this remark allusion may here be made to one or two of the many recent researches in Physical Science. In a work just published,* Professor P. G. Tait speaks of "the Law of the Dissipation of Energy, discovered by Sir W. Thomson," and adds that the Uniformitarian theories of geologists† are inconsistent therewith :

"It enables us distinctly to say, that the present order of things has not been evolved through infinite past time by the agency of laws now at work, but must have had a distinct beginning—a state beyond which we are totally unable to penetrate, a state which must have been produced by other than the now (visibly) acting causes."

And, arguing from our present knowledge of radiation, against the claims of

"Lyell and others, especially of Darwin, who tell us that even for a comparatively brief portion of recent geological history three hundred millions of years will not suffice,"

Professor Tait quotes Sir W. Thompson's three lines of argument, and urges

"Ten million years as the utmost we can give to geologists for their speculations as to the history even of the lowest orders of fossils" and "for all the changes that have taken place on the earth's surface since vegetable life of the lowest known form was capable of existing there."

Of course, it remains to be seen how far future researches may induce others to modify the above statements. An example of the change in our conceptions of Nature resulting from recent investigations, is afforded by the fact that whilst the use of improved telescopes was considered to have resolved some of the nebulæ into multitudes of stars, spectrum analysis now shows them to be, wholly or in part, masses of glowing or incandescent gas. These remarks can scarcely be concluded without a reference to the researches into what Professor

* Recent Researches in Physical Science. 2nd Edition, 1876.

† They are "totally inconsistent with modern physical knowledge as to the dissipation of energy."—*Ibid.*, lecture VII.

Lionel Beale, F.R.S., has called "the Mystery of Life"; upon which Professor G. G. Stokes, F.R.S., no mean authority among scientific men (see *Nature*, No. 298), recently remarked (*in his Address as President of the British Association in 1872*):—

"What this *something*, which we call Life, may be, is a profound mystery. We know not how many links in the chain of secondary causation may yet remain behind; we know not how few. It would be presumptuous indeed to assume in any case that we had already reached the last link, and to charge with irreverence a fellow-worker who attempted to push his investigations yet one step further back. On the other hand, if a thick darkness enshrouds all beyond, we have no right to assume it to be impossible that we should have reached even the last link of the chain, a stage where further progress is unattainable; and we can only refer the highest law at which we stopped to the fiat of an Almighty Power. To assume the contrary as a matter of necessity, is practically to remove the First Cause of All to an infinite distance from us. The boundary, however, between what is clearly known and what is veiled in impenetrable darkness is not ordinarily thus sharply defined. Between the two there lies a misty region, in which loom the ill-discerned forms of links of the chain which are yet beyond us: but the general principle is not affected thereby. Let us fearlessly trace the dependence of link on link as far as it may be given us to trace it, but let us take heed that in thus studying second causes we forget not the First Cause, nor shut our eyes to the wonderful proofs of design which, in the study of organized beings especially, meet us at every turn."

F. PETRIE,

Hon. Sec. and Editor.

DECEMBER 30, 1876.

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JOURNAL OF THE TRANSACTIONS

OF THE

VICTORIA INSTITUTE.

OR

PHILOSOPHICAL SOCIETY OF GREAT BRITAIN.

ORDINARY MEETING, MARCH 1, 1875.

REV. G. HENSLOW, M.A., F.L.S., F.G.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following elections were announced :—

MEMBERS :—J. Beeston, B.A. (London), Stepney Green.

ASSOCIATES :—Rev. Garton Howard, B.A. (Cambridge), Fenny Bentley ;
Rev. J. Wolfendale, Tutbury.

Also the presentation of the following Works to the Library :—

"Proceedings of the Royal Society," Part 158.	<i>From the Society.</i>
"Proceedings of the Geological Society," Part 121.	<i>Ditto.</i>
"Ancient Cave Men of Devon." By W. Pengelly.	<i>Professor Tennant.</i>
"The Catholic Layman." 2 vols.	<i>A. E. Gayer, Esq., Q.C.</i>
"On Hemerozoology." By the Rev. F. B. Goodacre, M.D.	<i>The Author.</i>
"Design." By Dr. Moore.	<i>The Publisher.</i>
"Doctrine of an Unpersonal God." By Rev. W. Martin.	<i>Ditto.</i>
"Biology." By Rev. Professor Watts.	<i>Ditto.</i>
"God in Consciousness." By Rev. J. Morris.	<i>The Author.</i>
"Jesus the Centre." By Rev. J. Wolfendale.	<i>Ditto.</i>

The following paper was then read by the author :—

ON THE CHRONOLOGY OF RECENT GEOLOGY.

By S. R. PATTISON, Esq., F.G.S.

THE antiquity of man on the earth is one of the questions which at present stand in the way of an *entente cordiale* between religion and science. The geologist, looking at the

facts with a mind coloured by contemplating the vast duration of the earth's building-up, naturally refers to cycles of ages. The zoologist, studying the more restricted area of the dying out of sundry species in time, is content with much less. The late Baron Bunsen, familiar with the loose guesses of comparative philology, adopted twenty thousand years as his conclusion. The Scripture student, with Genesis in his hand, asks only for six or seven thousand years. Can either of the rivals prove his assertions? If we find that neither can do this to demonstration, but that each submits considerations worthy of notice, then all dogmatizing on the subject is out of place. This is the present condition of the question.

The dozen years which have elapsed since Sir C. Lyell published his *Antiquity of Man* have been rich in contributions of facts and reasoning on the subject, but have not brought forward any demonstration. The interesting and careful researches of Prestwich,* Dupont, Belgrand, Evans, Dawkins, and others; and the still more numerous philosophizings on both sides of the Channel, and on both sides of the Atlantic, are favourable to a brief reconsideration of the subject.

I hold that a decision in either way does not really touch revelation, and therefore is wholly apart from religion. This ought to enable us to treat the matter without passion. Convenient hypothesis is often the bane of science. Long after the insufficiency of an empirical rule has been fully demonstrated its formulæ still haunt the field and influence the speech. This has eminently been the case with the uniformitarian theory as applied to the formation of the present surface of the earth. It is admitted that this theory cannot reasonably account for existing gravel-beds, and yet the very men who have displaced it adopt its cast-off expressions. Sound often survives sense.

If there is any province in which dogmatism is peculiarly inappropriate, it is that which comprises our inquiries concerning man's antiquity. The authorities have succeeded to the old geographers, who

"On pathless downs,
Place elephants instead of towns."

The written record to which some of us appeal; does not, and does not profess to, bear full testimony on this head; the unwritten one is wholly made up of materials that have been

* Nothing was accepted on this subject until Mr. Prestwich's researches in 1859 gave public scientific value to the facts.

placed and disordered in a succession extremely difficult to unravel. The one has no chronological beginning, is obviously incomplete, and permits in its text a variation of 1,200 years or more; the other allows of variations in chronology absolutely unlimited.

By recent geological chronology, I mean the evidences as to succession displayed by the strata of the recent period, the period contemporaneous with the introduction of man into Europe.

(1.) The proposition I seek to establish is, that geology furnishes no proof, nor high probability, that this event took place longer ago than about six or seven thousand years. Neither from geology can we absolutely displace the affirmance of the short period; nor can we from Scripture conclusively displace the assertion of a longer one.

As a preliminary, I wish to dispose of the stories about men older than the quaternary; that is, older than the fourth of the great geological divisions of the past. The alleged discoveries of remains of men in pliocene (tertiary) strata, at St. Prés, in Val d'Aras, and in Sweden, are entirely destitute of proof, and so is the announcement of Monsieur l'Abbé Bourgeois, made to the Anthropological Congress at Paris, and afterwards at Brussels, of man in the miocene. Subsequent examination into these statements has altogether failed to support them.

By common consent, then, the earliest deposits in which human remains have been found are the gravels in the valley and tablelands of the Somme, and other rivers in the north of France, and south and east of England, and the floor-beds of caves on the edges of rocky valleys in Western Europe. In the Somme Valley the remains have been found at heights of 30 ft. below the present water-level, and in the caves from 30 ft. to 50 ft. above it.

Considerable changes in the surface have therefore taken place since the deposits were laid down. Has this change of surface been effected by the slow action of present causes, excavating and filling up the valleys by turns; or, if otherwise, is there any warrantable measure or order of succession, and therefore of time, to be deduced from them? We of course exclude from our consideration the present surface-soil, and the immediate subsoil of the historical era. The latter includes the peat, and is synchronous with the ages of polished stone, and of metals down to the present. This latter series counts little over 2,000 years in Western Europe. It is far too much tainted with novelty to be of interest to us in the present inquiry,

though it is the tomb of the reindeer and many denizens of our land, now utter strangers to us.

We will not here yield to the temptation of recapitulating the facts. The excellent, accessible, and popular works of Lyell, Evans, Prestwich, Dawkins, and others, render such recapitulation wholly uncalled for. We will first glance at the gravels, and then into the caves, and afterwards state the deductions and arguments *pro* and *con*.

Mr. Prestwich puts the case of the implements thus: "The flint implements have been found in beds of sand and gravel along the line of existing river-valleys, in some cases but little above the level of the rivers, and others on adjacent hills, at heights of from 30 to 100 feet above the river."* He afterwards adds that isolated implements of the same kind have been found on table-lands 200 feet above the level of the existing stream. The instances of their discovery now extend widely over the valleys flanking the chalk adjacent to the main streams of drainage. "There can be no possible doubt," says Mr. Evans, "that a certain series of gravels, sands, and clays, containing organic remains and flint implements in extremely variable quantity, all belong to one geological period, and owe their existence and present position to similar causes."†

We at once assume that the flint implements are of the age of the gravels and earth in which they are found. They have not been dropped and penetrated since. They may have been re-sorted and disturbed with the gravel itself, but they belong to it. We have therefore man, as a worker in stone, in connection with a distinct stratum, the last in which we find remains of great mammals now extinct. We have only to inquire if this stratum yields to geology any proofs of its own absolute age; and if so, do such proofs accord with our conclusions on the same subject, derived from the book of Genesis. How long ago, then, were the gravels deposited?

(2.) When we set out on this inquiry we are met at once by apologies all round, for the necessary uncertainty attaching to the whole subject. Belgrand, the highly-accomplished French Government engineer, says: "Les phénomènes géologiques qui se sont accomplis dans ces temps anciens, sont eux-mêmes peu importants; ils se bornent à quelques oscillations d'une faible amplitude du sol de l'Europe septentrionale et au relèvement très lent des continents, que nous constatons encore de nos jours. Il est donc difficile d'émettre une opinion sur la

* *Philosophical Transactions*, 1864, part ii. p. 257.

† *Stone Age*, p. 611.

durée de l'époque quaternaire, et je crois que les calculs qu'on a faits sur ce point sont purement hypothétiques."*

The language of the careful editor of *Reliquiæ Aquitaniæ*, Professor Rupert Jones, is an echo of many others. He says, "How long a time was required for the changes in land and sea, mountain and valley, for the change from the glacial to a boreal and pluvial climate, with its ever-recurring snow and rain, excavating the higher valleys and filling up the coast valleys with enormous accumulations of sands and gravels, we have but few means of calculation to judge by." †

With the Lyellian school, the theory of the formation of the Somme and Thames valleys, and of all other valleys in whose flanks or basin palæolithic implements have been found, is, that a flat surface of chalk was left by the original sea, here and there dotted with banks of marine tertiary mud and sand; that the action of the rain gradually formed hollows, and connected these, until a channel was made, deepened by ordinary rains and floods; and that the waters occasionally accumulated, so as to erode the chalk and distribute the pebbles as we now find them.

It is admitted,—nay, supposed,—that, according to the calculations of Mr. Croll, this erosion would take place at first only at the rate of 1 foot in 1,000 years, and afterwards somewhat more rapidly in the limited area of the valley. The Thames now lowers its bed only 1 foot in 11,740 years, and therefore the amount of time since the deposit of the gravel-beds at Gray's Inn or at Ealing, say 100 feet above the present level, and four miles wide, is truly inconceivable.

Now, as we are not dealing with a fact of observation, but of deduction, if it is inconceivable, it is, of course, relegated to the domain of the imagination. The action of rain and rivers, though a true cause, ceases to be a true cause, in relation to an effect which it cannot produce. With any amount of time and present forces, the work assigned is plainly impossible. The eroding and lifting power of the present streams are wholly inadequate. On the one hand, Sir C. Lyell says, "I see no reason for supposing that any part of the revolutions in physical geography, to which the maps above described have reference (post-pliocene oscillations of level), indicate any catastrophes greater than those which the present generation has witnessed." But, on the other hand, Professor Prestwich lays it down, "That the formation of the higher gravels can be owing to the action of the present rivers is clearly impossible under existing

* *La Seine*, Belgrand, p. 103, Introduction.

† *Proceedings of Geologists' Association*, vol. iii. p. 207.

conditions." We make no apology for calling so early, or for presently quoting so often the words of Mr. Prestwich. No one can follow in a path once trodden by him, without using his footprints. He thus admits the futility of present operations, and points to the greater agencies of the past: "River action of greater intensity and periodical floods imparting a torrential character to the rivers, the consequences of the joint operation are obtained."*

He refers to his reasoning as that which thus "brings down the larger mammalia to a period subsequent to that when the extreme glacial condition prevailed, and closer to our own times." "These conditions, taken as a whole, are compatible only with the action of rivers, flowing in the direction of the present rivers, and in operation before the existing valleys were excavated through the higher plains, of power and volume far greater than the present rivers, and dependent upon climatal causes distinct from those now prevailing in these latitudes. The size, power, and width of the old rivers is clearly evinced by the breadth of their channel, and the coarseness and mass of their shingle beds; whilst the volume and power of the periodical inundations are proved by the great height to which the flood silt has been carried above the ordinary old river levels,—floods which swept down the marsh and land shells, together with the remains of animals of the adjacent shores, and entombed them either in the coarser shingle of the main channel, or else in the finer sediment deposited by the subsiding waters in the more sheltered positions."† "To estimate the time to which we have to carry back the high-level gravels, we have to consider what may have been the duration of their accumulation, and that of the subsequent excavation of the valleys with the resulting low-level gravels. A difficulty here meets us at the onset. The accumulation of sand, gravel, and shingle along the course of rivers is so irregular (sometimes very rapid, at other times slow,—what is done one year being undone another), that we are entirely without even the few data by which we are approximately guided in ordinary sedimentary strata. The thickness of the deposits affords no criterion of the time required for their accumulation. They rarely exceed 20 feet, and are more frequently not above 10 feet to 12 feet thick. It is well known that recent inundations have covered valleys with sand and gravel to the depth in places of four, six, or even

* *Philosophical Transactions*, part ii., 1864, p. 250.

† *Ib.*, p. 286.

ten feet in the course of a few days, and, therefore, there are no high-level gravels, which, so far as thickness is concerned, might not have been deposited in the course of a few weeks, or even a few days."*

Turning to other witnesses, we find Professor Morris, alluding to the Thames gravel, saying,—“I am inclined to consider it as resulting from fluvial action, and that at a period when a river far more deep and extensive than the present stream flowed along the valley.”†

And Mr. Evans,—“Certainly, the whole character of the deposits is more in accordance with their resulting from the occasional flooding of the streams than from any other cause. If this be so, who shall tell at what intervals such floods occurred, and what was the average effect of each in deepening the valleys?”‡

Mr. Tylor calculates that in the pluvial period there must have been 120 times as much water per acre as at present. It is impossible to conceive causes now in operation, on the present scale, producing continuously any such phenomena. It is not necessary for my argument to show more than the full admission, by the most distinguished geological observers, that there must have been a sufficient departure from the present established course of things to form and place these gravels. So Dupont,—attributing the formation of the valleys to rains far more powerful and prolonged than the present, — “Aussi devons-nous rechercher, dans une augmentation des pluies, la raison des masses d'eau qui donnèrent naissance à nos vallées et admettre que la quantité d'eau qui tombait alors sous nos latitudes, était plus grande qu'aujourd'hui.”§

M. Dupont estimates that at the beginning of the mammoth age the valley of the Meuse was eight miles broad at Dinant, and at the close of the same period less than one mile. “Les phénomènes physiques se produisaient sur une immense échelle.”|| Afterwards the water ceased to conquer the land, and has been barely able to continue its present channel.

Mr. A. Tylor, in the year 1868, brought forward proofs of excessive rainfalls during the formation of the river-valleys, and characterized the period during which it occurred as the “pluvial period.” He discussed these questions in his papers

* *Philosophical Transactions*, part ii., 1864, p. 299.

† *Quarterly Journal of the Geological Society*, vol. vi. p. 223.

‡ Evans, *Stone Implements*, p. 620.

§ Dupont, *L'Homme pendant les Ages de la Pierre*. Bruxelles, 1872.

|| *Ib.*, p. 125.

on the quaternary period, the publication of which commenced in the *Journal of the Geological Society*, vol. xxiv. p. 103, and was continued in another paper, read May 6th, 1868. He advances the following important considerations:—

1. The contour of the river-bed is such as could only have resulted from pluvial and fluvial action.
2. After the heaviest rainfall in recent times there is not sufficient force of water to remove the vegetation so as to make any change in the present surface.
3. There is therefore evidence of an enormous rainfall at the commencement and close of the second period.
4. The materials show that floods brought down from the uplands heavy materials into the valleys.

He adds:—"We are able to correlate the gravel of the river Aire, containing remains of hippopotami, with that of a number of rivers which appear to have risen in times of floods from 40 to 80 feet above the present ordinary level, in that part of the second period which I term the 'pluvial period.'" All the observers now, in England, Belgium, and France concur in this. Then we have from Mr. Godwin-Austen's researches in 1850-1851 proofs of a vast river and delta system having existed in what is now the English Channel; valleys occupying lines of depression in the line of existing rivers. The Somme, Seine, Thames, and others were valleys deepened by the great waters which occupied them. Beds of thick sand and silt were deposited by the action of vast floods.

Now all these witnesses are experts of the first class, and write from personal observation. Professor Dawson of Montreal, surely a competent witness from observation in both continents, says:—"Slow and gradual movement, even if interrupted, could not have produced these sharply-defined terraces." . . . "When we stand by the grassy and tree-clad slopes of a river valley, and consider that they have been just as they are during all the centuries of history, it is difficult to resist the prejudice that they must always have been so, and that vast periods have been required for their excavation at the slow rate now observed; but if we carry ourselves in imagination to the time when a plain was raised out of the sea, bare and bald, and a river began to run in it, we at once see our error. The river so running, and beginning to cut a channel, must in a few years execute a stupendous work of erosion, almost diluvial in its character; but in the course of centuries its work becomes completed, a state of equilibrium succeeds,

and its banks, protected by vegetation, scarcely experience any modification."*

Belgrand, from a consideration of the physical phenomena of the Seine valley, concludes that the valleys were scooped out by waters of flooded rivers running at the highest levels of the gravels by a process far more violent than the present forces, and that they were by the same process filled with gravel from the destruction of the surrounding beds, and then again scooped out by floods which continued long enough to produce great rushes of water from the plateaux above, down into the valley whilst and after it was thus again excavated.† The section at Fisherton, near Salisbury, given by Mr. Evans in the *Quarterly Journal of the Geological Society*, vol. xx. p. 191, shows exactly the state of things. High up under the brow of the hill, 80 feet above the bottom, is a patch of gravel lying in the cheek of an eroded hollow in the chalk; lower down is another patch which passes under the present small stream. In both are there flint instruments, and in both are there mammalian remains of the mammoth age. Difficult as it is to imagine that the mammoth could have resorted to the river-banks, and man pursuing it at intervals during an excavation of 80 feet, yet this is the fact deducible from the evidence; and it is equally deducible that this excavation was not caused by the slow operation of present forces, but by some means incomparably more rapid and effective.

Mr. Prestwich tells us: "That the rivers were larger and more rapid than now, is evident from the great quantity of *débris*, the prevalence of the gravels, the coarseness of the sands, and the general absence of mud sediments." . . . "The melting of winter snows, and combined possibly with a larger rainfall, must have afforded to the old rivers a volume of water far exceeding any present supply, and giving them more of a torrential character." It appears, therefore, that the gravels in these rivers are part of the phenomena of their erosion.

Original inequalities and lines of depression became the natural channels of running water, the latter in flood erodes the substratum, washes away the lighter materials, and grinds and sorts the pebbles; thus forming gravel and sand. After this process had gone on to nearly the present levels, and during some part of the time, and when the action was still intermittent, man followed the mammalia into these parts.

What we have, therefore, is violent diluvial action, under the influence of which the valleys were formed in pre-existing

* *Leisure Hour*, 1874, p. 767.

† *La Seine*, p. 99.

gutters or lines of weakness of the chalk, and partially filled by hard rubble from the eroded materials. Then there was, first, a short occupation by man, and afterwards a recurrence of eroding action, accompanied by a considerable elevation of the land, and next a lowering or a flow of the sea into the ends of the old depressions first opened to its action by these movements. The waters still were larger than at present, making huge deposits of clay, mud, and sand; but by a rise of the land—gradual, though not continuous,—the rivers became reduced to present dimensions, present levels were fixed, and man resumed his occupation and remained as a dweller.

(3.) I will now advert specifically to the fact already alluded to,—the violent disturbance in the framework of Europe that took place before the historical period, before the neolithic period, closing, probably, the palæolithic age of man's occupation. This disturbance the following witnesses will prove:—

Sir C. Lyell says:—"There were probably many oscillations of level during this last conversion of continuous land into islands."

Belgrand, speaking of the level of the Seine, says:—"Il y a donc eu, entre les temps des hauts et des bas niveaux, un relèvement du continent, peu considérable comme fait géologique, mais suffisant, cependant, pour produire de graves perturbations dans le régime des eaux, et pour modifier la forme du fond de la vallée."*

The fractures in the chalk, and contortions of the old drifts on the island of Møen, fifty miles south of Copenhagen, prove the action of great and frequent oscillations and disturbances since the older pleistocene beds were deposited, although these dislocations usually leave but slender traces in gravel-beds. Professor Dawson adds:—"This seems to have been a comparatively rapid subsidence and re-elevation, leaving but slender traces of its occurrence, but changing to some extent the levels of the continents, and failing to restore them fully to their former elevation, so that large areas of the lower grounds still remained under the sea."† After considering the effect of crust movements in the earth as bearing upon the question, he adds:—"There is, therefore, nothing unreasonable in that view which makes the subsidence and re-elevation at the close of the post-glacial period somewhat abrupt, at least when compared with more ancient movements."‡

We have then the undoubted fact that the mammoth age was characterized by at least one period of terrestrial disturbance, by which the land and water were greatly modified in

* *La Seine*, p. 99.

† *Ib.*, p. 290.

‡ *Ib.*, p. 292.

level and contour. England was broken off from France, the British islands formed, and the rivers reduced to their present size and courses.

Sir C. Lyell says :—"The naturalist would have been entitled to assume the former union, within the postpliocene period, of all the British isles with each other, and with the Continent, even if there had been no geological facts in favour of such a position."*

The recent examination of the bed of the English Channel, for the purposes of a submarine tunnel, confirms the conclusion that its disruption is only of recent geological date, that it is a denuded hollow in the line of ancient rivers, broken into by oscillation, and pared down by the inroad of the sea in post-glacial times.†

(4.) I will briefly refer to the cave evidence. England and Wales, like most European countries, contain caves that have been occupied by man from the earliest times to the present. They inclose not only relics of all ages since they were the dwellings or resorts of the people first encountered by the Romans, but of a still earlier race whose implements are found sealed up in stalagmite, with bones of extinct mammals of the same epoch as the valley and terrace gravels. All such caves are within one hundred and fifty feet of running water, or of the sea, the majority of them within seventy or eighty feet. The lowest fossil contents ascertained, correspond with the lowest fossiliferous gravels. I will just refer to a few of these. Kent's Cavern, at Torquay, offers us in its lowest bed a typical instance of the occurrence of man's works contemporaneously with the mammoth. This locality is familiarized to us all by the popular demonstrations of Mr. Pengelly. The stratum in question was accumulated or drifted when the entrance to the cave was from seventy to one hundred feet lower than at present relatively to the sea-level. After an elevation had first taken place, a second depression occurred, bringing the cave floor level with the sea beach; since that, gradual changes only have followed, from causes now in operation, resulting in the present contour of the country. Unquestionably this indicates vast lapses of time; but the two principal factors—the raising and submersion—require the intervention of causes

* *Age of Man*, p. 277.

† I much regret that, at the time of writing, I had not before me Professor Geikie's able work on the "Great Ice Age." In discussing it I should have claimed him as a witness for catastrophe at this epoch, on the ground of that which he terms—"those mysterious forces by which the solid crust of the globe is elevated and depressed" (p. 509).

not now in operation in the district. We know not how suddenly they may have arisen and fulfilled their course. A space of two thousand years is adequate to account for all the phenomena, if we take this into account, whilst, on the other hand, no allowance of time whatever is adequate to account for it on the other supposition, *i.e.* as effected by causes now progressing here.

Brixham Cave is another in which works of man are in the lowest stratum. It has been channelled by a strong stream of running water flowing through the crevices of the rock from the table-land above; the waters were gathered in the cave, and rushing out by a stream to the sea 60 feet higher than the present base of the surrounding valleys. In Brixham Cave the remains of the mammoth,—gnawed bones,—occur in the lowest bed. The implements are worked flints of the simplest shape, triangular and lance-shaped, with cutting edges. The bones were some of them carried in by water with pebbles and mud, others by beasts of prey inhabiting the cave.

“Water charged with silt probably found its way into the cave by the lower or north entrance, and deposited the cave earth, in which occurs so great an accumulation of bones, including, in addition to the above-named animals, those of the various deer, bear, fox, rhinoceros, hare, and lemming. Looking at all the circumstances of the case, I consider it most probable that at that second period the cave was at times dry, and at other times flooded, not by streams flowing in from higher ground, but by flood waters from streams at a level lower than that of the cave; that during the former interval the cave continued to be frequented by carnivores, who brought in their prey to devour; and that by each successive inundation successive collections of bones were covered up and imbedded in the sediment with which the flood waters were charged.”* In Brixham Cave there occurred thirty-six specimens of flint, fifteen of which had been artificially worked. Mr. Prestwich suggests that the flints were lost or left behind by man during occasional visits to the cave, either for the sake of temporary refuge, or in following prey which may have sought shelter there.

He further considers that we can only account for the phenomena of Brixham Cave on the suppositions:—

1. Of greater rainfalls.
2. Of an intensely cold climate.

* Prestwich, p. 558.

3. Spring floods of great power, such as now occur in Arctic regions.
4. Sea action.
5. A slow movement of elevation.

Mr. Boyd Dawkins, in his ample and able researches into the subject, embodied in his most interesting book, referring to the Victoria Cave at Settle, estimates that the two feet of *débris* accumulated at its mouth since the ancient British period, supplies a chronometer, and indicates the lapse of 1,200 years. He applies this to the six feet between this and the floor of the men of the polished stone period (neolithic), and thus makes the latter 3,600 years ago; and then to the still earlier (mammoth) age, which brings the occupation of the cave by man to about 5,000 years ago. But he admits that in ancient times the frosts may have been more intense than they are now, and therefore that the rate of weathering may have been faster.* Thus the calculation is invalidated, and one-half the number of years has equal claims on our belief,—or superior, if favoured with other considerations.

There are a sufficient number of good instances of the occurrence of bones with palæolithic implements only, to warrant the conclusion that the early cave period is synchronous with that of the gravels. The cave was the resort of the first hunters.

The most remarkable and complete of the Belgian caves are those on the Meuse and its tributaries, described in the able work of M. Dupont, Director of the Natural History Museum at Brussels.† No less than forty-three caverns which open in the limestone cliffs of the Meuse or its tributaries have been carefully explored; of these, twenty-five have furnished remains of man's work associated with extinct mammals. The caves open at heights varying in different parts of the valley from 12 to 60 yards from its level. They all have a floor of ancient mud, the result of periodical inundations of the river. Some of the bones were thus washed in, but the greater part were accumulated during occupation by living men and animals. We select one of the twenty-five caves,—that of *Magrite*, near Pont-à-Lesse. Dry, large, open, light, it has been often chosen as a convenient abode. Its floor is covered with rolled pebbles and $2\frac{1}{2}$ yards of river-mud, including four distinct successive surfaces, and each layer containing bones. These remains vary

* Prestwich, p. 115.

† *L'Homme pendant les Ages de Pierre dans les Environs de Dinant-sur-Meuse et Bruxelles*. 1872.

from stage to stage. The lowest bed contains worked flints of rude triangular form, and some other used stones. In this ancient mud, and with these implements of man, washed by water, but not transported, are found the bones of

Mammoth	1	old, 1 young, 1 very young.
Rhinoceros.....	8	individuals.
Bear	3	„
Horse.....	17	„
Chamois.....	2	„
Reindeer.....	30	„
Stag	3	„
Hyena	4	„

and many others. I will not enumerate further, but refer you to M. Dupont's book. The upper layers contain fewer of extinct mammals and more of the bones of the reindeer and horses. The flint tools, too, exhibit some slight advance in art. In the third bed was found a carved reindeer bone, with cut ornamentation. Some of the bones in the earliest deposits display traces of designed fracture and cutting. In their selection and treatment they show the action of man's mind. In many cases the mode of introduction of mammoth bones and flints is not clear; they may have been introduced by crevices, or surface floods, but in others the evidence is that of entry by the open mouth of the cave. In both, the floor has been covered by mud of inundation, occupied by man and beast of prey, abandoned and sealed over by stalagmite, then after an interval occupied again; and thus it has gone on until recent times. In one case there are six beds of ossiferous mud, and five layers of stalagmite. The openings of the caves in Belgium once flooded by the stream of the valley, are now 200 feet above the latter, in solid limestone. It has therefore been inferred that 200 feet have been scooped out of the valley by causes now in operation since the inhabitancy of the cave. But there is no appreciable lowering of the valley going on now, and therefore this reasoning is obviously illusory. There is no such cause in operation.

This is precisely analogous to the alleged scooping out of the wide valley of the Somme. The one is as impossible as the other, and if geologists have to bring in other and more powerful causes for the one set of effects, they must do the same for the other also. The only interpretation of the Belgian caves, in regard to their mud deposits, is that which assigns the material to the drifting and sorting powers of water

intermittent between periods of occupation during which they were dry. In other words, they were on the borders of a river, subject to inundation, and within the limits of the inundation. The caves of the Dordogne and of Bruniquel, in France, do not present the action of floods, but accretion of soil by inhabitation without disturbance. Undoubtedly they show that wild animals now extinct haunted these caves and that man hunted them, and used them for food, and also the flesh of reindeer in a district where the latter do not now exist, besides that of some creatures still living in the district.

As far then as geological evidence of antiquity goes, it is merely a question as to what changes have taken place in the valleys since the accumulation of the soil forming the floors,—what was the time necessary for the formation of the stalagmite which in some cases overlies them, and of the calcareous breccia into which they have been converted. These are dependent upon such variable conditions that it seems utterly hopeless to attempt to assign positive dates. Here, again, we have to quote from Mr. Prestwich the cautious remark:—"Some doubt must always attach to the determination of the relative antiquity of the cave remains, owing to the several possible causes of disturbance, whether by physical operations which re-arranged the contents of the cave, or by the agency of animals or of man producing local displacements."*

And with regard to the stalagmite on which so much stress has been laid as proving extreme antiquity, various observers,—Mr. Farrar, at the Victoria Cave; Professor Phillips in the Ingleborough Caves; and Mr. Dawkins,—may be said to have established the average rate, at a quarter of an inch per annum; (*i.e.*) 20 feet of stalagmite may be formed in 1,000 years; and, says the last named,—“It may fairly be concluded, that the layers of stalagmite cannot be used as an argument in support of the remote age of the strata below.”†

The mammoth or palæolithic age, and the reindeer or neolithic age, cannot always be sharply separated though usually betraying change of level between them. Perhaps in America they cannot be separated at all. Some of the French and Belgian caves of the first stage show that the rudest implement contained was still used among the later people. But on the whole the distinction is real and well-founded, and indicates true succession. Palæolithic man may have been altogether a transitory visitor in these parts. His cave abodes may have been mere

* *Report on Brixham Cave*, p. 560.

† *Ib.*, p. 40.

summer hunting lodges. At all events, we do not track him north-eastwards into the frozen lands of Siberia with the mammoth, unless, passing beyond the latter, he is now represented by the Eskimos, to which tribe he certainly bore a very great resemblance, but which probably was the result of a later migration.*

Mr Dawkins adds :—“ We may therefore infer that the same palæolithic race of men ranged over the whole region from the Pyrenees and Switzerland as far to the north as Belgium, as far to the east as Würtemberg, and west as Devonshire. The cave-dwellers are the same as those who have left the rude flint implements in the river gravels.” Mr. Dawkins enumerates nineteen species, including the mammoth, found in the palæolithic gravels, not found afterwards, which may be assumed to have become extinct in these parts before the historic period. He infers from this that an interval of considerable length must have intervened to allow for the migration and extinction of these creatures.†

But this is only a repetition of the hypothesis, for the violent disturbance and disruption of the land in the interval would render far less time than is supposed equally or even more probable.

Mr. Dawkins justly infers the migration of the great mammalia in an uninterrupted range from the south of France to Devonshire and Ireland. This, of course, could only have been effected by the absence of portions of the Channel, *i.e.* by the elevation of the land now submerged. Hence, as we have before seen, the necessity for an actual movement of the crust of the earth, sufficient to account for a great change in the physical geography of the west of Europe, including a period of action, which raised the land and reduced the mighty rivers to comparatively tiny streams, falling into the encroaching sea, which now swept the submerged area. These considerations forced on us from the life of the period, as well as by the appearances of the gravel-beds, bring us to the conclusion that the epoch of the great mammoth and man was terminated by catastrophes in which the former perished, and the latter withdrew. On man's reappearance, after the lapse of ages, the mammalia are represented by somewhat smaller forms, man resumes his place with greater comparative power over nature. Thus he continued, and slowly improved himself in Western Europe, until about the sixth century B.C., when he receives from the East the art of making bronze, and

* Boyd Dawkins, p. 359.

† *Id.*, p. 260.

a few centuries later he uses iron and other metals. Stone falls into desuetude, and is banished to the remoter islands, or used only as a makeshift.

The non-uniformitarian nature of the oscillations referred to is shown in all the "raised beaches" round our coasts. The old sea-bed, at an elevation of from 40 to 60 feet above its former level, is covered with a mass of angular shingle, resulting from local fresh-water floods or rains poured out subsequently to their rise and settlement, in a degree not now experienced in the same localities.

Mr. Boyd Dawkins says:—"The general surface of the valleys has undergone but little change since history began, and the excavation of rivers has been so small as to have escaped accurate measurement."*

(5.) We are now in a position to discuss the bearing of these geological discoveries on absolute chronology. We have before said that even in the present advanced state of our knowledge all schemes of chronology are at best mere suggestions having more or less probability.†

In the midst of the quaternary period, on the boulder drift, we stand on the upraised sea-bottom of the icy ocean, and in the banks around us we may still discern in some places shingle and rubble once pushed along the bottom of the sea by an iceberg, or thrown down by the melting of an ice-raft. In some places we may perceive the denuded land left bare by the melting of the ice-cap. Coming down through the ages from this far-off time, we next discern a surface spotted with forests, intersected by vast rivers, occupied by large mammals pursued by men. Here first we encounter the being described by Schiller:—

"Darkly hid in cave and cleft,
Shy, the Troglodyte abode;
Earth, a waste, was found and left
Where the wandering Nomad strode;
Deadly, with the spear and shaft,
Prowl'd the hunter through the land."

It is, however, just as reasonable to conclude that these were the characteristics of the human race *elsewhere at that time*, as it would be for the celebrated Zulu savage to construct a theory of mankind founded on the empty powder-cans and pitfalls in the wake of Gordon Cumming. We have no indication whatever of the character or duration of this occupancy, save that

* Boyd Dawkins, p. 271.

† The observation of Cicero, in the *Academic Questions*, applies:—"These assertions seem strange, but the man who has made them could not take his oath that such is the case; nor could I take mine that it is not the case."

given by the succession of mammals, denoted by remains of young individuals, or the irregular layers of the earliest gravels and silt. From these slight data we know that it must have endured for a considerable period. How much of this period is covered by the implement time, no record tells us. The cave deposits associated with the latter may have been introduced in a very few years. There is no scientific requirement for very many centuries. Of what was taking place in other parts of the earth at the same time, amongst other assemblages of creatures, we have no information. We can only surmise, and hope this gap will be filled up by future researches in the East.

Next comes the period of disturbance and augmented action. This, from the nature of the causes at work, is also without positive chronology. Numerous oscillations of land over a large area might, and probably did, take many ages to produce the results which ended in equilibrium and settlement. But it seems evident that *geology* has nothing to say against the assumption that 2,000 years might have sufficed for this part of the palæolithic epoch, including the revolution effected by change of level at or near its close. We find that North America shows the same prevalence, first of rough implements exclusively, then of polished ones. But without the break between which exists in our parts obviously from catastrophe. Yet how different are the fancies inaugurated by the uniformitarian master and his disciples, from the sober deductions which an unprejudiced person may make from the same premises. Sir C. Lyell says: "Since the advent of man on the earth, we have therefore to deal with periods of incalculable length. Figures cannot enable us to appreciate these enormous lapses of time."* "In the old glacial drifts of Scotland the relics of man are found along with those of the fossil elephant."† "The date of the origin of some of these beds (the peat beds) cannot be estimated at less than 40,000 or 50,000 years."‡ "The change from the chipped to the polished stone period is very gradual. It embraces thousands of centuries."§ "So far as investigations have gone, they indisputably refer the existence of man to a date remote from us by many hundreds of thousands of years."||

Now, it will not surprise you to learn that not one of these dogmas is founded on geology; nor do we arrive, in our imaginary flight backwards, at any different race of men; for Sir Charles affirms that the human skeleton in the Belgian

* *Antiquity of Man*, p. 196.
 § *Ib.*, p. 197.

† *Ib.*, p. 19.
 || *Ib.*, p. 193.

‡ *Ib.*, p. 197.

mammoth caves does not betray any marked departure in structure, whether of skull or limb, from the modern standard of certain living races of the human family.*

Again, Sir Charles says that, between the palæolithic and the neolithic there is evidently "a vast interval of time," but gives no grounds for the assertion save the modern slow extinction of the tiger in Bengal, and *more suo* he invalidates his own conclusion by saying that "it is probable that causes more general and powerful than the agency of man,—alterations in climate, variations in the range of many species of animals, vertebrate and invertebrate, and of plants, geographical changes in the height and depth and extent of land and sea,—some or all of these combined, have given rise in a vast series of ages to the annihilation, not only of large mammalia, but to the disappearance of the *Cyrena fluminalis*, once common in the rivers of Europe."† Why vast series of ages? The more general causes and powers thus evoked, operating for a few centuries, are quite equal to the task required.

The advent of man, according to Sir Charles Lyell, belongs to the second continental period, when Britain was a portion of the Continent, and was insensibly being raised, and the ice retreating northwards, and with it the Arctic quadrupeds; whilst the mammoth and woolly rhinoceros and great hippopotamus still wandered on the banks of the broad rivers. After this came the breaking up of the British area into its present island form, during which many oscillations of level occurred, the land became lowered, the climate ameliorated; then came neolithic and historic times. Sir Charles affirms that the first human period is an integral portion of a cycle of 224,000 years, but wisely does not say what portion. He says that *if* it occurred at the epoch to which he has assigned it, then it is so remote as to cause the historical period to sink into insignificance. This is merely intimating that the changes referred to might have occurred without catastrophe, and, if they did, would have required over 100,000 years. We may just as forcibly say, and if they did not, they may have required 2,000 years only.

Mr. Boyd Dawkins is equally bold with Sir Charles Lyell, and his carefully-observed and detailed facts are equally at variance with his working theory.‡ After stating that the

* *Antiquity of Man*, p. 419.

† *Ib.*, p. 418.

‡ But Mr. Dawkins elsewhere maintains that it is impossible to gauge time past, outside historical record. He also founds his opinion on pre-glacial, or inter-glacial, appearance of man on the occurrence of his companion the reindeer.

animal remains are clearly post-glacial, he concludes with the strange and unauthorized statement,—“ We may also infer with a high degree of probability that man migrated into Europe along with the pleistocene mammalia in the pre-glacial age.” This he props up by the statement that the remains in the Victoria Cave “ may be considered pre-glacial,” and therefore the small fragment of bone found in the cave in 1872 establishes the fact that man lived in Yorkshire before the glacial period. The reasoning is curious. If the mammoth, whose remains are found in the caves, was post-glacial, we should find its remains in the drifts; but we do not; therefore it was pre-glacial; and therefore man, a fragment of whose bone was found in the mammoth stratum in 1872, was also pre-glacial, and protected from destruction by the ice-sheet. Now, the value of the non-finding of the mammoth-bones in the drift is *nil*; and as they are found in the drift elsewhere, it is less than nothing. The question for consideration is, What is the latest date to be assigned to the extinction of the mammoth in this country? We find none of its remains in the neolithic period,—say for the 2,000 years before Cæsar. This sends it back, say, to the antecedent 2,000 years, and in some portion of this time was the great diluvial disturbance.

If the high-level and low-level gravels are parts of the same series, on the theory either of Belgrand, that the valleys were first filled with them and then scooped out in them, or of Prestwich, that the gravels are the residuum of the water action which formed the valleys, the question of time is the same in either case. What time is required for either the wearing-down operation or the scooping-out? If this is supposed to have been effected by present causes, then the longest period hitherto assigned is not too long. But if all are agreed that other causes, if similar to the present, yet worked far more powerfully, then almost any time which allows succession of intermittent action is sufficient for the purpose, and the received Biblical chronology is as good as any other. Sir Charles Lyell adduces in proof of the extreme antiquity of man the vast distance of time which separated the origin of the higher and lower level gravels of the valley of the Somme, both of them rich in flint implements of similar shape. Yet this distinction of time between high and low level gravels is virtually abandoned. High and low level are mere names for the consecutive portions of the same phenomena, which might all have occurred in a few centuries. They do not support the allegations of vastness which are put forward. And yet, with Sir Charles Lyell, the whole of the grand oscillation, comprising the submergence and

re-emergence, took "in round numbers 180,000 years for its completion."

Well does the veteran philosopher add:—"I am aware that it may be objected that the average rate here proposed is a purely arbitrary and conjectural one."*

Dr. Andrews appears to show, by careful observations, that the present surface-land of North America rose out of the waters of the glacial period between 5,500 and 7,500 years ago. This appears to limit within these bounds the possible duration of the human period in North America. Dr. Dawson says there are other lines of evidence which would reduce the residence of man in America to a much shorter time.† From a communication to "Nature," of January 14, 1875, we gather that the distinction between palæolithic and neolithic obtains in implements imbedded in the soil there—the former being always rough and more deeply buried. But we also infer that both belong to one type of people, and that the superiority of the latter is the result of progressive improvement.

The wearing away of the land to the south of the Hampshire coast, partly in soft beds and partly in chalk, would require, it is said, far more than ten thousand years. But why go into such a calculation at all, inasmuch as the hypothesis of gradual uniform erosion is wholly inadmissible. Mr. Evans, placing his spectator on the edge of the Bournemouth cliff, and bidding him gaze over the waste of waters in quest of the lost Atlantis, may as well accept the ancient tradition of its *sudden* submergence, confirmed as it is by the appearance of the cliffs. The gazer, on any other supposition, could have beheld no appreciable change, and there would have been nothing remarkable in the prospect, however long he might have continued at his post. With regard to the antiquity of the implements, Mr. Evans says:—"With our present amount of knowledge, it is hopeless to attempt its determination with anything like precision."‡ This does not exclude hypotheses, but it reduces it to mere working suggestion. What, then, is the value of Mr. Evans's argument for a long period between the change from palæolithic to neolithic? He says: "It can hardly have been the work of a few years, or even of a few centuries." Granted; but when it is evident that the change did not take place from ordinary slow causes, but was necessitated by sudden alterations, a period of one thousand years will amply suffice. If Mr. Tylor

* Since these observations were written, and on the 22nd of the present month, this distinguished philosopher has passed away.

† Dawson, *Earth and Man*, p. 295.

‡ *Ibid.*, p. 617.

is right in intercalating the pluvial period here, we have then, antecedent to this, say at least 3,000 years in the ordinary chronology of the Bible, within which to place the mammoth age and its hunters in the West.

We may assume it as established that there was a time when England was connected with the continent, when big animals roamed in summer up the water-courses and across the uplands, and man, armed only with rude stones, followed them into the marshes and woods, hunted them for sustenance, and consumed them in shelter of caves, then accessible from the river levels. This state of things was continued until disturbed by oscillations of surface, accompanied by excessive rainfalls and rushes of water from the water-sheds of the rivers, until the great animals were driven out or destroyed, and man ceased to visit these parts. The disturbances continued, the Straits of Dover were formed, the configuration of the soft parts of the islands and continents was fixed, action subsided, and the present state of things obtained. Man resumed his residence, but with loss of the mammoth and its companions. The reindeer now constituted the type of a state of things which lasted down to the historic period, without any other break from that time to this.

We have then, first a period during which the waters of the valleys ran at higher levels, and were considerably larger,—the mammoth age. Then a diluvial and pluvial period, part of the mammoth age,—a period of great physical changes; and afterwards the present state of things.

Now we know tolerably well the duration of the last. Secular history concerning the West contains no records earlier than the date usually assigned to the foundation of Carthage, B.C. 844, which leaves 1,643 years after the Flood, during which all written history is silent, and 1,656 years before the Flood, also quite dark. The latter 1,656 years was a time of great operations. We know that enormous physical results have been produced and completed in very brief time. Instances of this are matters of familiar history. If we assign 1,656 years for the occurrence of this turbulent epoch, no one can say that it is insufficient. Then we have upwards of 3,000 years from the alleged introduction of man, according to the book of Genesis; if the mammoth period occupied 1,000 years, we have 2,000 years before secular history for the duration of the neolithic age, and all its accompaniments; *i.e.*, take the whole of the period since the Flood as the recent period, and the 1,656 before that, to include the man-and-mammoth age and diluvial period. It should not be forgotten that the

necessities of the genealogies and migrations after the Flood recorded in Genesis, appear to require a far longer time than the annalists assign. Any extension conceded by the chronologists would be absorbed by the geologists, as their data allow of great extension, though not requiring it. Among the changes involved during the period which includes the epoch of disturbance, is that of the severance of the Isle of Wight from the mainland, which must have been subsequent to the blotting-out of the great river, preceding the Thames, Seine, Somme, and Rhone in a vast delta, on the banks of which the implements at Bournemouth were found. Mr. Fox, quoted with approval by Mr. Evans, says: *—"The severance of this island from the mainland, it appears to me, effected under very unusual circumstances, and at no very distant period, the present channel of the Solent being pretty nearly equally deep and equally broad throughout its entire length of fourteen miles, proves at once that it was not formed in the usual way of island-severing channels,—*i.e.*, by gradual encroachments of the sea,—but by its being originally the trunk or outlet of a very considerable river." † In further indicating the progress of the changes that took place here at the close of the mammoth period, Mr. Evans says:—"Directly this closer communication with the sea formed for the Dorsetshire rivers, they would of course, owing to the now rapid fall, excavate their valleys with greater speed at their mouths, and directly they became tidal the sea would make rapid inroads on the soft sand and clay exposed to their action." ‡ Thus quickly would the change be made which has finally resulted in the present configuration and contour.

Chronologists are agreed that about 2,000 years before Christ, Abraham migrated from Mesopotamia to Canaan, and that at this time, Egypt, at least, was old in civilization. § Beyond this we have no positive scale of time in Scripture; for it is evident, from the narrative itself, that the latter does not cover the whole of time.

Usher estimates from Scripture, the creation of man as about 2,000 years before this. During the latter portion of this time, civilization was proceeding under settled governments in the East, interrupted, says the record and tradition, by a flood.

* Dawson, *Earth and Man*, p. 605.

† *Ib.*, p. 605.

‡ *Ib.*, p. 610.

§ "This is the boundary, in looking backwards, of Time—absolute; all beyond is time—relative."—Duke of Argyll, *Man Primeval*, p. 84.

So Lucretius,—

“ Thus, too, the insurgent waters once o’erpowered,
As fables tell, and deluged many a state ;
Till, in its turn, the congregated waves
By cause more potent conquered, heaven restrain’d
Its ceaseless torrents, and the flood decreased.”

Barbarism covered the whole Western world ; neither in the 2,000 years before Abraham, nor in the 2,000 years afterwards, have we any light reflected from these regions to the East. In this 4,000 years, or in the somewhat longer period which probably will be ultimately settled as warranted by the record, we place hypothetically all the phenomena of the later mammalian age, including the introduction of man as a hunter, the first occupation of the caves by him also, the diluvial phenomena of the wide valleys, the oscillations and disturbances of the earth’s crust, alterations in the coast-line and physical settlement of the country ; after this comes the second occupation of the caves. In short, if we say that, hypothetically, the whole first-known human age occurred within 4,000 years of the Christian era, no one can say that it is geologically impossible. Who can say that 1,643 years is insufficient to comprise all the phenomena that occurred during a period confessedly characterized by more rapid and extensive action than the present,—a period during which ruptures in the earth’s crust, oscillations, and permanent uprising took place, and the intermittent action of violent floods caused the deposit and disturbance and re-settlement of the gravels and brick-earth ? There is nothing to interfere with the prevalent opinion that man was introduced here whilst the glacial period was dying out, and whilst it was still furnishing flood-waters sufficient to scour and re-sort the gravels of the valleys down which they flowed. This supposition may be extended to both the great continents. Professor Dawson says,—“ A sufficient number of probable indications appear to make it not unlikely that man had reached America before the disappearance of the mastodon.”*

The late Sir R. Murchison, and the late Mr. J. W. Flower, who had made careful study of the drifts, attributed the implement gravels to the sudden and tumultuous action of floods not of long continuation. In the discussion on Mr. Prestwich’s paper of February, 1872, the latter expressed himself “ willing to concede that the implement-bearing gravel-beds had been deposited under more tumultuous action than that due to rivers of the present day, though still forced to attribute

* *Leisure Hour*, 1874, p. 740.

the excavation of the existing valleys, and the formation of terraces along their slopes, to river-action.**

Why then, with all this geological evidence of uncertainty recorded by the masters of the science, do the same masters or their disciples, dogmatize on the subject of long periods? Why has this scientific dogmatism crept into elementary treatises, and is there laid down with all the confidence of axiomatic knowledge? Verily the domain of fashion is not confined to dress, but certainly extends to geological theories. In Dr. Draper's "History of the Conflict between Religion and Science,"† the following dogmata occur:—"Recent researches give reason to believe that under low and base grades the existence of man can be traced back into tertiary times." Now, on this subject the most recent authorities on both sides the Atlantic not only give no countenance to this, but flatly deny it. The reviewer of Mr. Boyd Dawkins's book, in the *Athenæum*, in the face of all the geological evidence, quietly says:—"We may infer with a high degree of probability that a palæolithic people migrated from the East into Europe along with the peculiar pleistocene Fauna in the *pre-glacial* age, and disappeared with the same Arctic mammalia, leaving behind them as their representatives the Eskimos; they were cave-dwellers, and occupied their time with hunting and fishing, and supporting life in a rigorous climate. An indefinite interval of time which cannot be measured by years, separated these palæolithic peoples from their successors of the prehistoric times."

Sir Charles Lyell, in his "Student's Geology" adduces the old arguments, the disappearance of various species of animals, the deepening and widening of valleys, the change in the course of rivers, the formation of solid floors of stalagmite and the change of climate, to support his statement, that "the 3,000 or 4,000 years of the historical period do not furnish us with any appreciable measure for calculating the number of centuries which would suffice for such a series of changes; which are by no means of a local character, but have operated over a considerable portion of Europe." We have seen that the opposite conclusion is at least equally tenable, and far more probable. According to Mephistopheles in "Faust":—

"Words answer well, when men enlist 'em,
In building up a favourite system;
With words men dogmatize, deceive;
With words dispute or words believe;
And be the meaning much or little,
The word can lose nor jot nor tittle."

* *Geol. Soc. Proceedings.*

† H. S. King & Co., 1875, p. 195.

Mr. A. Tylor, much more of an observer than a theorist, maintains on geological grounds that the high and low level gravels are of one formation, closely connected in age, forming one continuous deposit at irregular intervals, dating from the time immediately preceding the historical period.* The last testimony of the Oxford Professor, given in his recent inaugural discourse, is that "This last great change in the long geological record is one of an exceptional nature."†

On the whole I have called attention to an admitted sequence of events since the introduction of man which comprises physical operations vast, violent, and unusual, as well as long ages of uniform action. The time required *may* have been more than our ordinary interpretation of the Biblical narration prescribes, but it cannot be maintained that it *must* have been so; on the contrary, there are not wanting parallelisms between the two records that should induce us to accept the inferences of a short period from the one, until absolutely displaced by proofs, not yet furnished, of a longer period from the other.

I have, in this paper, discussed both fact and hypothesis. I have tried to discriminate between the two, and to sum up the evidence in the words of the witnesses themselves. This is just what eager disputants do not do, and hence arise misunderstandings. The Lyellian scheme is a fair working hypothesis; so is that of the Scripturist. Until either is absolutely verified, I may adopt one or the other without obloquy; neither can be imposed on me. I accept the latter, and seek to maintain it, because, as I have attempted to show, on the testimony of geologists, it is the more probable. I have not referred to other sciences than geology, affecting this conclusion, for my topic is restricted to this one. A parallel process has been going on in at least one of these sciences, for I find from Herodotus that in his day the priests were given to assign an extreme and fabulous antiquity to their nations. The Babylonians counted 468,000 years from their first king to Cyrus. The Indians and Chinese to a much longer period.‡ Science has reduced these to the first dates from Babylonian history 2,234 B.C., and for Egyptian only a few centuries earlier, to 2,500 B.C. for the Chinese, and to 2,256 B.C. for the Indian;—dates the general agreement of which is at least very remarkable, and which bring us face to face with a great social, perhaps a great physical, break.

* *Nature*, Feb. 18.

† *Rawlinson's Herodotus*, vol. ii. p. 2.

‡ *Quarterly Journal of the Geological Society*, vol. xxiii. p. 468.

The CHAIRMAN.—I am sure all will join with me in thanking Mr. Pattison for his paper. (Cheers.)

The HON. SECRETARY.—I have received a letter on this paper from Mr. Whitley, who says:—

“Mr. Pattison refers to the flints found in Brixham Cavern as implements worked by man. After a searching examination of this cavern and the surface formations around it, it is my opinion that there is satisfactory evidence to prove that the so-called flint knives are only subsoil flakes, which are found in similar gravel and loam, both within and without the cavern, and that they are fragmentary and imperfect of their kind. These flints are now deposited in the Christy Museum, Victoria-street, and may be seen on any Friday. I minutely inspected them on the 19th inst., and compared them with those which I had found in the soil above the cavern, and the evidence of their relationship in form, in fracture, and in colour, was most complete. Not only is this so, but all the corroborative evidence which has been put forward has completely broken down. The remarkably symmetrical scraper figured by Mr. Evans in his ‘Ancient Stone Implements’ (fig. 412) has been found to be a surface implement placed among the others by mistake, and has been withdrawn from the specimens. ‘The portion of a cylindrical pin or rod of ivory,’ relied on by Mr. Evans as the only object wrought from an animal substance found in the cavern, is not now placed in the company of the flints. Of this relic Mr. Pengelly, who superintended the exploration of the cave, says: ‘I have no recollection of this specimen, and, as Mr. Prestwich says its position is not certain, I am inclined to suspect that it does not belong to the cavern series of specimens. It may, I believe, be safely stated that every object forwarded to the Committee was numbered by myself, and that its position was duly recorded in the register.’* The assumed evidence of wear by use is only the broken and jagged edges, which every fractured flint knocked about in a mass of gravel shows more or less on its angles. For many years past visitors to the cave have been shown a plaster model of a most perfect and large flint flake, said to be a representation of one of the flint knives deposited in the rooms of the Geological Society, but no such flint is found amongst those now in the Christy Museum. The public have been deceived, and the delusion of ‘knives’ supported. Having made so searching an investigation of the evidence produced from this cavern in support of the high antiquity of man, and given the results in a paper read before this Institute, I cannot allow my friend, Mr. Pattison, to dislodge me from the ground which I have won and fortified, by the assumption that these ragged flints are human implements. I trust that the members of the Victoria Institute will visit the Christy Museum and judge for themselves.

“N. WHITLEY.”

Mr. PATTISON.—I have looked over collections of flints with Mr. Whitley, and, among them, those from Brixham; but though we agreed about most, there were two or three which bore undoubted traces of design, and I attributed them to human workmanship—I could not do otherwise. Of course, I admit that many of the bushels and tons of edged flints that are found, are

* *Transactions of Devonshire Association for the Advancement of Science*, vol. vi. p. 836.

natural flints ; but there are many, I am sure, which are artificial, and on this subject Mr. Whitley and I are at issue. There were thirty-six specimens of Brixham flints, fifteen of which were artificially worked ; and if there was only one specimen of artificial workmanship, it would be as good as a thousand. I hold letters from Mr. Prestwich, and from Mr. Boyd Dawkins, saying, in effect, that all computations of the dates of geological phenomena are inaccurate and useless for chronological purposes. Mr. Dawkins then refers me to his book and seeks to explain, or rather recapitulates the statement made in that book, that there are glacial phenomena at Settle more recent than the remains of man. This may be so, without its proving that these remains are pre-glacial, for this would carry them back to a far greater antiquity than any one supposes, or than there is any evidence of.

The Rev. Prebendary Row.—Has Mr. Pattison's attention been directed to the excavations made in Troy ?

Mr. PATTISON.—No : I have looked to see whether they would furnish any evidence, but they are too modern for us here this evening.

Mr. Row.—I understand a flint age was discovered there, or a set of flints supposed to belong to the first flint age, and below that a much higher form of civilization ; if this were clearly established, it seems to me that it would have a most important bearing on this question.

Mr. PATTISON.—I have not followed it at all, but I should think it very likely, but not very important, because the evidences of a primitive civilization and barbarism overlay each other in turn, and these changes have been very rapid indeed in Asia Minor—a country which used frequently to be overrun by barbarism.

Mr. A. TYLOR.—I have listened to Mr. Pattison's paper with much attention, and think it is by far the best *résumé* on the antiquity of man which has appeared. Hitherto those who have written well upon this subject have been original observers as well as writers, and have taken their own point of view. In the paper we have just heard every one must admit that the evidence is most fairly stated, although we may differ as to the conclusions. I can say, for myself, that in what I have written I have tried to make out the relative age of man and of the gravel-beds themselves, from the geological evidence alone, and not from the opinions of others. Perhaps I may be allowed to refer to the change of view that has taken place, even in my time, in regard to the age and manner of deposition of these gravel-beds. When I first joined the Geological Society, thirty years ago, what is called the glacial hypothesis was not much known. Playfair, in 1805, observed the land ice-action in Switzerland, but did not apply it to lower ground. Agassiz and the older (Dr.) Buckland, in 1837, took the whole world by surprise when they spoke of glaciers having once existed in these temperate climates. The older geologists, such as Hutton and Playfair, had not given sufficient attention to the probable accumulation of snow and ice in former periods, or to the evidence everywhere of such great and recent changes of

climate. The glacial theory was first mentioned in 1837; by 1857 it was accepted with avidity all over the world, and nearly everything diluvial was attributed to ice; Agassiz even spoke of glaciers coming down to the sea in Brazil: there are signs of them, I believe, in Equatorial Africa. I think I was the first to revive the Huttonian doctrine about rain—that is to say, to show that there must at one time have been twenty or thirty times as much rain as at present. Mr. Pattison has been obliged to limit his quotations from Prestwich and Lyell; but if he had given more, he would have shown that they both always demanded ice-action, or floods produced from melting snow. Dana imagines that the old Mississippi was fifty miles wide, and was supplied by melting snow. He does not give any calculation as to the depth of the snow-field, or sun's heat, to supply a river of that size. I calculate it would take 600 times the present rain and heat to supply water to feed Dana's river.* There is no passage in Prestwich which gives you the idea that he contemplated a previous greater rainfall than we have at present; in fact, he thought the mean temperature was only just above freezing. The prehistoric period was a complete snow age according to Prestwich; with one degree over frost there could be very little rain indeed, yet all the torrents which he speaks of, were to be the products of melting snow or an occasional torrential shower; he depended almost entirely on snow and ice-water for the excavation of the valleys, which Sir C. Lyell referred partly to tidal action. There has been as much change on this point in geology as on most others, arising from more extended observation. Lyell at first followed Buckland, and urged strongly, in his early writings, that man was extremely modern, and that species were permanent, and not subject to change. I mention this to show that a similar great change of view has taken place on the permanency of climate: first came the water-action of Hutton and Playfair; then, the view of ice and snow-action of Prestwich and Lyell; and now Mr. Pattison has been so bold as to say that all the world are agreed that there was excessive rain-action, or a pluvial period. This certainly helps his argument for reconsideration of the question, because it shows that those eminent geologists did not always hold the same theory, but had their primary, secondary, and tertiary views and notions within sixty or seventy years. I first brought forward my theory in 1853, of greater rivers; and when afterwards, in 1866, I suggested my pluvial period, I was told that it would not do, as it smacked of the Deluge. To-night Mr. Pattison has only taken the geological branch of evidence of the antiquity of man. As you are aware, there are many other sources by which you can get some confirmation on this subject as a check on your conclusions. Mr. Pattison has not alluded to Egypt, where there is a long chronology and a list of kings for 30,000 years. The question there is, whether those kings

* *Geol. Mag.*, Sept. 1875.

were all in one line, or whether there were separate kingdoms for Upper and Lower Egypt, and three or four monarchs reigning together? There are the advocates of a short as well as of a long chronology. Then there is the question of race: there was within twenty years a belief—a scientific belief—held by most eminent naturalists, that mankind did spring from a pair, and that all animals did the same. I heard the late Professor E. Forbes, at the Royal Institution, declare, very clearly and positively, that there was no evidence in the animal kingdom of any one individual belonging to a species being found in a position apart from others of the species. He believed in the doctrine of specific centres. The test of the theory of evolution is really to be found in the evidence of geology. Darwin's theory of evolution, all must admit, is most convenient for classification of specimens, and for arrangement of species, by nearest affinities or by their smallest differences; but because organisms are arranged in a settled scheme, it does not follow that there is a progressive or unlimited range of development for each part or characteristic of a species. The law of change is a question to be decided by observation; both Forbes' and Darwin's theories* were supported and deduced solely from a consideration of actual observed facts. You may find in the Reptiles four main divisions: successive changes of form, in time, occur in every part of the skeleton; sometimes ascending to a more complex form, at other times descending: no one can say there is a gradual gain in size, power, intelligence, or fitness for reptile life in any one of the divisions, or any progression or evolution: no one has yet connected these changes with any positive law of development; we can point to numerous changes in forms succeeding each other, but links in the chain are wanting. I plead for liberty of opinion and for suspension of opinion as to the laws that govern the incoming of new species, until all the *fossil* evidence has been analyzed by the scientific method. There is a particular family of Brachiopoda of which 3,000 species are recognized by naturalists; many Brachiopoda are living now, and they begin at the earliest times in the Silurian rocks: they are, you know, a very numerous family, containing many living species; but many more are preserved in a fossil state. There is no evidence of what may be called evolution among them—no species appears to be the development of another species. The forms of individuals of the same species of this family, taken from the opposite sides of the Atlantic, have been compared without finding the smallest difference in localities so distant

* Hœckel (in 1876 edition of *History of Creation*, edited by Ray Lankester) makes a remark in favour of Centres of Creation, although he is a strong evolutionist (page 46, vol. ii.). Thus—"We may be permitted to assume that the original form of every larger or smaller natural group only originated *once* in the course of time, and in only *one* part of the earth." I observe that a very unscientific term, "spontaneous generation," frequently occurs in this work.—(A. Tylor.)

from the common centres. Colonies of species, started at particular times in different formations, have spread to immense distances, and their track can be traced by the persistency of type which characterizes almost all the species, until suddenly they come to an end, and a new form as suddenly occupies their place. Every specimen contained in museums all over the world has been examined by the most competent naturalists, to find a single clear case of development, or a repetition of the same species in this immense family, but at present without success. The numbers of the lowest organisms have never decreased; therefore there can have been no general system of progressive development from some low organic type.* As to the law of changes, the late Mr. Babbage made this suggestion: That you might make a machine to go on with a clock, with a particular series of differences, for thousands of years; and then, by an automatic change pre-arranged in the formation you would find the series changed, and go on afresh, and so on for ever, the machinery carrying its law of change with it. That is very much the case with the family of the Brachiopoda: new species are constantly coming in, and old ones dying out. No one has suggested what change of condition has to do with form or sculpture of the shell of mollusca; every change of form must have an object—origin, near or remote. We are however met by this difficulty: that there is no discernible law for a genus or species first coming in: it was on this ground that the great naturalist, Edward Forbes, believed in specific centres. If the *Terebratula caput serpentis*, now living in the North Sea, could be fossilized, no living naturalist could say that it ought to belong to the present period more than to the Oolite, or to the Oolitic period more than to the Silurian. We have nothing to assist us to define the cause of change, or to help the Darwinian view of struggles for existence, or changes of material conditions, influencing the shape or size of any organ, in the case of any one species of the Brachiopoda. Edward Forbes had studied morphology, and yet he considered every individual fossil as having sprung from one pair of the particular primordial species. If you take man, you will find that in different countries he has a different brain, size, aspect, and skin, and is under very different modifications; but there is no evidence of any living men

* See Barrand's *Colonies*, and Davidson's *Brachiopoda*, page 264, 1857-62; also page 47, Davidson's *Journal de la Société Malacologie*, 1876; also Murchison, King, and others on the persistency of this species with distribution of the species of the Brachiopoda. I quote one passage—"Since the Cambrian period, both great divisions continue to be represented without showing any tendency to pass one into the other."—(A. T.) Principal Dawson, F.R.S., in his 1874 Annual Address as President of fixity of species, the Natural History Society of Montreal, strongly insists on the giving remarkable instances among the Fauna on the coast of America (see note, vol. ix. p. 236).—Ed.

not having had a common ancestor. Those differences that now exist may have taken a very long time to bring about, and therefore I think Mr. Pattison's chronology far too short. Many naturalists think that 20,000 years was the least time in which such a change could be accomplished; still, domestic cattle have changed very rapidly. The 20,000 years human period was the view of Bunsen, the great Egyptologist, and is, of course, subject to discussion.* We have not such good evidence, however, as to time in geology, as in other sciences, such as archæology and philology. If your members will take up the subject of the origin of ideas, manners, and customs, with a reference to Egyptian and other ancient records, and to the analogies of natural history, and the evidence of climatal modifications, and so on, I am sure that you would get a very valuable series of papers on the antiquity of man. Such work, if impartially and systematically done, would give a fairer and more impartial view of the state of knowledge on this subject than has ever been hitherto presented.

Mr. J. E. HOWARD.—Let me say a word about the Babylonian chronology. Mr. Pattison has referred to it as indicating a very long period, and giving a series of kings for hundreds of thousands of years. The members of the Society of Biblical Archæology who are present, can attest the recent discoveries of Mr. Smith, which tend to confirm the Fragments of Berosus. Xisuthrus, in the arrow-headed inscriptions, is the name of Noah; but Mr. Smith has ascertained that the Babylonian records only trace ten generations from the first of the land Alorus—to Xisuthrus, which is exactly the same number that we have in Genesis from Adam to Noah. We have this difficulty, that the length of the reigns of these kings is extravagantly long. The duration of the reigns is given in what are called *sari*, a *saros* being supposed to be 3,600 years, and the whole reign of these ten kings, 120 sari, gives the preposterously long period, for ten men, of 120 times 3,600 years.

* Professor W. Kitchen Parker, F.R.S., in a letter upon this subject, says:

“These race-distinctions of character took place rapidly, I have no doubt. Your Yankee is a good sub-species already, and a fine new type he is—good luck to him! but he has lost for ever the full form, fresh colour, mild expression, and quiet self-possession of that happiest of all breeds, the Anglo-Saxon. I suspect that the African tribes—the Negro especially—became modified in a bad way from a nobler old-world type, not merely because of the *sun and the swamp*, but also because of their being frightfully sensual and baboonish. It is very remarkable how gently the features of the Easterns become *Mongolian*, as we pass from the north-west to the south-east of Asia, and I believe that forms could be found that would connect the ugliest Chinese with our nearest cousins in districts contiguous to the water-shed of the Indus. The whole subject is full of difficulties, and the rashest and most bigoted ethnologists are to be found amongst those who think they have got an easy method now of contradicting Scripture. Those of us who feel safe on that Rock can afford to wait for more light.”—Ed.

Sari.	BEROSUS.		SMITH.
	From Apollodorus.	From Abydenus.	From Cuneiform Inscriptions.
X.	1. Alorus.	1. Alorus.	1. —
III.	2. Alaparus.	2. Alaparus.	2. —
XIII.	3. Amillon (Amillarus).	3. Amillarus.	3. —
XII.	4. Ammenon.	4. Ammenon.	4. —
XVIII.	5. Megalarus.	5. Megalarus.	5. —
X.	6. Daonus (Daos).	6. Daos.	6. —
XVIII.	7. Euedoresohus.	7. Euedoresohus.	7. —
X.	8.	8. Amempsinus.	8. —
VIII.	9.	9. Otiartes (Ardates).	9. Ubura-tutu Servant of Tutu=Bel= Father.
XVIII.	10. Xisuthrus (Sisithrus).	10. Sisithrus.	10. Hasis-adra.*

"So that the number of all the kings is ten, and the term which they collectively reigned, 120 sari."—Cory, *Ancient Fragments*, p. 20, *et seq.*

120 sari=432,000 years (?). "Now a sari is 3,600 years—a *neros* 600—and a *sozus* 60."

It is remarkable that whilst in the Bible we have ten generations in the line of Noah, we have also the same number of generations from the first king of Chaldea to the reign of Noah—the reverent worshipper of the Chaldean historians. The length of the reigns presents a difficulty; but it is also difficult to understand how the antediluvians could have lived as long, as we usually admit, unless by special and continued miraculous power. This hypothesis might, perhaps, be admitted without extending such a gift of nearly a thousand years of life to the rest of mankind? We ought not to deduce our conclusions as to the period of man's past existence from one science alone, such as geology; but from a review of the whole history of mankind, taking into consideration all that bears upon the question. This has never yet been properly attempted.

Mr. PARRISON.—I did not adduce the Babylonian point with any intention

* The meaning of this name is "attentive to worship."—See *Trans. Society Bib. Arch.*, vol. iii. part 2.

LXX.

130 + 800.	1. Adam.	1. 'Αδάμ.
105 + 807.	2. Sheth.	2. Σήθ.
90 + 815.	3. Enosh.	3. 'Ενώσ.
70 + 840.	4. Kenau.	4. Καϊνάμ.
65 + 830.	5. Mahalaleel.	5. Μαλελεήλ.
162 + 800.	6. Yered.	6. 'Ιάρεδ.
65 + 300.	7. Chanoch.	7. 'Ενώχ.
187 + 782.	8. Methushelach.	8. Μαθουσαλά.
182 + 595.	9. Lemech.	9. Λάμεχ.
500 + 100 + 350.	10. Noach.	10. Νώε.
	1. Adam.	5. Mechuyael.
	2. Cayin.	6. Methushael.
	3. Chanoch.	7. Lemech.
	4. Jerad.	8. Tubal Cayin.

to discuss it, but in order to comfort some of us respecting the changes which take place in the opinions of scientific men. I hope that in future, instead of these epochs of immense duration being assigned in our geological text-books for the duration of man, we shall be able to show that the Scriptural period is far more consistent with the facts of geology.

Rev. J. JAMES.—Of the geological theories which have arisen from time to time, two only have been brought before us to-night, namely, the glacial and the pluvial, both of which are indisputably true causes of many of the changes which have taken place. But there is another theory which in my early days, forty years ago, was dwelt upon a good deal—a theory showing that manifold changes have been, and are still being, from time to time introduced by catastrophic action, especially of water. I will mention an instance, of which I have taken particular cognizance, owing to a passage in Sir Charles Lyell's book—easily referred to—in which he mentions certain phenomena connected with the Tinière, a little torrent which flows into the Lake of Geneva, between the castle of Chillon and Villeneuve. Sir Charles Lyell mentions that the railway line from Lausanne to Villeneuve had to be cut through an elevated cone formed by the action of the Tinière, and that this deep cutting had disclosed three or four strata of gravel from five to eight feet thick, with thin strata of soil, from four to six inches thick, interlaid between them. He is, of course, compelled to assume that, during the periods necessary for the formation of the several intermediate layers of soil, there would be a cessation of the gravel-deposit, but that then it would begin again (why or wherefore he does not explain) at the same rate of gradual formation as obtains, according to his view, at present, viz., at the mean rate of six or nine inches in a hundred years. And measuring all these strata of gravel by that rule, he brings out a great number of ages as the result. Now it struck me, as I read the book, that it would have been far more natural to suppose that the beds of gravel were formed, from time to time, by some sudden action, such as on a small scale I witnessed recently at Weesen, on Lake Wallenstadt; and that the length of time taken up by the formation of the entire cone was rather to be gathered from what might be thought requisite for the accretion of the several interlying thin strata of soil. On visiting the spot, I found the idea of catastrophic action, as accounting for the several strata of gravel, entirely confirmed. Looking up the mountain-side, down which the torrent flowed, I found that at a great height, right over the line of the little torrent Tinière, there were two converging mountain-tops with a narrow chasm or ravine between them—a chasm or gorge just fitted to enclose a lake or tarn, or, at least, such a reservoir of water as may be seen in many a narrow valley among the hills of our manufacturing counties in the North of England, and such as we all have known occasionally to burst with devastating effect upon the regions below them. In short nothing seemed to me more natural than to suppose that such a reservoir, or tarn, or lake should have been from time to time formed of the waters flowing from

those mountain-sides ; and that this natural reservoir should, then, from time to time (it may be after intervals of hundreds of years) have overflowed and burst through its natural barrier of gravel and rock ; and that, when once a sluice was opened, it should have brought down with it a vast quantity of gravel to the more level country at the foot, and should there in a few days or weeks have formed one of those beds five or eight feet thick, for the formation of which Lyell gives hundreds and thousands of years. I have ventured to think it might be worth while for this meeting to be thus reminded of that kind of catastrophic action of which earlier geologists took so great account, and which certainly takes place even in the present day, side by side with that more gradual and almost imperceptible action which seems to be the one idea of some modern geologists. Here at the Tinière was an instance where it would have been natural for a cataclysm, or avalanche of sand and gravel to occur from time to time, burying the old surface-soil, and for a new layer of soil afterwards gradually to accumulate, and for grass to grow slowly again upon the surface of the latest formed gravel-bed. And yet, even here, Sir C. Lyell, prepossessed by his one idea, has been so blinded to the elder theory, by which the facts of the case are so naturally explained, that although compelled to assume, between the several formations of the various gravel strata, long periods of unaccountable repose, during which the torrent would cease to overspread with its sediment the newly-formed soil, he nevertheless adduces this very case of La Tinière as an instance of the ordinary, continuous, gradual, and imperceptible action of water. I cannot help saying that his doing so exemplifies his own remark, quite as applicable to a true as to a false theory :—"A false theory, it is well known, may render us blind to facts which are opposed to our prepossessions, or may conceal from us their true import when we behold them."—*Principles of Geology*, p. 498.

Mr. T. W. MASTERMAN.—Mr. Pattison says in the last paragraph of the paper: "The Lyellian scheme is a fair working hypothesis, so is that of the Scripturist ; until either is absolutely verified, I may adopt one or the other without obloquy ; neither can be imposed on me." Now I differ from this statement. I ask, is not the question of man's existence on this earth for a longer or shorter period an important point for a believer in revelation to inquire into and to have strong views about ; for if you admit that there was a race of men existing for 10,000 years before the present age, you seem to undermine important passages in God's Word ? Can you hold that long antiquity of man and maintain the grand doctrines of the Fall and the Redemption ? I think we must totally exclude from papers like this any allusion to Revelation or Scripture, or else we must allow some allusions in the discussions to these matters, and there is one text which I feel bound to quote : "Wherefore, as by one man sin entered into the world, and death by sin : and so death passed upon all men, for that all have sinned : . . . For as by one man's disobedience many were made sinners : so by the obedience of one shall many be made righteous." Does not that text

fail if we admit that 10,000 years has been the duration of man's existence on this planet ?

The Rev. Dr. CURREY.—I do not pretend to any extensive knowledge of the subject of geology, but I can scarcely agree with Mr. Masterman in his views in reference to the antiquity of man. There are differences of opinion on the subject, and while he may entertain the view he has expressed, there are other people who have an equally strong belief in Revelation and all its truths, who take a different view in regard to the possibility of reconciling their ideas with the *great* antiquity of man. With reference to the text which Mr. Masterman has quoted, all we need say is, that we do not abandon that text, but only his method of interpreting it. If it is said that we are to abandon Revelation when we discuss the antiquity of man, I think the Institute must give up discussing such subjects altogether. But, as I understand it, our object is to consider how far the results of modern science can be reconciled with religion, even if it leads to a different interpretation of the texts of Scripture from that to which we have been accustomed ; for it is possible to hold firmly to the truths of Scripture, without refusing to admit new modes of interpretation, if they are consistent with reason and seem to be established by sound argument. Mr. Pattison lays great stress on the fact that geology affords no chronological data, and I observe that other persons who hold very different opinions with regard to the antiquity of man, make the same assertion. But the proposition that "geology affords no chronological data" may be understood in two different senses ; it may mean that geology gives no ground for supposing any such antiquity, or that it affords no data for framing a *system* of chronology, and determining *how many* thousands of years have passed since the creation of man. Now although there may be no sufficient data for forming a system of chronology (and I think Mr. Pattison's paper shows, at least, that we have not sufficient data for this purpose), geology may furnish us with evidence—I will not say conclusive, but forcible evidence—in favour of a very great antiquity. For my own part, I believe (for the investigations of science and of history seem to show) that the period has been very long, but I do not believe that we have sufficient data for determining how long. I do not think, however, that this, my belief, is contradictory to the scriptural records. The dates affixed to the margin of some of our Bibles are not part of the Bible itself : they are formed by calculations made at a time when geology was unknown, and although they seem to agree with the obvious meaning of the text, the arguments in favour of them are not conclusive. In records so brief, of times so remote, it may well be that gaps were left, which were not intended to be filled up : but this is not the time to discuss the modes in which difficulties of interpreting the same may best be overcome. In such questions we must not be too positive ; when we have evidence before us acquired by true science, we may examine the records with new light, and find in them a meaning which, though not lying upon the surface, may yet be the true one.

Dr. E. HAUGHTON.—In reference to what has fallen from Mr. Masterman,

it seems to me that men of science who are not members of the Victoria Institute, may take the position of approaching every scientific subject with minds entirely unbiassed by the consideration of whether they believe in Revelation or not. I suppose we all here believe in Revelation, but when we discuss subjects from a philosophical point of view, we cannot too thoroughly clear our own minds of every prejudice if we wish to arrive at the truth. Our object is not to get up an *odium theologicum* against those who differ from us; but to discuss our subjects dispassionately, and to invite our opponents to come here and to make the most they can of their arguments, so that there may be fair play from every possible point of view. I therefore think that the holding of any particular opinion as to the interpretation of Scripture by a man of science, even if he be a member of this Institute, is not to be a matter of obloquy. (Hear, hear.)

Mr. E. H. PICKERSGILL.—I think that every candid and impartial mind will fully endorse the strictures that have been passed upon Mr. Masterman, who told us that if we accept the theory of the greater antiquity of man we must reject the theory of the Fall; though he gave us no reason for that view. If we are asked how are we to reconcile the two records, Mr. Pattison tells us, in his second page, where he says: "The written record to which some of us appeal does not, and does not profess to, bear full testimony on this head; the unwritten one is wholly made up of materials that have been placed and disordered in a succession extremely difficult to unravel. The one has no chronological beginning, is obviously incomplete, and permits, in its text, a variation of 1,200 years; the other allows of variations in chronology absolutely unlimited." With regard to the question of the formation of stalagmitic matter in caves, such as that at Torquay, considering what an important part some have endeavoured to make it play in the argument in favour of the great antiquity of the human remains found under it, I am glad to find Mr. Pattison telling us, that the mere existence of these layers of stalagmite does not necessarily prove any great antiquity. Mr. Pattison, quoting from Mr. Dawkins, says:—"It may fairly be concluded that the layers of stalagmite cannot be used as an argument in support of the remote age of the strata below." I think this paper is very likely to be prejudiced by the consideration that it is a distinct challenge of the theory upon which must rest, I suppose, at least to a very great extent, the posthumous fame of that venerable philosopher whose mortal part England lay at rest in her national mausoleum only a few hours ago (Sir C. Lyell). But there is another and a weightier consideration; namely, that disregarding other questions, we should follow the truth, and follow it whithersoever it leads. With regard to the gravels which have been introduced into the discussion to-night, I would bring forward an argument which tells very strongly against the Lyellian theory. You have these high-level gravels, and also the low-level gravels; and Sir Charles Lyell tells us that, according to his theory, a vast interval of time must have intervened between the formation of the high gravels and the formation of the low gravels. Now, let us accept

this theory. If a great interval of time *has* elapsed between the formation of the two, it will be only natural, from a common-sense point of view, to suppose that the fossil remains in the two would be distinctly different; but what do we find? I have it here, on the authority of Mr. Evans and of Sir Charles Lyell himself, that the fossil remains in the two sets of gravels are very similar. To take another aspect of the question: I certainly think that, looked at from an *à priori* point of view, the Lyellian theory, to a scientific mind, would have a preference, and for this reason; that, according to the Lyellian theory, we are dealing with causes at present in operation, and the scientific man, in solving a difficult problem, would always prefer to use known factors rather than unknown ones. In this connection there is one fact quoted here, which I think is worth almost all the other facts advanced. Mr. Pattison says:—"Slow and gradual movement, even if interrupted, could not have produced these sharply-defined terraces." Now here is a fact: If, by comparing these sharply-defined terraces with the work which we know to be actually accomplished by the slow process of wearing away, we find that the facts in the two cases are distinctly different, we shall surely be justified by every scientific law in referring these different results to different causes. There is one other matter to which I should like to call attention, and the argument is somewhat analogous to the one I have just referred to. It is with regard to the caves in Belgium. Mr. Pattison says:—"The opening of the caves in Belgium, once flooded by the stream of the valley, is now 200 feet above the latter, in solid limestone." According to the Lyellian theory, those 200 feet have been scooped out by the gradual process of wearing away.* But Mr. Pattison goes on to tell us that there is no such cause in operation. Why, then, the whole thing (he says) is illusory, because the very object and existence of the Lyellian theory is to refer all those changes to causes which are at present going on around us. I think the paper before us is a singularly fair and impartial one, and it is certainly distinguished by close logic and critical acumen.

Mr. E. CHARLESWORTH (a visitor).—Although I have paid some attention to the superficial formations of the earth's surface, yet I feel utterly incompetent to express any opinion as to the philosophy of the view taken by Sir Charles Lyell in relation to the enormous period of time during which man has existed upon the earth. But I can say this much: that I think Sir Charles Lyell's calculation with regard to the 30,000 years during which the cataract of Niagara has been cutting its way through the rock, seems to me certainly consistent with fair and legitimate deduction from the facts evolved by Sir Charles. But then comes the question, Can you correlate with the cutting of the channel the existence of man? Can you show that any human remains, of any sort whatever, date their existence before the commencement of that

* This subject is taken up by Mr. J. Parker (vol. viii. p. 51), who disagrees with Sir C. Lyell.—Ed.

30,000 years? * With regard to the measurement of geological time, I am a firm believer in the great periods of time during which life has existed on this earth. But when we come to consider *how* many thousands or scores of thousands of years man has existed, then I must admit fully that we are all in a haze. There is one point to which I should like to call attention with reference to the chronology of these gravel deposits, and that is the growth of the coral reefs. They have been made the subject of most efficient and careful study, and one of the most distinguished men living in the roll of those who have devoted their lives to scientific research—Mr. Dana, a professor in an American university—ascertained the depth of the coral reefs in the Pacific to be upwards of 2,000 feet. He finds the present rate of growth to be half an inch per year. Then he multiplies that half-inch by the measurement—and these, remember, are not geological reefs, but living reefs of the present day—and he finds they have taken 192,000 years for their growth. I do not ask you to believe this, but men like Agassiz, and Lyell, and Dana, and others, have exercised a great deal of intellectual power in order to arrive at solutions of questions of this kind, and have bestowed quite as much labour, of quite as high a class, as astronomers have upon their studies. There is this difference however between their chronology, that when an astronomer tells us of bodies in the firmament whose light has been thousands of years travelling through space before it has reached this earth, we feel bound to believe him, for he points out the exact date of an eclipse, and we find him right to a moment. † And when we see this, are we not justified in having faith in his calculations, when he comes before us with the marvellous and striking announcement,

* Sir W. Thomson concluded, from different lines of argument, that the age of the earth as a body cool enough for habitation cannot be much greater than 100 million years. Professor Tait, in his *Recent Advances in Physical Science*, recapitulates the same arguments, but with different conclusions, and states the limit of age to be about ten million years (see *Nature*, April, 1876).—Ed.

† “Astronomy, as a whole, is more certain than geology; it is a more advanced science, and many parts of it depend on a definite law, already ascertained, and involve fewer uncertain elements. But it by no means follows that the more doubtful parts of astronomy are clearer and better known than the plainest and simplest conclusions of geology. In all there is an immense interval between the plainest parts and the most obscure. Mr. Charlesworth’s remark must involve this assumption: Astronomers are as certain of the distance of the most distant stars, or of the nebula of Orion, as of the relative distances of the sun, moon, and earth, on which the calculation of eclipses depends; but this is manifestly, and almost absurdly, untrue. We see that they mistook nearly 4 millions of miles in the absolute distance of the sun till within the last few years. The notion of the immense distance of the nebula of Orion is one part or corollary of those views of the nebulae which recent observations have done so much to disprove. Mr. Proctor’s papers, for instance, all tend to establish quite a different view.”—(Communicated by Professor T. R. Birks, Camb.)

that light has been so long travelling through space before it reached this earth? * I have read the paper before us with great interest; and, without committing myself to Mr. Pattison's views on all matters, I may certainly say, I think that it is one of the most interesting and able papers that was ever brought before a scientific society.

Mr. R. W. DIBDIN.—I understand Mr. Charlesworth to say that we have reason for believing in the astronomical computation of time; but we have no such reason for believing in geological computations.

Mr. CHARLESWORTH.—A geologist cannot give us the same test possibly. But his intellectual power and his scientific knowledge are the same.

Rev. Dr. BUTLER.—How can we ascertain that the coral reefs have always gone on increasing at the same rate? What data have we to show that thousands of years ago the coral reefs did increase at the same rate? The argument is inconclusive as it stands.

Mr. D. HOWARD.—There are one or two facts which I should like to bring before the meeting; one is with regard to the question of the movement of gravel. The present rate of rivers never could have produced the results which have been attributed to it. It is a simple mechanical problem; the power of water to move heavy bodies is a perfectly well-known quantity. It varies from nothing up to any force you will. Given, a certain current of water, running at a certain rate, at a certain inclination, it is not difficult to say what sized stone it will carry away. If it is not running with sufficient rapidity it will not move a single stone. A single hour of a sufficient current will move more gravel than centuries of a slower one. I remember, after a violent thunderstorm, passing through a valley of somewhat similar formation to that which has been referred to, and there was a sudden deposition of six or eight feet of gravel over the road. There we have a condition produced similar to that in the case mentioned, yet it does not mark a geological period at all. It would have taken a great many centuries to have produced that result by a gradual process. In measuring time in this way, we almost always discover that that very important factor, whether the process is constant, has been left out. As to the growth of stalagmite, it depends on the rapidity of the action upon calcareous rock, of carbonic acid in water. The stalagmite is no measure of time whatever; the speed of its formation depends simply on the balances of power of solution and redeposition of calcareous matter in water charged with carbonic acid, which is a chemical but not a chronological fact. One illustration shows how uncertain natural phenomena are in respect of time; I allude to the extraordinary formation of vegetable growth in the Nile, which Sir

* The nebula of Orion is said to be 60,000 years of light distant from us; but certain considerations, not necessary to be referred to here, tend to make it a question whether the 60,000 should not be only 20 or 30 years (see also note on previous page).—ED.

Samuel Baker gives us. The place was comparatively clear a few years ago, but now it is a matter of the greatest difficulty to force a passage at all, after centuries of unobstructed navigation. As to the coral reefs, the different quantity of lime at different depths in the water has a most important bearing on the question: the speed of growth must depend on the amount of carbonate of lime which it is possible for the builders to get. But this point is little understood at present. There are different depths of the sea where the processes are completely reversed. It is also a question whether the coral began near the surface on a sinking bottom. Before we can decide time in this manner, we must discover whether what is going on has been going on at a constant rate, else we might as well try to catch a train with a watch which had no balance-spring.

Rev. G. HENSLow. — There are several things which one would feel inclined to talk about, but time passes, and the hour is getting late. It is interesting to see that we appear to be returning, to some extent at least, to the cataclysmic theory of former geologists, and to which Mr. Prestwich also appears to be coming round. No doubt the "uniformitarian" processes are going on to a large extent, but whether we are to abandon the cataclysmic views entirely is quite another thing. Mr. Prestwich refers to the glacial theory, as an instance of the arrangement of the globe for the benefit of man. That is a teleological idea, which had never occurred to me before, and it is certainly worthy of our consideration; but he says we have now a uniform condition without cataclysm, and he contends that this is due to the glaciation of the previous period. With reference to the antiquity of man himself, I see no objection to the notion of his having lived in the *pliocene* or pre-glacial epoch. We know the flora of this country was then identical with what we have now, as far, at least, as the Cromer Forest and lignite beds show; and the climatal conditions of their existence must have been much the same as now. But in all the gravels where man's remains have been detected, they are either lying in depressions scraped out of the "glacial drift" itself, as at Bedford; or else are from obvious reasons post-glacial. Yet that man might have existed before that time cannot be gainsaid. If the idea suggested by Mr. Belt, in his book on Nicaragua, should be confirmed, it would be very interesting to know that man must have existed before the glacial epoch. Whether, however, he lived during the *Miocene* epoch is another matter. I myself think not, though some, but doubtful, evidence has been thought to have been found; for we know from examining the animals of that period, that not only is there *not a single Miocene vertebrate species now living*, but that all existing mammalian forms have been developed since that epoch; thus, if we take the horse as it now is, the genus *equus* is not known at all in the *Miocene* period, but its ancestral representative, the *hipparion*, is abundant. If the horse has come from the *hipparion*, and both the civet and hyena of to-day differentiated from the *ictitherium*, then *man*, by analogy, *would not be the same now as he would have been then; i.e. on the imaginary*

supposition of an ancestral "pre-homo" having lived in the Miocene epoch. With regard to corals, we know that they grow far better on the windward than on the leeward side of land, because there they get a continually renewed supply of water. The sea is "full of rivers," as the discoveries made in the *Challenger* show; and a coral island, if it does not lie in the line of a particular current, will in that stratum of water in which it lies naturally exhaust the carbonate of lime and oxygen which it requires for vigorous growth. If it is in still water, therefore, it is not likely to increase so fast as when a fresh body of water is continually brought to play upon it.

Mr. PATTISON.—I am not aware that there is much that I need trouble you with. With regard to what has been said about the possibility of man being older than the present Pleistocene period, I think no observations yet made carry back the existence of man further than the upper gravels, and the assemblage of animals in which he is found may, I think, be useful, as our Chairman has intimated, as negative evidence with regard to the Miocene period. The case of the coral is beyond my subject, inasmuch as there is no allegation that the commencement of the present coral reefs was coeval with the introduction of Man. No one knows the distinctions attaching to this subject better than Mr. Charlesworth, who worked at it long ago in the Crag deposits, and who knows how different these corals are to the corals of modern days. As to the case of the rate of deposition of gravels which has been so appositely brought forward, we have no time this evening for discussing it, and it is a subject which deserves to be treated by itself, for it has a very important bearing on this question. With regard to catastrophes, the case I have put is the introduction of a catastrophe at the latter end of the Palæolithic period after man visited these parts, to account for the shorter time which I propose to substitute for the theories of geologists who have gone in for a long period of time. But I need not dwell on that, for I hope that in my paper I brought it forward with sufficient clearness to make it intelligible.

The meeting was then adjourned.

ORDINARY MEETING, MARCH 15, 1875.

C. BROOKE, Esq., F.R.S., V.P., IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following elections were announced :—

MEMBERS :—J. G. Gibbs, Esq. (Surgeon-Major Madras Medical Service), Rickmansworth ; M. H. Habershon, Esq. (Hon. Master and Secretary of Rotheram College), West Hackney ; Rev. C. F. Norman, M.A. (Cantab.), Mistley.

ASSOCIATES :—Rev. E. J. Barrett, Cape Colony ; Rev. W. S. Davis, Cape Colony ; Rev. T. Eastwood, Cape Colony ; Rev. P. Hargreaves, Cape Colony ; Rev. W. Hunter, Cape Colony ; Rev. James Morris, Cape Colony ; Rev. Joseph Morris, Bristol ; Rev. W. Park, A.M., Belfast ; Rev. J. E. Parsonson, Cape Colony ; Rev. T. Powell, F.L.S., Samoa, Pacific ; Rev. W. H. Tucker, M.A., Brentwood ; Rev. E. J. Warner, Cape Colony ; Rev. C. White, Cape Colony ; Colonel C. W. Hutchinson, R.E. (Inspector-General for Public Works Department, Bengal) ; W. Stephenson, Esq., Hull ; A. Rivers Willson, Esq. (Chemist), Hammersmith.

Also the presentation of the following Works to the Library :—

- “Proceedings of the Royal Society,” Part 159. *From the Society.*
“Proceedings of the Warwickshire Arch. and Nat. Hist. Soc. 1874.”
Rev. P. Brodie.
“Atomism.” By Rev. Professor Watts. *The Author.*
“Materialism.” By Rev. Dr. Hooppell. *Ditto.*
“Man’s Responsibility for his Belief.” By Rev. J. Macnaughtan. *Ditto.*
“Holland House.” Vol. II. *T. W. Masterman, Esq.*

The following paper was then read by the author :—

**ON THE NATURE AND CHARACTER OF EVIDENCE
FOR SCIENTIFIC PURPOSES.** By the Rev. J. M’CANN,
D.D., F.R.S.L., F.G.S.

SCIENCE is knowledge in the fullest and truest meaning of that word. We cannot be said to know any fact, unless we know its relation to other facts, the place it occupies in

the economy of nature, and the laws by which it has been produced. I may see a flower before me, which I call a rose, and at first sight may learn something of its form, colour, perfume, &c.; but I do not know it in the scientific sense, till I have learned its affinities to other flowers, its uses in the world, and the modes by which it has been built from air and earth. There is, moreover, such a multitude of objects presenting themselves to our notice, such an infinite variety of apparently isolated facts, that the mind soon becomes overwhelmed by their numbers, and finds itself powerless to grasp them, even in their individual significance.

We can, therefore, only know as we classify, as we discover certain unities round which the varieties cluster, and by whose name they are designated. This is the special province of science, to search for similarities amid these diversities, and harmonies amid these apparent discords. The work to be done by the student is thus greatly reduced; instead of requiring to examine every separate individual, he need only examine one of that particular sort; the knowledge also of this one sort saves much study in the investigation of other individuals that resemble it in some points, while they differ from it in others. Even one point of true resemblance is useful, because it mostly happens that one point of likeness will be accompanied by others, not perhaps so patent to the senses, but still existing. It was something for the botanist to have found that he might group plants according to the structure of the embryo into three great classes; for this told him other particulars regarding the structure of the stem, and the character of the flowers and leaves. In like manner information about the buttercup will render the study of monkshood much simpler, because while there are specific and even generic differences between these two, there are many important similarities. The naturalist—and by naturalist I mean the student of any department of nature—thus gradually progresses from generalizations of less significance to those of greater, from unity to unity, till at last the whole field of observation is mapped out into a few great provinces or kingdoms, these having their minor divisions and subdivisions, so that we are able to take an intelligent, even if not detailed, survey of the whole, and feel ourselves competent, by the division of labour, to examine and relegate all phenomena to their appropriate departments.

It is, however, of the utmost importance that these unities should be real and not imaginary, the products of our investigations, and not the children of our wishes or our fancies. If the former, we gradually rise to the apprehension of that great

unity called a law of nature ; but if the latter, we inevitably sink to the pernicious occupation of constructing bubble theories, and add some more to the already too long list of the fallacies of philosophers.

A scientific is somewhat like a judicial court, where the purpose is to obtain a verdict ; in other words, to procure information regarding the subject in dispute. The jury must see that they have sufficient evidence on which to base a verdict of *any* kind ; secondly, that they have all the evidence before them which is procurable ; and thirdly, that the verdict be according to the evidence. The naturalist also, before he can say he has discovered a fact or a law, must act in a similar manner. While the evidence is all on one side, the way is clear ; but when it becomes conflicting, only the greatest care, strictest impartiality, and most thorough training can sift the false from the true, and decide the matter rightly ; but even then it is not always possible.

There lies in this a strong temptation to concentrate our attention on those facts alone which favour the theory we wish to establish, excluding all others from our thoughts. This may be theory-manufacture, but it is not science. Let the confusion, or difficulty, be increased ever so much, the naturalist must search thoroughly, and impartially, and critically, if he would have his science true, and his knowledge real.

Science, then, begins with facts obtained either by observation or experiment, passes on to inferences from these facts, which inferences, if conducted rightly, according to the laws of thought, will be as true as their premises ; so that we end with facts as we began with them.

The first step consequently in the procuring of adequate evidence for scientific purposes is the obtaining of facts, mostly by observation. This seems an easy matter to those who are unaccustomed to the task. "What simpler," they say, "than to look, and tell what you have seen?" It is, however, so difficult, that the well-known saying is unfortunately true, "that there are more false facts than false theories in the world."

The reason of this is that we confound our observations with our inferences, for observation is never a simple passive process of the senses, but is always accompanied by some active mental state. We think while we look. We consequently contribute to the observation something from ourselves, uniting the subjective and the objective into one. This mental addition very frequently is a prejudice ; we are not content with trying to discover what is, but look out for what we imagine ought to be, or what we want to be. It would be very difficult, for example,

for the creationist and the evolutionist to examine with equal care and fairness some phenomenon that would tell either strongly for, or strongly against the theory of development. Both might imagine they were honestly doing their best; but, unless their minds were of a high order, prejudice would warp one way or the other. This warping power is, however, often present when no such reason is to be found; it may spring from carelessness, want of training, or previous habit. It is a very common opinion, most difficult to shake, that the moon appears larger when on the horizon at certain times, than when her altitude is greater; measure her as you may, there is always the response, "But look at her; don't you see the greater size for yourself?" And seeing is held to be believing. "When," says Kant, "we have once heard a bad report of this or that person, we think that we read the rogue in his countenance." In such a case observation fails, and fancy completes the task. A parson and a lady having both heard that the moon was inhabited, believed it, and, telescope in hand, were attempting to make out the inhabitants. "If I am not mistaken," said the lady, who looked first, "I perceive two shadows; they bend towards each other, and, I have no doubt, are two happy lovers." "Lovers, Madam," said the divine, who looked second, "oh, fie! the two shadows you saw are the two steeples of a cathedral." It is no uncommon thing for naturalists of all ranks to turn shadows into lovers or steeples, as their prepossessions lead them. It reminds me much of an echo I once heard in a rocky chasm in Yorkshire. When I shouted "fracture" down the opening, the answer returned was "fracture"; but when I shouted "denudation," something like "denudation" came back to me. When I cried, "What are you?"—a surely fair question,—the startling one was asked of me, "What are *you*?" The rock was evidently of an accommodating nature, and determined to reflect my ideas, instead of its own facts. Something similar frequently occurs also where there is perfect honesty of purpose; but where the mind, running in old grooves, acting according to its latent modes, is not prepared to accept in their entirety new facts, which are more or less inconsistent with these previous experiences, as the following instance will illustrate. Shortly after Day had succeeded in decomposing the fixed alkalies, a portion of potassium, a substance light enough to swim on water, was placed in the hands of one of the most distinguished chemists, with a query as to its nature. The philosopher observing its aspect and splendour, did not hesitate in pronouncing it to be metallic, and, balancing it on his finger, he exclaimed, "It is

certainly metallic, and very heavy." He united the idea of weight with that of metal, and the evidence of his senses having been insufficient to dis sever ideas so inseparably associated in his mind, he mistook his judgment of the ponderosity of the substance for his sensation of it.* Of course, therefore, in the same degree as we mingle observation and inference in the record of what professes to be observation only, the evidence afforded is in the same degree invalidated. The first step then is to sever the one from the other, and see that our facts be true.

I do not mean, in what I have said, to imply that in the accumulation of evidence we ought, if possible, to keep our mental action wholly in abeyance, and observe indiscriminately all facts that come before us. It is most useful to have some suggestive hypothesis to guide our observations, in order that there may be method in our investigations, and to enable us to select for more careful scrutiny the more important circumstances. A certain amount of deductive reasoning must accompany the student from the first, if he would not accumulate his facts blindfold. I quite agree with what Hooke says in his work on Philosophical Method, that "the natural philosopher ought to be very well skilled in those several kinds of philosophy already known, to understand their several hypotheses, suppositions, observations, &c., their various ways of ratiocinations and proceedings, the several failings and defects, both in their way of raising, and in their way of managing their several theories, for by this means the mind will be somewhat more ready at guessing at the solution of many phenomena almost at first sight, and thereby be much more prompt at making queries, and at tracing the subtlety of nature, and in discovering and reaching into the true reason of things." What I may call the suggestively deductive method, accompanied by continuous observation—has accumulated more valuable and systematic evidence than any other, and has yielded most important results. The investigator in such a case uses "such facts as are in the first place known to him, in suggesting probable hypotheses; deducing other facts, which would happen if a particular hypothesis be true, he proceeds to test the truth of his notion by fresh observations or experiments. If any result prove different from what he expects, it leads him either to abandon or to modify his hypothesis; but every new fact may give some new suggestion as to the laws in action. Even if the

* This paper having been written away from books, I have not been able to tell always whom I am quoting, nor always to refer known quotations to the respective authors.

result in any case agrees with his anticipations, he does not regard it as finally confirmatory of his theory, but proceeds to test the truth of the theory by new deductions and new trials."* It is therefore of the utmost importance that the naturalist should have an almost instinctive aptitude in conceiving hypotheses, to be used, however, only as finger-posts directing him along a certain line of observation, and only to be used while they are useful, but to be discarded without hesitation when they would lead him into the quagmire of error. Hypotheses of this kind are only tentative, and must be regarded merely as the scaffolding to a more permanent erection, but must never be mistaken for the erection itself.

But before we begin to build we must see that we have sufficient materials with which to complete the structure, so that it may be well-proportioned and secure. In other words, it is of great importance that we should collect a considerable number of facts before we commence theorizing; if we have only a few, we have no range of vision, our power of comparison is limited, and, consequently, the evidence in favour of any explanation being insufficient, the explanation or hypothesis erected on it will be as a cone on its apex, in very unstable equilibrium, easily overturned, as many such have been. Several naturalists have fallen into the mistake of elaborating theories of the universe the instant they have discovered a few supposed facts, which seemed new to them, instead of patiently gathering more, or trying to verify those previously observed. The more abundant the evidence the more likely is the verdict to be true.

I have so far spoken only of the evidence obtained by direct observation; when, however, we can by experiment repeat the phenomenon at will, and so verify or correct it, our confidence in the results we have obtained is greatly increased. But to speak of the absolute necessity for varied and accurate experiment in the procuring of scientific evidence would be here a mere waste of time; there is, however, one great result accomplished by it which I would not wholly overlook, and that is, the deciding some of several supposed causes to be the actual one in the production of the observed effect. The corpuscular and undulatory theories of light seemed each of them for a time to satisfactorily account for the phenomena; but when it was proved by experiment that light moved more slowly in glass than in air, the undulatory theory which predicted this, was known as more likely to be true than the corpuscular,

* Jevons' *Principles of Science*, vol. ii. p. 137.

which required it to move rapidly. Again, when it was discovered that an acid and an alkali were produced at the poles, together with oxygen and hydrogen, when water was decomposed by electricity, it was supposed by some that electricity had the power of generating acids and alkalies; but Davy supposed that this might be the result of the circumstances in which the experiments had been performed; he therefore varied those circumstances, until he performed the experiment without any acid or alkali having been detected.

Having now, by the methods indicated, obtained a certain body of tolerably trustworthy facts or materials for science, the next step is to give them cohesion, or convert them into science—to bind them into as few unities as possible. We have now to pass from facts to inferences, from the senses to the intellect; to bring into play that unifying power of the mind by which we detect the one in the many, and discover the special law, of which various facts are illustrations. This is done by what I may perhaps be permitted to call an inductive guess.

The mind that is trained to close and cautious inference, and at the same time possesses a special aptitude for generalization, will almost instinctively see the hypothesis that supplies the needed explanation. As in the case of Pascal, who, rejecting the previous idea of nature having an abhorrence of a vacuum, conceived that air had weight; or in that of Roger Bacon, explaining by refraction the bending power of a convex lens towards the perpendicular, while his predecessors thought it to be the result of the material of the substance through which the light passed, the form having been supposed to be of no importance. All persons, however, have not been of this accurate character. Most discoverers have tried many suppositions before they have hit upon the right one; numbers have passed in review before their judgment has selected any as probable; and even of those so selected, not one may have survived the test of experiment. The weakest analogies, the most whimsical notions, the most apparently absurd theories, may pass through the teeming brain, and no record may remain of more than the hundredth part. Kepler, for example, imagined and discarded no fewer than nineteen hypotheses before he established the actual fact regarding the motion of Mars, and then applied to it the correct term "elliptic."

But although a guess or hypothesis may be erroneous, it does not follow that it is useless; it may be a means of collecting and binding together evidence for a certain purpose, which, although eventually useless in the proving of that for which it

was collected, may eventually prove most serviceable in the establishment of some other doctrine. This was the case with the false hypothesis of epicycles ; which, however, proved of great service to a truer astronomy, by giving a mass of observations, which represented the velocities and places of the planets in a way not far from true, and also by giving knowledge sufficient to predict eclipses and construct astronomical tables.

Such conjectures as those of the hypotheses of spontaneous generation, conservation of energy, or evolution, however they may by future observation be demonstrated as erroneous, will yet prove exceedingly useful by the most important facts they are accumulating in such large numbers ; they are, as it were, cutting from the quarry of nature a great quantity of building-material, which some future architect may erect into a noble and permanent building. But while fertile and intelligent conjecture is so advantageous to science, a bigoted adherence to these conjectures, when all evidence is against them, is just as pernicious to its interests, and arrestive of its progress. The character of the true naturalist is indicated by the words of Leslie, who said : " In the course of investigation I have found myself compelled to relinquish some preconceived notions ; but I have not abandoned them hastily, nor till after a warm and obstinate defence, I was driven from every post." He, of course, held on while he could ; but when he could no longer honestly hold his post, he abandoned it ; an example much needed by some modern theorists. " The candid and simple love of truth," Whewell well remarks, " which makes the discoverer willing to suppress the most favourite production of his own ingenuity as soon as it appears to be at variance with realities, constitutes the first characteristic of this temper. He must neither have the blindness which cannot, nor the obstinacy which will not, perceive the discrepancy of his fancies and his facts. He must allow no indolence, or partial views, or self-complacency, or delight in seeming demonstration, to make him tenacious of the schemes which he devises, any further than they are confirmed by their accordance with nature. The framing of hypotheses is, for the inquirer after truth, not the end, but the beginning of his work." Having then framed an hypothesis, the next step is to test it by contact with fact, to verify the correctness of our inferences by further observation or experiment ; to examine by an appeal to nature whether the conclusion at which we have arrived is in harmony with the evidence at our disposal. In other words, we must now proceed deductively from the intellect to the senses, from an imagined law to its consequences. By induction we have bounded to the

top of the stair by one leap, but we must now descend deductively, steadily, and methodically, trying each step, in order that we may establish the solidity of our footing. The deductive reference of any theory to every detail of the evidence from which it was supposed to spring cannot be too strongly enforced. If our law be a correct one, certain consequences ought to follow; experiment or observation must search and see whether these consequences actually do follow; if they do, our confidence is strengthened; if not, it is in the same degree weakened. Newton, when meditating on the subject of gravity, thought it might extend as far as the moon, and at last guessed that she was retained in her orbit by it; but if so, certain results must follow. One was that the moon must be deflected from the tangent every minute through a space of more than 15 feet; but his calculations made, so as to determine the truth of this, gave a deflection of only 13 feet. Here then was discrepancy between theory and fact; he had, proceeding deductively, apparently proved himself wrong, by a small quantity indeed, but yet sufficient to induce him to give it up at once. But when he found he had been basing his calculations on a wrong magnitude of the earth, he commenced afresh, and now found that theory and fact agreed with remarkable exactness. Here then was an inference verified by evidence of the most satisfactory kind, and he was warranted in looking upon the universal prevalence of gravity as a good hypothesis. Because a good hypothesis is one that foretells or allows of deductive reasoning; that is, it must anticipate the results of new combinations of series of facts, prophesying the, as yet, unknown consequences. Another generalization was that the gravity of every material body is in the direct proportion of its mass; but if this be true, all objects, when opposing obstacles are removed, will fall with equal velocity. This was verified in the familiar experiment of the guinea and feather.

Another important test is that there be nothing contradictory in the hypothesis to the known laws of nature, as ascertained in other departments of investigation. "Mere difficulties of conception must not discredit a theory which otherwise agrees with facts, and we must only reject hypotheses which are inconceivable in the sense of breaking distinctly the primary laws of thought and nature" (Jevons).

Then confidence in our inference is very much strengthened when it explains to us the meaning of evidence wholly different, apparently, in kind from that on which the inference is based. Thus the theory of the universality of gravitation, based on the evidence of the perturbations of the planets, was corroborated

by the fact that it accounted for the dissimilar fact of the precession of the equinoxes. This indirect evidence is of more value than the direct, because in the case of the direct there is often a danger of our observations being somewhat warped by the prejudice of a wished-for result, but the indirect must be altogether honest.

It sometimes happens that the result of experiment may approximate very closely, but not exactly, to that required by the hypothesis; the divergence having been caused by some residual fact, which, when examined, strikingly confirms the hypothesis instead of weakening it. The law of the development of heat in elastic fluids by compression affords an illustration in its relation to the propagation of sound through the air. Newton calculated that sound ought to travel at the rate of 968 feet per second; experiment however, at that time, showed it to travel at the rate of 1,142 feet. Here, then, was a residual velocity which Newton and others made many ineffectual attempts to explain. Laplace, however, suggested that it might arise from the heat produced by the condensation taking place at every vibration, increasing the elasticity of the air. In 1816 he published the theorem on which the connection depends. On applying it, the calculated velocity of sound agreed very closely with the best antecedent experiments, and thus this residual velocity strengthened the foregoing law of the development of heat by compression. There are many other characteristics of true evidence, and tests of the hypotheses inferred from it; there is much more that might be said regarding the evolving of science by the threefold process of observation, hypothesis, and verification; but time will not permit. Indeed, the subject is so extensive, that I could only detach a small portion of the fringe; and as this hasty paper has not been written for those who understand the subject far better than I do, but for those who may not have given much attention to this special aspect of science, I hope I shall be pardoned for the superficial manner in which I have treated it. Before proceeding to apply these principles to cases of present theories, I must give you the character of the true naturalist as drawn by Professor Jevons and by Faraday. Jevons says, "It would seem as if the mind of the great discoverer must combine almost contradictory attributes. He must be fertile in theories and hypotheses, and yet full of facts and precise results of experience. He must entertain the feeblest analogies, and the merest guesses at truth, and yet he must hold them as worthless till they are verified in experiment. When there are any grounds of probability, he must hold tenaciously to an old

opinion, and yet he must be prepared at any moment to relinquish it when a single clearly contradictory fact is encountered." "The philosopher," says Faraday, "should be a man willing to listen to every suggestion, but determined to judge for himself. He should not be biased by appearances; have no favourite hypothesis; be of no school; and in doctrine have no master. He should not be a respecter of persons, but of things. Truth should be his primary object. If to these qualities be added industry, he may indeed hope to walk within the veil of the temple of nature." He may indeed, and when there we should have from him fewer crude speculations when facts are absent; fewer fallacious reasonings when logic can nowhere be found; less talk about that which is inherently impossible, contradictions between the science of God's creation and that of creation's God. We may hope, however, that the establishment of schools for original investigation and mental discipline will eventually produce students competent to see facts truly, describe them accurately, and infer from them reasonably; qualities very much needed in the present day.

I shall select my first illustrations from the beautiful discoveries by spectrum analysis. The stars, we know, resemble the sun in being sources of light and heat, not mere reflectors, as are the planets. It was therefore inferred that whatever might be discovered regarding the physical constitution of the sun, would be in great degree true of them also. The telescope however could not afford us much information here, because to it they are but points of light. However, the spectroscope decided the question, and confirmed the supposition by showing that their spectra were similar in kind to that of the sun. But a still more striking confirmation of a cautious deduction, one regarding the motions of the stars, has been yielded by it. Giordano Bruno was, I think, the first to suggest that as the planets moved round the sun, the stars also had planets revolving round them; and not only so, but they also themselves moved in space. This guess, since proved by direct astronomical observation, has received additional confirmation by the fact that the spectroscope can distinctly detect such motion in the change of the hydrogen line, caused by the different effect produced on the retina by light when the luminous body is stationary, from that produced when it is in motion. There is, however, a difference in the rate of motion as yielded by spectroscopic and by telescopic observation; that given by the spectroscope being about 29 miles per second for the star Sirius; while that given by the parallax of M. Abbe is 43;

but the parallax of Henderson gives only 24, which approaches very closely to that given by the spectrum.

I now proceed to select a few illustrations from the Belfast Address of Professor Tyndall, but, with the exception of the first, of a kind to show how hypotheses are built upon insufficient evidence, and consequently are not scientific. I begin with his opening sentence: "An impulse inherent in primeval man turned his thoughts and questionings betimes towards the sources of natural phenomena. The same impulse, inherited and intensified, is the spur of scientific action to-day. Determined by it, by a process of abstraction from experience, we form physical theories which lie beyond the pale of experience, but which satisfy the desire of the mind to see every natural occurrence resting upon a cause."

He first speaks of a scientific *impulse*, of a *determination* in a certain direction. Is there any evidence of this impulse? Yes. abundant evidence in our own consciousness. We know that when we see a change we *cannot help* believing in a cause for the change, and when more actively intelligent, we are *impelled* to search for that cause. From this we infer that if such search be an inherent impulse, it will often, if not always, act without reference to expediency or profit. This deduction is fully verified in the fact that numbers are enthusiasts in this search who never hope to receive any equivalent in the way of prudential recompense. But we have also the affirmation that the impulse is inherent in primeval man; that is, not derived from inheritance, or obtained by experience. The evidence for this is that there is no trace whatever in our supposed ancestors, the monkeys, of turning their thoughts towards the sources of natural phenomena; being found in the first men, it could not be inherited, so must be inherent. So far I think the Professor is thoroughly scientific, though his first proposition directly negatives nearly the entire remainder of his address. But I regret that I cannot long coincide with him, for in his second sentence he speaks of this impulse as being inherited by us. This is surely a flaw, for if it was not inherited by the first man, what reason have we for inferring that it was inherited by any of his descendants? If it were inherent in him, why should we not say that it is inherent in ourselves? We now proceed to the propositions of Democritus, which are, all but one, accepted by Tyndall in these words: "The first five propositions are a fair general statement of the atomic philosophy as now held. One statement in that philosophy is that 'nothing that exists can be destroyed.'" The only evidence for this being, that however we may change the form of any

compound, we do not destroy the materials. This is sufficient evidence that man has not destroyed any substantial existence, and a very important generalization it is in some respects; but there is not one tittle of evidence for the wider proposition of Democritus, either in observation or the laws of thought. Another statement is, "every occurrence has its cause, from which it follows by necessity." I agree with this, but not in the sense of Democritus. I believe there is a necessity, but that it flows from the will of a Creator, whose will is law; but Democritus held that the necessity was inherent. That this is not evidentially proved, is shown by the fact that many of his own school reject this necessity altogether, and use the word antecedence instead. Bain says, "To express causation, we need only name one thing, the antecedent, or cause, and another thing, the effect." Huxley writes, "The notion of necessity is something illegitimately thrust into the perfectly legitimate conception of law." The invaluable evidence of the fundamental laws of thought, and the testimony of consciousness is ignored by those naturalists who maintain that the only bond of union between successive happenings is that of time and regularity, and that by these two terms they give an adequate explanation of causation.

Indeed this whole atomic hypothesis, while a most valuable one for working purposes, and very useful to the chemist, is not sufficiently verified to be assumed as a fact, or made the basis of a theory of the universe. Professor Cooke, of Harvard University, who says he has been called a blind partisan of the atomic theory, writes regarding it, "I wish to declare my belief that the atomic theory, beautiful and consistent as it appears, is only a temporary expedient for representing the facts of chemistry to the mind; although in the present state of science it gives absolutely essential aid both to investigation and study; I have the conviction that it is a temporary scaffolding around the imperfect building, which will be removed as soon as its usefulness is passed."* This is consistent and scientific, but Tyndall's mode of treating the molecules seems neither one nor other. He first adopts the idea that "the varieties of all things depend upon the varieties of their atoms in number, size, and aggregation," and states distinctly that Maxwell's logic was not legitimate when he took the step from the atoms to their Maker, that we must abandon all conception of creative acts. Here then is a distinct

* *The New Chemistry*, p. 103.

hypothesis, the atomic or molecular, to account for the phenomena of nature, to explain the facts of observation and experience. We are pointed to the atom as the one unity, or resting-place for thought. But the very man who does this says, that molecular motions and groupings not only do not explain everything, but in reality they explain nothing. But he does not end here, for he goes on to say that if the materialist cannot explain these things or tell the "why" of phenomena, no one else, "priest or philosopher," can.

Here, then, we have evidence of two things,—that the science of material phenomena cannot solve what he rightly calls the "problem of problems." This is beyond its province, and ought not to be expected of it. But we have evidence also of a baseless assumption, an unwarranted generalization in the statement that if that science cannot solve it, no other can, that solution is impossible. It is seen, however, that we have the authority of Tyndall for saying that not to the naturalist must the man go who believes in the reality of awe, reverence, wonder, religion, &c., for he can do nothing for him; if there *be* hope anywhere, it must be found in the priest, not the philosopher.

We are also introduced, of course, to the subject of evolution, which means an indefinite or continuous change of structure, from the simple upwards to the more complex, from the monad up to man. The only direct evidence he adduces of such a fact is, that varieties are continually being produced, "no chick and no child is in all respects and particulars the counterpart of its brother and sister; in such differences we have variety incipient." I object here to the word "incipient," which I take to mean a beginning. From the hypothesis of evolution we would deduce the expectation of finding the varieties continuous. But in this case they have remained incipient ever since man has been known; how long that is, I prefer, in this case, leaving our opponents to determine. Now a variation that is always beginning, and at the same time always ending, is not a verification, but a refutation of an hypothesis, from which we deduce a variation always beginning and never ending. Again, the theory is that these variations are produced in the struggle for existence, by the preservation and accumulation of small inherited modifications, each profitable to the preserved being. If so, we are warranted in expecting that these preserved varieties must be in the first place actually beneficial; but Tyndall says they are "differential," that is, indefinitely small; but a differential advantage not only could not preserve the life of its possessor,

which is the reason assigned by the theory for its transmission, but could not possibly be of any advantage at all.

If, again, the theory be sound, we have a right to anticipate that where an experiment has extended over at least 6,000 years—some would say 60,000—where the struggle for existence has been severe, and favourable variations have often occurred, some definite advance would have been produced. Such a case is that of man; no one can say he has had no struggle for existence. Take the case of the labourer, where development of muscle is so advantageous, and where use does develop certain muscles in a high degree. Now here is a distinctly useful modification; but are his children born with a more fully developed muscle than their father? Is the race of such men steadily growing more muscular? The reverse seems nearer the truth. Once more, therefore, the theory lacks the evidence needed for verification. But Tyndall says, and rightly, that “the function of the experimental philosopher is to combine the conditions of nature and produce her results”; but, he adds, “this was the method of Darwin.” Here I differ from him, because I consider Darwin’s experiments on pigeons, to which Tyndall refers, as being quite distinct from the methods of nature. He selected a variety that struck his fancy, and with his eye directed to the particular appearance which he wished to exaggerate, he selected it as it reappeared in successive broods, and thus added increment to increment, until, as he says, an astonishing amount of divergence from the parent type was effected. Here, then, we have wish, observation, intelligence, and voluntary selection, every one of which is a conscious state, and every one of which is wanting in nature. Am I justified from the evidence, that a conscious intelligence, having an end in view, can produce some slight useless variations, for such are those of pigeons, in inferring that nature without consciousness, without intelligence, and without a purpose, can produce endless beneficial variations? Am I warranted in inferring that, because a compositor can, by selecting the particular type he requires, arrange them into a connected statement; therefore, if you fling them on the floor, they will arrange themselves into a more difficult and longer statement? If I be, then I strangely misapprehend the nature of evidence; but if I am not, Darwin’s experiments are of no evidential value whatever as to nature’s method; and his hypothesis is not a good one, because in this case at least it is not in agreement with fact, does not allow of deductive inference, and conflicts with known laws of nature.

He also instances Darwin’s investigations into the cell-making

instinct of the hive-bee as an instance of his analytic and synthetic skill, and in confirmation of evolution. That Darwin's experiments were most interesting, and afforded additional illustrations of the wondrous instinct of the hive-bee I gladly acknowledge, but that they afford evidence of this power having been acquired by natural selection I cannot admit. The experiments were made with hive-bees; that is, with bees already possessing this economical instinct, and could not, therefore, show how they acquired it. The hypothesis is that humble-bees have gradually evolved themselves into hive-bees; to prove this by experiment, he must collect a number of humble-bees together, see if they will swarm, and then, supposing them to swarm, watch whether they make any progress towards cell-building. When he has taken some steps in this direction with success, he will have commenced experiments affording important evidence, but not before. Another flaw in this explanation seems to be that the bees "transmit by inheritance their newly-acquired economical instincts to new swarms." Is this a fact? The bees that make the cells have no descendants, and the bees that have the descendants, the drones, do not make the cells; how then can they have the instincts without doing the work? Darwin has shown how it is useful for communities to have working insects which are neuters; but I cannot find where he attempts to show that non-constructing insects can transmit a constructing instinct. The next important point to which attention is called, is the important doctrine of teleology. Tyndall says, "It is the mind thus stored with the choicest materials of the teleologist that rejects teleology, seeking to refer these wonders to natural causes. They illustrate, according to him, the method of nature, not the 'technic' of a man-like artificer." On this point Huxley speaks still more decidedly. "The teleology which supposes that the eye, such as we see it in man or one of the higher *vertebrata*, was made with the precise structure which it exhibits, for the purpose of enabling the animal to see, has undoubtedly received its death-blow." Nevertheless, it is necessary to remember that there is a wider teleology, which is not touched by the doctrine of evolution, but is actually based upon the fundamental proposition of evolution. That proposition is, that the whole world, living and not living, is the result of the mutual interaction, according to definite laws, of the forces possessed by the molecules of which the primitive nebulousity of the universe was composed. If this be true, it is no less certain that the existing world lay, potentially, in the cosmic vapour; and that a sufficient intelligence could, from a

knowledge of the properties of the molecules of that vapour, have predicted, say the Fauna of Britain in 1869, with as much certainty as one can say what will happen to the vapour of the breath in a cold winter's day. Why limit the prediction to the fauna, if we be, as he says we are, machines as much as the fauna; why not have been able to predict this paper this evening, and also the criticisms on it, if it be thought worthy of any? Why not predict the state of every man's mind and life at any particular moment? The one ought, by his hypothesis, to be as possible as the other. But as regards teleology, are all the phenomena of nature to teach this, that by merest accident, according to Darwin, or by some unconscious force possessed by primitive nebosity, according to Huxley, the eye for example just happens to be as it is, but that all the structure, every detail of which is so admirably adapted for seeing, had in its combinations no reference whatever to sight. That the fact that we are able to see with the eye and hear with the ear are only accidents, in accordance, indeed, with law, as all accidents are, but not the purposes of either; in fact, that they have no purpose; for if they have a purpose or end of any kind, that is teleological. Are we also to infer that those cases of—adaptation I was going to say, but may not, as adaptation, Huxley says, has received its "death-blow"—those cases where flowers and insects are mutually suitable, and which Tyndall himself quotes, are mere coincident suitabilities, the one having no designed relation to the other? All this may by its disciples be called inductive philosophy. Perhaps it is presumptuous in me, but I would call it by another name, as I cannot discover the inductions, still less the philosophy. It is wholly unnecessary for me, in this Society, to point out the overwhelming and accurate evidence in favour of teleology, which has superabundantly every test of a true theory. There is another doctrine coming prominently to the front now, which was only alluded to in the Belfast address, but which formed the subject of a masterly lecture by Huxley: I allude to automatism. There is difficulty in dealing with this subject, because the word has not yet been satisfactorily defined in its scientific application; one thing, however, is clear, that by animal automata are meant conscious machines. Huxley says "that consciousness is a spectator not an actor, that we are in fact conscious machines." The facts from which he infers this show a certain amount of involuntary, or what he calls automatic action; but they do not warrant the further inference that, because some actions are automatic, all are; that because our circulation, &c., is involuntary, our choice of evil rather than good is involuntary

also. This is contradictory of consciousness, which testifies that volition is not a farce ; that we can compare and select one action rather than another ; that we can, if we will, choose the right and reject the wrong. If we be only machines, all terms of praise or blame are fallacious ; there can be neither right nor wrong, virtue nor vice. But our whole moral consciousness testifies to the existence of these things ; it is a fundamental law of our nature that we should approve or disapprove in certain cases ; and consequently, whatever hypothesis contradicts this, must be so far unsound. The surest evidence we can have testifies that we are voluntary agents, and not involuntary machines.

Several other illustrations from Tyndall's address, as well as from evolution in general, might be selected to show that many of its inferences are from insufficient or untrustworthy evidence ; that it often violates what we know to be laws of nature ; that its deductions are but seldom verified ; but what I have selected are sufficient for my present purpose. It must not for a moment be supposed that because evidence is sifted and explanations tested, the fullest investigation of nature is objected to ; yet this is what our opponents often insinuate, or openly state. For example, Professor Roscoe says, in the conclusion of his lecture at Manchester on the atomic theory, "In order to flourish and produce fruit, science must be free—free to experiment and observe, without let or hindrance ; free to draw the conclusions which may flow from such experiments or observations ; free, above all, to speculate and theorize into regions removed far beyond the reach of our senses." To all this I am convinced every theologian will give a hearty assent : it is not knowledge, but ignorance we have to fear, either in our own department of thought or any other. What we do object to are conclusions that do not flow from observation or experiment, speculations that are not only beyond the reach of sense, but also of reason ; the wandering, fancy free, in regions where the logician can find no solid ground for his foot, and consequently cannot follow. We object to the freedom which is untrammelled by the laws of observation, of inference, and of verification. And we object to these things more in the interest of science than of theology, because while science may be seriously hindered by the blundering of injudicious friends, or irrational votaries ; the fundamental bases of theology are too firmly seated in the consciousness of humanity ever to be overturned by any amount of illogical reasoning on the part of its friends, or any amount of illogical rancour on the part of its foes.

The CHAIRMAN (the Rev. Prebendary Row)—having conveyed the thanks of the Institute to Dr. M'Cann for his paper,—observed, that he had carefully studied the general laws of evidence, but that he had given less attention to those which regulate the inductions of physical science than to any other branch of the question. No doubt the principles of the paper were capable of a far wider application than to this special subject, and the application of the principles contained in the latter part of it were of much value. That portion of the paper which dealt with the subject of transmitted instincts seemed worthy of great consideration, as the question was becoming one of grave importance in reference to the controversies of the day ; but before any general theory could be laid down upon this subject, it would be necessary to collect a much greater number of facts respecting it than those already in our possession. He far from wished to dispute that instincts were in some way or other transmissible ; but it was quite clear that we were not in a position to determine the law which regulated their transmission. The fact that the father of the working bee was a drone who never gathered honey or performed any labour in the hive, and the mother one whose exclusive business was to breed, afforded a conclusive proof that the instinct of the working bee was not a mere accumulation of instincts gradually acquired through a long succession of fathers and mothers. He made this remark because there were not wanting persons occupying a high standing in the ranks of physical science, who affirmed that the moral nature of man was merely the result of a mass of accumulated instincts gradually acquired in the course of an indefinite (nay, almost infinite) number of generations. No less unknown, he might almost say capricious, was the law which regulated the transmission of likeness, whether it were mental or bodily, passing over one or two generations, and reappearing in another ; but the transmission of likeness in some way or other was unquestionably a fact. In the same manner there could be no doubt that many of our actions, and even of the operations of our intellects, were automatic. Many of his own mental operations were carried on in a manner that he was utterly unable to analyze the process by which they were performed. What was designated "cerebration" might account for some of these phenomena, but he did not think that it could account for all of them. Again, with respect to adaptation, more popularly designated design ; any one who examined the structure of living organisms, and yet who denied that they testified to the existence of an Intelligence, seemed to him to maintain a most astonishing paradox. He was glad to find that the late Mr. J. S. Mill, in his posthumous essays, admitted the validity of this argument. He (Mr. Row) admitted that the argument from design had been unduly pressed in some cases ; but it was manifest that the innumerable adaptations in nature could only be accounted for on the supposition that they originated in intelligence. What was the only substitute that scientific men who denied its existence could find for it ? An infinite chain of happy coincidences and concurrences of events during the eternity of the

past. Let us take one out of the innumerable instances of adaptation—the skeleton of a serpent in the British Museum, with perhaps not less than 300 joints, admirably fitted to each other, and to the whole ; if these marvellous adaptations were to be accounted for by nothing but the principle of natural selection and survival of the fittest, it would require an eternity for the production of that serpent alone : what then should we say of the adaptations in nature which existed in numbers that surpassed all comprehension ? One could hardly conceive how it was possible that men of high intelligence should have propounded such doctrines,

Mr. J. E. HOWARD, F.R.S., while expressing a strong general approval of the paper, did not think the description given of evolution was altogether correct ; nor did he think that the account Professor Tyndall gave of the atomic theory was adapted to anything else but to mislead. The atomic theory of the old Greeks had about as much relation to the theories of modern science as Tenterden Steeple had to Goodwin Sands (according to Kentish traditions) : there might, indeed, have been a connection in some way, but it was exceedingly remote and difficult to appreciate. It was equally misleading to speak of “ the ” doctrine of evolution, for the doctrine of evolution propounded by Tyndall was as different from the doctrine of Lucretius as it was possible to be.

The Rev. J. SINCLAIR said Dr. McCann had maintained that inherent and inherited qualities could not be the same, as they were incompatible ; but as a matter of fact there was no incompatibility between the two. A quality might be inherited, and yet might be inherent, as being an essential part of a man’s nature and constitution. The origin of that quality might be hereditary or otherwise ; but if it were an essential part of the being, it was inherent. With regard to the evidence, he (Mr. Sinclair) doubted whether there was any difference between scientific and any other kind of evidence ; or, in other words, whether there was any other than scientific evidence. With reference to teleology, he felt that something more than was contained in the present paper was necessary to refute the theory of Darwin and Tyndall. That theory was a perfectly consistent one—that the instincts of an animal combined with the circumstances were sufficient to produce certain effects, or to increase, strengthen, or develop existing faculties of which the germ might already exist. There might thus rise up a perfect harmony between the faculties of a being and the circumstances in which it existed ; the only question was as to the facts ; as to hereditary transmission, there could be no doubt that qualities were so transmitted, and often from ancestors more remote than the immediate parents. Dr. McCann had referred to navvies and others whose work developed the muscular system, and pointed out that their children were not more muscular when they were born than were the children of other people ; but there might be other causes to account for that ; such as insufficient food or bad sanitary conditions, which would counteract the effect of the exercise of the muscles in the employment of the

father. Some races were distinguished for their muscularity or for other qualities inherited through successive generations, from the exceptional employments of their ancestors. As instances of this, he referred to the hippopotamus-hunters mentioned in *Livingstone's Journal*, and to the New-haven fishwives near Edinburgh, who were distinguished for their great muscularity and strength.

Mr. M. H. HABERSHON pointed out (as bearing upon the question whether the development of muscle might be referred to the individual alone, or in a measure also to the transmission of quality), that the iron-workers of Staffordshire and Sheffield were examples of great muscular development, which seemed to indicate that persistence for a long series of years in a certain trade occupation had a marked effect on the physique of the people of the district. It was said, at the time of the Chartist riots, that a much greater number of troops would be required in the neighbourhood of Sheffield than among an agricultural population, on account of the greater muscularity of a race of men whose arms had great power from the daily use of the hammer. The sons of a race of blacksmiths would make stronger-armed blacksmiths than the sons of a race of printers or weavers. Among animals it was unquestionable that certain qualities developed by use were transmitted from generation to generation, and it would be easier to train a dog whose progenitors had been trained than one whose progenitors had not.

Mr. Row asked, in reference to the peculiar qualities of pointers and setters, whether any dog was ever known to point or set at game without instruction, and simply through the transmission of qualities from one generation to another.

Dr. McCANN said dogs had been known to point and set without instruction, but only very slightly.

The Rev. G. CURREY, D.D., remarked that in weighing scientific evidence care must be taken not hastily to conclude, because certain facts militated against any hypothesis as originally stated, that the hypothesis therefore was fundamentally wrong. It was possible that the hypothesis might have been too broadly stated, and so might need modification, and yet be in the main correct; or, on the other hand, it might contain a partial truth, which ought not to be overlooked, although the main hypothesis might not be sustained. This seemed to be the case in regard to the theory of Evolution. Careful investigation seemed to discredit the hypothesis that the whole of creation was governed by evolution as one universal law, and yet the same investigation left little doubt that evolution took place within certain limits. To assign these limits, was a work well deserving the attention of men of science; and if Mr. Darwin had been too hasty in his assumption of a general law, we were not to pass over the facts which he had observed, or to imagine ourselves concerned to deny all evolution under the general name of Darwinism.

Dr. E. HAUGHTON agreed that a scientific theory ought to be based upon facts; but before we were asked to believe that all living creatures came

from one little monad or molecule, the facts in support of such a belief ought to be very startling indeed. He complained that the facts given in support of the doctrine of evolution were wholly insufficient to sustain it, and protested that there was no reason to believe that man had descended from a monkey because there were certain breeds of pigeons or of horses which differed from one another.

Mr. I. B. NICHOLSON complained that Dr. McCann's paper was not of a sufficiently elementary character for those who really required instruction : it assumed too large an amount of knowledge among those who heard it read. He asked that some definition of the meaning of teleology should be given.

Dr. McCANN briefly replied. Having thanked the audience for the kindness with which his paper had been received, he said that he did not think there was any action on the part of a human being which was altogether automatic, but the great difficulty in dealing with such questions was the absence of definitions. The word automatic had never received any adequate definition, and the result was that different people speaking of automata meant something quite different from one another. There was no analogy between a watch as an automaton and any conscious being ; but in mental action there were certain moods in which the mind became to some extent mechanical in following out a line of thought. There was a latent mental mode in which the mind, although it acted voluntarily, yet acted almost unconsciously, but not quite, or we should not remember afterwards what we had thought about. In threading our way through groups of people in the streets, we voluntarily turned to the left or right, as circumstances might render necessary, but we were almost unconscious of any mental operation at the time. With regard to inherited and inherent qualities, whatever was essential or necessary for a being was inherent, and could not well be described as inherited. Inherited qualities were clearly something in addition to those which were inherent—they were not essential, but acquired. The inherent habit he had referred to in his paper was that of the bee, which, in making its cell, was carrying on an operation which had never been performed by either of its parents, for the working bees were the neuters which had no descendants. With reference to the muscularity of Sheffield workmen, he could only say that he had seen a good many Sheffield babies, and they were not a bit heavier, stronger, or more muscular than others. As a matter of fact, however, these children began from their earliest years to develop their muscles, because they were put to work at as early an age as possible. He quite agreed with Dr. Currey that it was not right to reject a whole theory because of one failure of verification ; but it must be remembered that, in proportion to the value of the fact upset, was the theory weakened. As to the definition of Teleology, it simply meant purpose in the arrangement or contrivance of anything. If he had a distinct end in view in the construction of anything, that was so far a teleological act.

The CHAIRMAN, in closing the discussion said, it appeared to him that

there had been some misapprehension in the minds of some of those present as to the distinction between evolution and natural selection. Darwin's theory was evolution by natural selection; but the theory of Lucretius was pure and simple evolution, without any reference to natural selection.

The meeting was then adjourned.

ORDINARY MEETING, APRIL 5, 1875.

C. BROOKE, Esq., F.R.S., V.P., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following elections were announced :—

MEMBER :—J. Wood, Esq., Birkenhead.

ASSOCIATES :—Rev. H. de la Cour de Brisay, M.A. (Oxon.), Oxford ; Rev. R. H. Gray, M.A. (Oxon.), R.D., Hon. Canon of Chester, Exam. Chaplain to Bishops of Chester and Sodor and Man ; R. S. Boddington, Esq., Markham Square ; A. Gardner, Esq., Paisley ; Lieut.-Colonel G. Hutchinson, C.S.I., Inspector-General Punjab Police ; J. Smith, Esq., Cambridge Terrace.

Also the presentation of the following Works to the Library.

“Proceedings of the Royal Geographical Society,” Parts 2 and 3, Vol. XIX.

From the Society.

“Proceedings of the Society of Biblical Archæology,” Vol. III. *Ditto.*

“Science based on Religion.” By Rev. J. G. M'Vicar, D.D., LL.D.

The Author.

The following paper was then read by the Rev. T. M. Gorman, M.A., the author being unavoidably absent.

**THE RELATION OF THE SCRIPTURE ACCOUNT
OF THE DELUGE TO PHYSICAL SCIENCE.** By
Professor CHALLIS, M.A., F.R.S., F.R.A.S.

THE inquiry I have undertaken to make respecting the bearing of modern physical science, especially the science of geology, on the account given in Scripture of the Noachian Deluge, will be conducted in the following manner. I begin with assuming that the statements of Scripture relative to the natural operations which immediately caused the Deluge are descriptive of actual occurrences, as they would have appeared at the time to an unscientific observer, and on this hypothesis I shall endeavour to extract from these statements the precise

character of the phenomena. Next, by taking advantage of the physical science of the present day, I shall inquire by what natural forces such phenomena might have been produced, and how the asserted destruction of the lives of men and animals would be the necessary consequence. Lastly, taking into consideration, either individually or in classes, the facts which have been discovered in such great abundance and variety in recent times relating to the status and localization of animal remains, and to concomitant circumstances of the earth's superficial crust, I propose to account for *these facts also* by reference, as in the previous discussion, to the operation of known, or possible, physical causation. The facts will be accepted as described by Lyell, Lubbock, Evans, Boyd Dawkins, and other writers on geological questions, although I may not be able to adopt the views of these authors as respects either the *modus operandi* of the physical causes, or the *time* occupied in effecting changes of the features of the earth's superficies. Having spent a large amount of thought and mathematical research, during many years, on the laws of operation of the physical forces, I am entitled, I think, to form on these two points an independent judgment. If this second discussion should indicate that the observed phenomena may be accounted for by a deluge agreeing as to its physical causation and consequences with the inferences drawn in the first discussion from the recorded facts of the Noachian deluge, it is evident that the Biblical narrative would thereby receive much confirmation. This, I presume, will be considered to be a fair line of argument.

I. The passages in the Book of Genesis which describe the immediate natural causes of the Deluge are few in number, but very significant. "All the fountains of the great deep were broken up, and the windows (*καταρράκται*) of heaven were opened, and the rain was upon the earth forty days and forty nights" (vii. 11, 12). These statements clearly point to *two* sources of the waters of the Deluge. The views entertained by the Hebrews respecting the causes of natural phenomena were such only as might be suggested by ordinary observation; and hence, as it seems, they supposed that any collection of waters had its proper springs or fountains, and according as the fountains were opened or closed, the waters flowed or ceased to flow. Thus in 2 Esdras iv. 7, two kinds of springs are spoken of,— "springs in the beginning of the deep," and "springs above the firmament." The above passage of Genesis expresses similarly the twofold source of the waters which produced the Deluge, and may be taken as indicating that besides a copious down-pouring of rain through, as it were, cataracts, or windows,

in the sky, continuing uninterruptedly forty days and forty nights, there was—what a mere spectator might suppose to be due to fountains breaking out at the bottom of the deep—a welling up of the waters of seas and oceans, whereby the lands encompassed by them were flooded. The narrative appears to ascribe the waters of the Deluge to the *simultaneous* operation of the two causes.

“And the waters prevailed and bare up the ark, and it was lifted up above the earth. And the waters prevailed and were increased greatly on the earth, and the ark was borne upon the face of the waters. And the waters prevailed exceedingly upon the earth; and all the high hills that were under the whole heaven were covered. Fifteen cubits upward did the waters prevail, and the mountains were covered” (vii. 17—20). These words not only describe the great extent and height of the waters of the cataclysm relatively to the land, but indicate also that it continually advanced by gradations to a maximum height. In verse 24 of the same chapter, it is said that the waters prevailed (*ὑψώθη*, were elevated, *Sept.*) on the earth an hundred and fifty days. During this interval of five months, which is to be reckoned from the day of Noah’s entrance into the ark, the height of the waters was continually on the increase up to a certain time, which, as being the epoch of a maximum, would not be definitely marked; afterwards it continually decreased. The increase might go on *after* the cessation of the rain at the end of the forty days, and, as will presently appear, the decrease commenced *before* the end of the hundred and fifty days.

In the statements given in viii. 1 and 2 respecting the operations which produced the abatement of the waters, and caused them to return continually from the face of the earth, it is said, generally, that “God made a wind to pass over the earth, and the waters were assuaged”; and then, specifically, that “the fountains of the deep and the windows of heaven were stopped, and the rain from heaven was restrained.” This cessation of the rain took place at the end of forty days, and appears to be here mentioned in connection with the stoppage of the fountains of the deep, and the assuagement of the waters by “the wind,” as being a necessary antecedent condition of these operations. It may be remarked that the Hebrew word for “wind” in this passage is translated in the Septuagint by *πνεῦμα*, whereas the same word, employed in Exod. xiv. 21, in giving the account of the dividing of the Red Sea by “a strong east wind,” is translated by *ἄνεμος*. Possibly the LXX. Interpreters preferred *πνεῦμα* in the present instance because, as the Hebrew word appears to have been used to designate generally an invisible

agency, they supposed that a current of air (*ἀνεμος*) might not be the agent here signified.

“And the waters returned from off the earth continually; and after the end of the hundred and fifty days the waters were abated, and the ark rested in the seventh month, on the seventeenth day of the month on the mountains of Ararat. And the waters decreased continually until the tenth month; in the tenth month, on the first day of the month, were the tops of the mountains seen” (viii. 3—5). According to this account, on the seventeenth day of the seventh month, that is, five months, or one hundred and fifty days, after Noah entered the ark, the waters had so far abated as to allow the ark to rest on the mountains of Ararat. Since the ark was 30 cubits in height, this might have happened at no long interval after the maximum height of “fifteen cubits upward” had been attained, and *before* the tops of Ararat and of other mountains were visible. “The tops of the mountains,” it is said, “were seen on the first day of the tenth month,” that is, seventy-four days after the resting of the ark on Ararat.

The remainder of the statements (viii. 6—14) recount that at the end of forty days, reckoned apparently from the time the tops of the mountains were seen, Noah opened the door of the ark, and sent out at intervals, first a raven, and then a dove three times, and that at the second return the dove had “in her mouth an olive-leaf plucked off.” These circumstances are all consistent with the supposition that the subsidence of the waters was effected in a very *gradual* manner. The interval from the entrance into the ark to the time at which the earth’s surface was sufficiently dry to allow of Noah, his family, and the animals to go out of it, appears from the dates given in the narrative to have been three hundred and seventy days.

The destruction of the lives of men and animals by the Deluge is recorded in these terms:—“And all flesh died that moved upon the earth, both of fowl, and of cattle, and of beast, and of every creeping thing that creepeth upon the earth, and every man: all in whose nostrils was the breath of life, of all that was in the dry land, died. And every living substance was destroyed which was upon the face of the ground, both man, and cattle, and the creeping things, and the fowl of the heaven; and they were destroyed from the earth: and Noah only remained alive, and they that were with him in the ark” (vii. 21—23). In the Septuagint, both in this passage and in vii. 4, the Greek for “every living substance” is *πάν τὸ ἀνδστῆμα*, every thing that rises up. The context shows that only substance endowed with animal life is signified.

The foregoing are mainly the facts stated in the Book of Genesis, which I propose to account for by a physical theory. But before proceeding to do this, it is right to say that the theory necessarily has reference only to the *general* condition, and *kind* of action, of the physical forces concerned in producing the phenomena, and not to the precise amount of the results of their action, and that on this account it is incapable of giving quantitative determinations admitting of comparison with the specific numbers which occur in the above statement of the facts. Possibly these round numbers may be considered to mark out intervals that are approximately true as to their proportions, but not as to the actual magnitudes.

It should also be here mentioned that for the following reasons I have not thought it necessary to inquire what might have been the particular circumstances under which the lives of all the different kinds of living creatures were preserved in the ark. Much that relates to the ark is of a *miraculous* character. The very act of preparing means of safety in anticipation of a deluge could only have proceeded from divine interposition. It was by special "warning" from God that Noah built the ark; God also gave particular directions respecting its dimensions and construction; and it is added that when Noah with his family and the animals had entered into it, "the Lord shut him in" (vii. 16). On account of these avowedly miraculous circumstances, it is needless to inquire by what special means the ark and the animals within it were saved from destruction.

Moreover, I do not consider it necessary to take the terms of the biblical narrative as implying that the propagation of the different kinds of animals was continued after the Flood exclusively through those that were saved in the ark. It is true that this is distinctly affirmed relatively to the human race, because it is said of the three sons of Noah, that "of them was the whole earth overspread" (ix. 19). But it is not as expressly asserted that the offspring of all the living creatures that went out of the ark spread over the earth. It seems, therefore, allowable to interpret the account of the miraculous preservation in the ark of two of every kind, male and female, for the purpose of "keeping seed alive upon the face of all the earth" (vii. 3), as indicative of an effect which was produced by other means, also of a more extensive character and more conformable with ordinary physical operations. These means might be such that they could not be intelligibly stated without reference to physical and geographical facts which were not then cognizable by common observation, and on that account would have no place in Scripture. Possibly also the

reiteration with which it is affirmed that the continuation of every kind of animal life on the earth's surface after the Flood was owing to the intervention of the ark, may be taken to denote that this, the only means which for the time could be stated in consistent and intelligible terms, embraced symbolically all actual means of preservation. The sacred writers not unfrequently use words of universal import to denote the comprehensive character of an affirmation.

I do not think that more need be said on the miraculous element in the Scripture narrative, and shall, therefore, now proceed to discuss, in a second division of the essay, the physical causes that might have produced the phenomena of the Deluge, taking these phenomena exclusively as they have been inferred in the first division from the record in the Book of Genesis.

II. As preliminary to the main argument, reasons will be given for concluding that the interior of the earth is in a *liquid* state. By experiment it is found that when a quantity of ice in small fragments is inclosed in a vessel and violently compressed, the separate solidity of the different portions can be obliterated, and the whole be converted into a single solid mass. From this fact it may reasonably be concluded that the difference between the solid and the liquid states of the same homogeneous substance depends only on difference in the mechanical conditions of the parts constituting a very thin superficial stratum of the substance, and that the particular condition characterizing the solid state may be got rid of by *pressure*. The same effect, as is well known, may be produced on ice, and many other solid substances, by *heat*. Now in the interior of the earth both these causes operate in a very high degree, the pressure being due to the weight, increasing with the depth, of the superincumbent materials, and the heat to the increase of temperature with descent below the earth's surface, which is shown by thermometrical observations in deep mines, to take place at the rate of one degree of Fahrenheit for every 90 feet. Thus on both accounts the interior of the earth may be assumed to be in the condition of a liquid. It is true that this liquid must be supposed to be enveloped by a solid shell, the elevated parts of which are hills and mountains, and the depressed parts valleys or solid basins containing seas and oceans. But there is reason to say that the non-liquid state, whether solid or viscous, extends to a depth very small compared to the earth's diameter of 8,000 miles, and that the whole of this crust, together with the contained watery parts, constitutes comparatively a very

small portion of the earth's mass. For it would seem impossible to explain the remarkable fact that, after taking account of the above-mentioned elevations and depressions, the *mean* form of the superficies of the solid parts coincides with the form of the ocean-surface, unless that mean form were determined by the conditions of the equilibrium of a *liquid* mass constituting nearly the whole of the interior.

Adopting, for the above reasons, the hypothesis of a liquid interior of the earth, I propose, in the next place, to discuss briefly, with the view of applying the results of this discussion in the subsequent argument respecting the Deluge, the phenomena and probable causes of *volcanoes* and *earthquakes*. In treating of this subject I cannot do better than refer to what is said about it by Sir John Herschel in an excellent work entitled *Familiar Lectures on Scientific Subjects*. (Strahan, 1867.) The first lecture is on "Volcanoes and Earthquakes," the phenomena of which it gives a very intelligible account of in familiar terms, together with a theory of their causes, which, I believe, in all essential points is due to Herschel himself. It will contribute much towards elucidating my subject to quote some passages from this lecture, which I shall do by citing the numbers within brackets, placed for reference at the beginnings of the paragraphs.

In paragraph (3), speaking of the geological changes "we see going on," the author says, "We see everywhere, and along every coast-line, the sea warring against the land, and overcoming it; wearing and eating it down, and battering it to pieces; grinding those pieces to powder; carrying that powder away, and spreading it out over its own bottom, by the continued effect of the tides and currents." Looking at our chalk-cliffs, "what do we see? Precipices cut down to the sea-beach, constantly hammered by the waves and constantly crumbling: the beach itself made of the flints outstanding after the softer chalk has been ground down and washed away; themselves grinding one another under the same ceaseless discipline; first rounded into pebbles, then worn into sand, and then carried out farther and farther down the slope, to be replaced by fresh ones from the same source."

"The same thing is going on everywhere, round every coast." "And what the sea is doing, the rivers are helping it to do. Look at the sand-banks at the mouth of the Thames. What are they but the materials of our island carried out to sea by the stream? The Ganges carries away from the soil of India, and delivers into the sea, twice as much solid substance weekly as is contained in the great pyramid of Egypt. The Irawaddy

sweeps off from Burmah 62 cubic feet of earth in every second of time on an average." (4) The large deposits of sedimentary matter which have been ascertained by series of measurements made in quite recent times, to be going on at the mouth of the Mississippi, might be adduced as another instance of the transfer of earthy materials from one locality to another by river-agency. (See Lyell's *Antiquity of Man*, 4th ed., p. 44.)

But besides these changes which appear to be operating continuously and in comparative quietness, others are witnessed from time to time, which are specially characterized by their suddenness and violence. As to these, to adopt the language of Sir John Herschel in (6), "Let the volcano and the earthquake tell their tale. Let the earthquake tell how, within the memory of man, the whole coast-line of Chili, for 100 miles about Valparaiso, with the mighty chain of the Andes, was hoisted at one blow (in a single night, Nov. 19th, 1822) from two to seven feet above its former level, leaving the beach below the old low-water-mark high and dry." "One of the Andes upheaved on this occasion was the gigantic mass of Aconcagua, which overlooks Valparaiso, and is nearly 24,000 feet in height." On the same occasion "at least 10,000 square miles of country were estimated as having been upheaved; and the upheaval was not confined to the land, but extended far away to sea, which was proved by the soundings off Valparaiso and along the coast having been found considerably shallower than they were before the shock."

"In the year 1819, in an earthquake in India, in the district of Cutch, bordering on the Indus, a tract of country more than fifty miles long and sixteen broad was suddenly raised ten feet above its former level. The raised portion still stands up above the unraised, like a long perpendicular wall, known by the name of the Ullah Bund, or God's wall." (7).

Again, as examples of changes of level, Sir Charles Lyell adduces "the strata near Naples, in which the temple of Serapis at Pozzuoli was entombed. These upraised strata, the highest of which are about twenty-five feet above the level of the sea, form a terrace skirting the eastern shore of the Bay of Baiæ. They consist partly of clay, partly of volcanic matter, and contain fragments of sculpture, pottery, and the remains of buildings, together with great numbers of shells, retaining in part their colour, and of the same species as those now inhabiting the neighbouring sea. Their emergence can be proved to have taken place since the beginning of the sixteenth century." (*Antiquity of Man*, p. 48.)

Herschel's Lecture, before cited, contains, in the portion

devoted to the history of earthquakes and volcanoes, the following remarkable statements. In a district of Mexico, between two streams called Cuitimba and San Pedro, suddenly, on the 28th of September, 1759, a tract of ground from three to four square miles in extent, rose up in the form of a bladder, to a height of upwards of 500 feet. Flames broke forth over a surface of more than half a square league, and the ground, as if softened by heat, could be seen swelling and sinking like an agitated sea. Vast rents opened in the earth, into which the two rivers precipitated themselves, reappearing afterwards at some distance from among little volcanic cones, called hornitos, which sprang in great numbers out of an immense torrent of boiling mud, with which the whole plain became covered. "But the most astonishing part of the whole phenomena was the opening of a chasm vomiting out fire, and red-hot stones and ashes, which accumulated so as to form a range of six large mountain masses, one of which is upwards of 1,690 feet in height above the old level, and which is now known as the volcano of Jorullo" (43).

Paragraph (46) contains a description by Sir Stamford Raffles of an eruption from Mount Tomboro, in the island of Sumbawa, which gave perceptible evidences of its existence to a distance of 1,000 miles from its centre, by tremulous motions and the report of explosions. "I have seen it computed," Herschel states, "that the quantity of ashes and lava vomited forth in this awful eruption would have formed three mountains of the size of Mont Blanc" (47).

Many other instances of upheavals and eruptions that have occurred in recent times might be collected from the writings of geologists, especially those of Lyell. It will suffice for my purpose to have mentioned the foregoing. I shall now only add that earthquakes frequently produce *subsidence*, as well as elevation, of the ground, and that there are also cases of subterraneous action, which are akin to that which produces earthquakes, but do not operate in the same fitful and violent manner. For instance, the northern gulfs, and borders of the Baltic Sea, are steadily shallowing; and the whole mass of Scandinavia, including Norway, Sweden, and Lapland, is rising out of the sea at the average rate of about two feet per century" (9).

I proceed, next, to the consideration of *the nature of the forces* by which sudden and violent changes on the earth's surface might be produced, with reference, for the present, only to changes such as those above described, which are known to have taken place in comparatively recent times. Respecting the

dynamical causes of this class of phenomena, I adopt, as I have already intimated, the theory advocated by Herschel in the before-mentioned Lecture. After giving details of many extraordinary effects attributable to earthquakes and volcanoes, he goes on to say, "The origin of such an enormous power thus occasionally exerting itself will no doubt seem very marvellous—little short, indeed, of miraculous intervention; but the mystery, after all, is not quite so great as at first it seems. We are permitted to look a little way into these great secrets of Nature; not far enough, indeed, to clear up every difficulty, but quite enough to penetrate us with admiration of that wonderful system of counterbalances and compensations; that adjustment of causes and consequences, by which, throughout all nature, evils are made to work their own cure; life to spring out of death; and renovation to tread in the steps and efface the vestiges of decay" (10). He then asserts categorically that "the key to the whole matter is to be found in the central heat of the earth" (11); and before proceeding to indicate *how* this key unlocks the mystery, he requires nothing more than that there should be granted him "a sea of liquid fire, on which we are all floating, land and sea; for the bottom of the sea will not come nearly down to the lava-level, the sea being probably nowhere more than five or six miles deep, which is far enough above that level to keep its bed from becoming red-hot" (16).

It will be seen, on referring to the preliminary argument at the beginning of Division II., that the above postulate may reasonably be granted, if, as is there maintained, the quality of rigidity is destroyed in a very large proportion of the earth's interior mass, both by pressure and by heat, so that the dynamical properties of the mass become the same as those of a *perfect* liquid. In that case the transfer of ever so small a quantity of material from one position to another on the earth's surface, will *tend* to disturb the equilibrium of the floating mass. This cause of disturbance will not, however, immediately take effect, because the viscosity and rigidity of the earth's crust will act conjointly as an opposing force; but whatever be the amount of resistance this obstacle is capable of, it has a definite limit, and must, therefore, eventually yield to the constantly increasing disturbing force due to the accumulation of transported matter, both from the detritus of mountains and cliffs, and from the mud and gravel and sand conveyed by rivers. In short, the mechanical operation and its effects may be very appropriately described in the words of Herschel, contained in the following passage:—
"It is impossible but that this increase of pressure in some places and relief in others must be very unequal in their

bearings. So that at some place or other this solid floating crust must be brought into a state of strain, and if there be a weak or a soft part, a crack will at last take place. When this happens, down goes the land on the heavy side and up on the light side. Now this is exactly what took place in the earthquake [see three pp. *ante*] which raised the Ullah Bund in Cutch" (18).

This view of the causes of earthquakes, and of elevations and subsidences of the land, accounts at the same time for volcanic eruptions, the volcano being a vent for the passage of heated and melted matter, which the elevatory pressure of the liquid below tends to throw up. It has with much probability been suggested that the reason volcanoes and the originating centres of earthquakes are almost universally on the borders of seas and oceans, is that at such positions the accumulation of transported matter, whether due to sub-aërial detritus, or to river-deposit at deltas, would attain its greatest amount. Further, as is much insisted upon in Herschel's lecture, the eruption of scorïæ and lava from the mouths of volcanoes, in consequence of the upward pressure of the fiery liquid below, is a kind of compensation for the downward transfer of material by detritus and river-deposit, so that upon the whole the quantity of solid matter above the ocean-level is likely to be pretty nearly constant.

These are all the points relating to the forces concerned in the phenomena of earthquakes and volcanoes, that I have thought it necessary to direct attention to. This antecedent consideration of the nature of those forces was required for my purpose, because I am about to propose a theory which attributes the *Deluge* to the operation of forces of the same kind, differing only in degree and in the superficial extent of their action. Also I regarded it as a matter of importance to show that the character of the forces I shall have to deal with has received countenance from the views of so eminent a philosopher as Herschel, although the supposed applicability of such forces to account for the circumstances recorded in Scripture relative to the *Deluge* is altogether an independent hypothesis, for which I alone am responsible.

The next step in Division II. of the general argument is to indicate, first, the possible origination of physical operations which might have the particular effect of producing a deluge, and then to show in what manner such operations might generate the phenomena recorded in Scripture relative to the *Noachian Deluge*. The explanations I am about to propose relative to these two points will rest on the assumption that the earth's internal heat is not a constant quantity, but susceptible of variations partaking of a sudden and violent character. I do not

profess to be able to state how such changes are produced ; but that, as matter of fact, the heat of large masses is subject occasionally to abnormal augmentation, may be inferred from what is observed of certain stars, which have been seen to blaze out for a time, and then relapse into their previous degree of brightness, or to become altogether evanescent. To account for variability in the thermal conditions of the solar system, and, inclusively, of the earth's central heat, some physicists have supposed that there are different degrees of temperature in different regions of space, and that the sun, in consequence of its ascertained proper motion, passes with its attendant planets sometimes through a hot region, and at other times through a cold one. Without entering into details which would be inappropriate in this essay, I could not give the reasons which dispose me to assent to this view ; and after all, since the destruction of the human race by a deluge must be looked upon as a special act of divine judgment, the truth may be that the primary physical cause was simply an effect of *miraculous interposition*. I shall therefore content myself with saying that the subjoined explanations rest on the hypothesis that the *Deluge was produced by physical causes, which primarily were due to a paroxysm of the earth's central heat*. We have, therefore, now to inquire in what manner the recorded phenomena of the Deluge might have been thus produced.

It is not difficult to infer, from known physical laws, what would be the general result of a sudden increment of the heat of the earth's central mass. The effect of an increase of considerable amount would in a short time become perceptible at the surfaces of seas and oceans, because it would be conveyed from their lowest parts by convection as well as by the slower process of conduction ; whereas the visible effects of the heat on the solid parts of the envelope would be transmitted towards the surface mainly by conduction. The consequence would be that from the whole extent of water-surface a rapid *evaporation* would take place, which would load the superincumbent air with so much vapour that the ordinary state of atmospheric equilibrium would be disturbed, and air and vapour together would be compelled to flow towards the continental parts, where little or no evaporation is going on. According to what has just been said, those parts and the incumbent columns of air would for a time be nearly free from the influence of the central heat, and thus the overflow would bring air saturated with vapour into contact with colder air, in consequence of which the vapour would be condensed and fall on the continents in the form of rain. (The gene-

ration of rain by this means very much resembles the well-known process, in which vapour raised by the agency of the sun's heat from the ocean-surface in the torrid zone is conveyed by the atmosphere and deposited in the temperate zones). According to our hypothesis, the downfall of rain would continue till, by the mixture of atmospheric currents and the flowing of streams of water from the rain over the land, the temperature, so far as it depended on the access of central heat, was equalized at the earth's surface, and an equilibrium established between the temperatures of the contiguous parts of the air and ocean. The evaporation would then cease. According to the narrative in Genesis, the rain ceased at the end of forty days.

But what, under these circumstances, would be the effect produced on the earth's envelope, regarded as composed of solid and watery parts, and floating on a liquid sea? It is plain that by reason of the diminution, by the evaporation, of the weight of the waters resting on the bed of the ocean, and the increase of the weight of the continents by the accession of the deluge of rain, the previously existing conditions of equilibrium would be violated, and motion of some kind must ensue, and would continue till new conditions of equilibrium were established. It will be seen that the forces which, according to this view, produce the disturbance of equilibrium, act analogously to those which came under consideration in the foregoing theory of *volcanoes* and *earthquakes*; and from the results observed to take place under the *actual* physical conditions of these phenomena, we may infer what might be the consequences of an analogous action under the hypothetical conditions of the present theory. For instance, we may conclude analogically from facts such as those stated in pp. 73 and 74, that there might be elevations and subsidences of the earth's crust, the parts which receive an accession of weight being depressed, and those from which weight is removed being elevated. The application of this principle to our problem leads to a very remarkable result, which it will now be proper to point out.

The diminution of pressure at the bottom of the ocean, in consequence of the abstraction of fluid matter by the evaporation at the surface, will give rise to an excess of upward pressure of the liquid mass below, and on the other hand, the increment of the aggregate weight of the continents by the fall of rain will produce an excess of downward pressure. So long as the solid parts of the envelope retain their form, these two pressures only put it into a state of *strain*. But because

the strain will continually increase as the evaporation proceeds, sooner or later the envelope, according to the degree of its plasticity or rigidity, will yield, or actually be broken. In either case the bed of the ocean would rise and the continents correspondingly sink, and this movement will go on increasingly so long as the disturbing cause is operative. It might thus very well happen that the waters of seas and oceans would be caused to rise up as if from fountains situated at their bottoms, and to flow over the adjoining parts of the continents, increasing thereby the effect of the deluge of rain. This may be the explanation of the statement in Scripture that "the fountains of the great deep were broken open."

It is evident that the sinking of continents and mountains below the surface of the water would to appearance be the same as the rise of the water above them, and might by a mere spectator be described in the latter terms. We now know enough of terrestrial conditions to be sure that the mountains, if they remained fixed, could not be "covered fifteen cubits upward" by the waters of either land or sea; but our theory, if true, enables us to interpret the language of Scripture as indicating, not the absolute height of the waters, but the height *relative* to the mountains, by whatever means that relative height was produced. It is the part of physical science to ascertain such means: Scripture only states the fact as seen.

From known mechanical principles we may conclude that the sinking of continents and mountains would not stop when the operating causes—the evaporation and rain—ceased, but, by reason of the momentum acquired, would go on for a definite time, till by slow degrees the maximum depth was reached, after which there would be a return movement upwards. According to this interpretation of the Scriptural account, this upward oscillation brought the mountain-tops into view two hundred and twenty-four days after the commencement of the rain, or one hundred and eighty-four days after its cessation.

Although Scripture points only to a single downward and a single upward movement, it is known from mechanical principles that these initial oscillations would be followed by others of smaller magnitude; and we may presume that the earth's interior and crust returned to a condition of equilibrium and fixity by a succession of constantly-decreasing oscillations. The interval during which this took place would be one of comparative quietude, and may be supposed to correspond to that in which the raven and the dove were sent out of the ark, and the dove returned with a plucked olive-leaf in her mouth.

The only remaining statement in the biblical narrative which

the theory may be expected to account for is that relating to the destruction of animal life. Assuming that sufficient reasons have been given by the theory for concluding that by the combined effects of copious rain, overflow of oceans, and oscillations of the earth's crust, large tracts of the surface were for many days completely submerged, the destruction of living creatures, whether "man," or "cattle and beast," or "fowl," or "reptile" (Gen. vii. 21), frequenting those districts, would be a necessary consequence. I cannot, however, on the same grounds assert that there would be *no* localities to which animals might flee for safety; and the Scriptural account, as I have already intimated (p. 70), does not exclude means of continuing animal life after the Deluge, which at the time could not be within human cognizance. To this point I shall have to recur in the course of the third division of the subject, which I am now prepared to enter upon.

III. In this the concluding division of the essay I propose to inquire whether facts of a certain class, the evidence for which is exclusively drawn from the observations and descriptions of geologists, can be referred to the same physical causation as that which is proposed in Division II. to account theoretically for the statements relative to the Deluge which are cited and commented upon in Division I. If so, those facts may be appealed to in corroboration of the truth of the biblical record.

It will be proper, before commencing this inquiry, to introduce a few general remarks. There are two distinct processes of investigation applicable to physical questions: either it may be proposed to deduce, from the quality and circumstances of observed facts, the kind and degree of the agency to which they may be attributed, or the purpose of the inquiry may be to account for observed facts by a physical theory of causation which rests on hypotheses, the truth of which is established in proportion as the theory explains the facts. The second method is more comprehensive than the other, inasmuch as, if complete, it should be capable of accounting for the amount and the laws of action, arrived at deductively by the latter. The second method is that which I have followed in this essay; the first is the one most generally adopted in treatises on geology. It may here be remarked, that the attempts made by geologists to derive from facts of observation the character of the physical operations to which they may be due, exhibit a great diversity of views. Some, of whom Lyell may be considered the representative, are unwilling to admit the existence in geological times of any causation differing in kind, or much in degree, from what is seen to be going on at the present time; while

others allow of the occasional occurrence of violent perturbations, affecting the condition of sea and land, and originating in unknown and unobservable causes. According as the one or the other of these views is taken, the chronology of geology will be widely different. The system of Lyell demands, in fact, the concession of ages of inconceivable duration to account for the changes in the earth and its inhabitants which geology has revealed.

I here take occasion to advert to the paper by Mr. Pattison, entitled, "On the Chronology of Recent Geology" (read before the Institute on March 1, 1875), for the purpose of indicating the relation in which his treatment of that subject stands to the views maintained in the present paper. His method of discussing the chronological question is that which I have above called "deductive," as distinguished from the theoretical method which I have employed. He has, in fact, adopted the same deductive course of reasoning, and argued from the same premises, as Lyell, Dawkins, and other geologists, but, in my opinion, has, by sounder and more consistent arguments, successfully combated the principles of their calculation of long geological periods. I am able to give my assent to the conclusions Mr. Pattison has arrived at on geological chronology, both because they are remarkably accordant with those I shall come to by a different route in the sequel of this essay, and because I cannot but regard this coincidence of the results from the two processes of reasoning as confirmatory of the truth of both. I revert now to what is my special object, that of accounting for observed facts of geology by the physical theory already applied in explanation of the recorded facts of the Deluge.

It is unnecessary for my purpose to enter into details respecting the evidences that have been discovered in modern times, of habitation of the earth by man during a long interval antecedent to the earliest date of profane history, this subject having been so well discussed by Sir John Lubbock, in his *Pre-historic Times* (3rd ed. 1872). One point, however, requires to be specially noticed; namely, the marked difference, as respects the character of the evidence, between the portions of that interval which have been named "neolithic" and "palæolithic." Not only the implements of the neolithic men exhibit more art and polish than those of the palæolithic, the evidences also of habitation which they left behind, such as the Danish shell-mounds and the lake-dwellings of Switzerland, are found to be *in situ*, whereas the human remains and implements of the palæolithic age, having been discovered almost exclusively in "river-drift" and "caves,"

appear to have been transported from their original localities by the agency of currents of water. Respecting the difference in the character of the implements, there will be occasion to make some remarks subsequently; but as to the other mark of distinction between the palæolithic and neolithic ages, it may, I think, be safely assumed that the transition from the one to the other was signalized by a sudden cataclysm brought on by some violent interruption of the ordinary terrestrial conditions. When this happened we cannot gather, with any approach to certainty, from geological data; and if we might suppose the cataclysm to be identical with the Deluge of Scripture, the exact date would still be uncertain, because chronologies derived from the two authenticated forms of Scripture, the Hebrew and the Septuagint, differ as to the date of the Flood by eight centuries. If we take the earliest date assigned by Biblical chronologists, we cannot infer from geology that the interval between the supposed cataclysm and the limit of profane history is unduly lengthened; nor, if we take the latest date, that the interval is unduly shortened. It is, however, probable, when account is taken of the circumstance that the tradition of a deluge was handed down to historic times among the ancient Greeks, and generally in the East, that neither date would be very far wrong. On these grounds I make the hypothesis that the separation of the neolithic age from the palæolithic, as indicated by geological phenomena, was caused by a cataclysm identical with the Deluge of Scripture, and shall next proceed to substantiate this view by arguments.

One of the first lessons in geology that I learnt by attending the lectures of the late Professor Sedgwick was, that parts of the Jura chain of mountains were capped by *tertiary* strata, and that, consequently, they were raised up subsequently to the deposition of those strata; how much later it is not possible to say. These mountains flank the Alps, with a deep intervening valley, and might apparently have been pushed aside by the elevation of the Alpine range at a still later date. In short there is reason, from geological facts, to conclude that the elevation of mountain-ranges generally is to be regarded as the most recent of large geological changes. The following extract from a Lecture by Professor Owen on extinct animals, published in the *Standard* of August 3, 1874, is adduced in confirmation of this assertion.

“In the north of India, during the progress of the Jumna canal works, sandstone was being blasted in the foot hills of the Himalaya mountains at a point 1,000 feet above the present Indian Ocean. A fossil elephant was dug out. Every bit of

the original ivory and bony substance had passed away particle by particle, and had been replaced by particles of stone. There was no doubt that the whole Himalayan chain—the highest in the world, had been raised since that old elephant had lived; because at greater heights than this Indian quarry, not only fossil elephants, but hippopotami,—which required lakes and rivers to live in—had been found; also fossil giraffes. Similar evidence had been procured in regard to the Alps, the Pyrenees, and the Andes, all of which had been upheaved at what, in the history of geological changes, was a comparatively recent period.”

This account of the condition in which the fossilized elephant was found is very remarkable and instructive, as seeming to prove that this animal was suddenly enveloped by matter in the state of hot lava flowing from the mountain.

In a Manual of Geology by the Rev. T. G. Bonney, published by the Society for Promoting Christian Knowledge, the opinion is expressed that “mountain-ranges have been raised like gigantic billows, two of the largest, the Alps and Himalayas, being *comparatively modern*” (p. 41).

If for the reasons above given we may conclude that the upheavals of the principal mountain-ranges were of so recent a date that they might be contemporaneous with the Deluge of Scripture, and be referable to the same physical causation, it will be necessary to inquire whether the forces to which, according to our theory, the Deluge may be attributed, were adequate to the production of these effects also. The original and remote cause of the Deluge, we have argued, was an abnormal increment of the earth's central heat; the immediate cause, a disturbance of the equilibrium of the earth's crust by the abstraction of water from the sea by evaporation, and the descent of the same on the land in the form of rain. To give some means of estimating the weight of water which might be thus taken up from the oceans and deposited on the continents, it may be stated that every inch of rain falling upon an acre of ground is in measure 22,622 gallons, which is equivalent in weight to one hundred tons very nearly, and that in instances of rain-falls which occurred at Geneva, Perth, and Naples, the rates were found by measurement to be respectively two inches, one inch and three-fifths, and one inch and four-fifths, in an hour (Report of Transactions of Sections of the British Association, 1840, p. 44). Taking the rate of two inches per hour, the weight of the rain-fall in one hour on the area of England and Wales, which is known to be about $37\frac{1}{2}$ millions of acres, would amount to very little short of seventy-five hundred millions of tons.

Now supposing the mean rate of descent of the rain in the Deluge to have been only one inch per hour, which is proved by the observations just mentioned to be possible, we may judge by the result of the foregoing calculation how enormous would be the weight of the water transferred from one locality to another by rain falling at this rate on the continents and islands generally, and continuing without ceasing forty days and forty nights. This transfer of weight would put the earth's crust into a state of *strain*, and tend continually to *deform* it, at the same time that plasticity would probably be communicated to it by the great quantity of heat which, as is known from the theory of the mechanical equivalence of heat, would be developed by such mechanical conditions. When the effect of the simultaneous flow of the seas over the land (the cause of which has already been indicated) is also taken into account, it may well be supposed that the operation of the two causes would eventually produce *ruptures* at certain parts of the crust. Through the cracks thus opened the interior liquid would be ejected with great momentum, according to the resistance overcome, and by this means the ejected matter might be made to form mountain-ridges. The force of ejection would be greatly increased by the development of heat which would accompany the movements produced by this perturbing action. From the same cause the parts of the crust distant from the places of rupture might be put into a plastic, or semi-liquid state, and be susceptible of undulatory movements. When the pent-up energies have exhausted themselves in producing new conditions of equilibrium of the floating crust, the developed heat will be quickly dissipated; and supposing the primary cause of the disturbance to decline at the same time, or to be withdrawn, the solid parts will resume their proper rigidity, and the final result will be seen in that surface-contour which, in addition to the more prominent features of peaks and mountain-ridges, exhibits the minor inequalities of hills and dales and terraces, partaking very much (so, at least, it seems to me) of the characteristic forms of *waves* and *breakers*.

Since, according to the foregoing argument, the hypothetical forces which accounted for the phenomena of the Deluge, as described in Genesis, account also for upheavals of mountain-chains and concomitant circumstances relative to the earth's surface, and since geological facts show that these upheavals took place at a comparatively recent date, not inconsistent with that assigned by Scripture chronology to the Deluge, the truth of the theory, and the reality of the phenomena it explains, may be considered to receive confirmation. The Deluge and

the elevation of mountain-chains would thus appear to be related and simultaneous events, the epoch of which might be taken to be the end of the quaternary period, or that which Lyell calls Pleistocene.

In recent discussions respecting the "Antiquity of Man," much stress has been laid on a supposed "Glacial Period," the existence of which has been inferred mainly from the evidences of ancient glacier action and moraines which have been discovered in various districts of islands and continents. These phenomena give plain proof that the action of the glaciers must have gone on through long ages; and if the whole period through which it lasted was subsequent to the first existence of man on the earth, his antiquity will extend backwards to an extremely remote epoch. But as to this question, the theory I am expounding gives the following very different answer.

By considering the character of the forces to which the theory ascribes the disturbance of the earth's envelope, it will be seen that the action is as much downwards as upwards; and hence we may perceive a reason why, simultaneously with any elevation of large masses, as mountain-chains, there must be corresponding depressions, and probably such that the quantity of matter above the ocean-level would not be greatly altered by the disturbance. The fact might, therefore, be, that those localities which give evidence of the prior existence of glaciers and moraines (as, for instance, districts of North Wales) were formerly much elevated above their present mean level, and at that time, as the Alps do now, generated glaciers and moraines. The process might have gone on for ages, till, by the catastrophe of the Deluge and the accompanying convulsions, the glaciers were brought to a lower level, and were thus caused to disappear, after which there would only remain the evidences of their existence, which are visible at the present day.

Lyell, in his *Students' Elements of Geology*, p. 159, makes the following statement:—"In Europe several quadrupeds of living, as well as extinct species, were common to pre-glacial and post-glacial times. In like manner there is reason to suppose that in North America much of the ancient mammalian fauna, together with nearly all the invertebrata, lived through the ages of intense cold." These assertions, which are hardly reconcilable with the views entertained by the advocates of long-period geological chronology respecting the duration and effects of the glacial period, are quite consistent with the foregoing inferences from the present theory, which do not allow of a glacial period which could have any influence on the extinction of species of animals. The evidence for such a period

has been drawn from phenomena which, according to the view I take, belong to *depressed* mountainous heights, and consequently do not prove the *general* prevalence of intense cold at any period, but only the prevalence of cold at those heights *before* the mountains were depressed. It seems that the localities which have furnished this evidence are districts of limited area, but widely dispersed over the earth's surface; as, in fact, might be expected, if their origin be such as we have supposed. I do not think that there are causes of a *cosmical* order which could account for the prevalence, during a long period, of a great degree of cold. In short, I am not prepared to admit the existence of a glacial period which had any effect on the succession of mammalian fauna, or bears in any way on the question of the antiquity of man.

It has been urged that as there is geological evidence (which I fully admit) that man was contemporary with the Mammoth, and as the Mammoth has long been an extinct species, the antiquity of man must be correspondingly great, because species do not become extinct except by a long course of time. The theory I am maintaining meets this argument in the following manner. It has already been remarked that it is not a necessary consequence of the physical circumstances of the Deluge which have been deduced from the theory that all animal existence on the face of the earth would thereby be destroyed. There might be large areas which would be completely submerged, in the course of the vertical oscillations, during an interval sufficient to cause the destruction of all animals resident upon them; but at the same time, in conformity with a usual law of oscillations, there might be *nodal* spaces free enough from oscillations and inundation to allow of their proper inhabitants remaining alive upon them, and others from other quarters fleeing to them for safety. Under these circumstances there would probably be survivors from a certain number, but not from *all* the different species existing before the catastrophe. The fauna of different continents do not comprise the same classes of individuals, and it is known that the area of habitation by a particular species is in many instances of limited extent. "Mr. Boyd Dawkins has shown that out of forty-eight species [of mammalian fauna] living in the Post-Glacial, or River-Drift period, only thirty-one were able to live on into the Pre-historic or Surface Stone period." (Evans's *Ancient Stone Implements*, p. 618.) It might, therefore, have happened that certain species, by the submergence of the parts on which they lived, became wholly extinct. This would be an event of the same kind as that recorded in Scripture respecting the destruction of the human

race by the Flood, and might, if established on geological grounds, be adduced in corroboration of that particular in the Biblical narrative. According to this argument, the Mammoth species may be supposed to have become extinct by the Deluge, and from its contemporaneity with man, its comparatively recent sojourn on the earth ought to be inferred rather than man's antiquity.

Geologists have acknowledged that it is difficult to account for the fact that remains of animals have been found in localities far removed from their usual places of habitation, and where they could not actually have lived: for instance, bones of hippopotami have been dug up in districts where there are no lakes or rivers, and in northern latitudes far above the present limits of their habitation; and remains of the reindeer have been met with in abundance in spots much more southward than any they ever reach now. Lyell proposes to account for these circumstances by a theory of the migratory habits of the animals. (*Antiquity of Man*, pp. 208, 209.) It has occurred to me, that such a transfer from their usual localities might have resulted from the impulses of the vast waves of inundation that must have swept over the earth's surface at the time of the Deluge, which would be likely to transport animal remains in various directions to spots more or less distant.

With respect to the upper-level gravels and low-level gravels on the borders of the Somme, both containing flint implements, it has been thought that the interval between the deposition of the two gravels is to be measured by the time required for excavating the valleys to their present depth by river-action. It is, however, stated that neither the gravels nor the implements at the two elevations exhibit any considerable differences, and it has even been a matter of discussion among geologists which of the gravels is the most ancient. (See Lyell, *Antiq. of Man*, pp. 176, 177.) This being the case, the theory I have adopted leads to the supposition that the difference of level was caused by a local upheaval occurring at the Deluge epoch, when the features of the earth's surface were in so many respects undergoing change. The same kind of local disturbance seems to account for *caves* being situated at an elevation considerably above the position they must have at first occupied, and perhaps, even for their formation and interior shape, inasmuch as "engulfed rivers" have occasionally been found in them. The slow process of river-erosion would certainly not account for such facts as these.

The transport of Alpine boulders, or erratics, to a distance of fifty miles across the valley of Switzerland, "one of the

widest and deepest in the world," is an astonishing and perplexing fact, to account for which, Lyell (*ib.*, p. 340) conceives that "they might have been transferred by floating ice to the Jura, at the time when the greater part of that chain, and the whole of the Swiss valley to the south was under the sea." The detachment and descent of these large boulders at the epoch of the elevation of the Alps, or rather when the mass was in course of elevation and passing from the liquid to the rigid state, is not difficult to conceive of; but I should be disposed to ascribe their transport to the action of waves and currents while the Deluge was subsiding, when, as Lyell supposes, the Jura chain and Swiss valley had not yet been raised above the level of the water. I remember that Hopkins, an accomplished mathematician and geologist, was accustomed to attribute an enormous power of transferring boulders to the agency of currents of water.

The circumstance that *marine* shells have been found in *caves*, and in some instances in caves not near the sea, seems to require explanation. In a cave at Mentone, fifty-four marine and eleven terrestrial species were collected; and again, from the cave of Bruniquel were obtained "two classes of shells, one characteristic of the Atlantic and the other of the Mediterranean." (Lyell, *ib.*, pp. 142 and 144.) Lyell inclines to the opinion that these shells "imply that the natives of Aveyron had easy access to both sea-coasts, from whence they returned to mingle the shells of the Atlantic and Mediterranean in their cave-dwellings." Might not the overflow of the ocean on adjoining lands, which, according to the theory I have advanced, took place at the Deluge, account for marine shells being found in caves, and in particular, for Atlantic and Mediterranean shells being found together in the cave of Bruniquel, which is situated about midway between the seas?

The *contents* of caves give evidence by their character that they were driven by running water into openings and passages leading to the cavernous interiors, inasmuch as they consist for the most part of loose materials,—gravel, sand, and bones of animals,—which might be borne by streams, or torrents, along the valleys and channels of rivers. The caves generally have an upper opening into which the currents and the materials carried by them would enter, as well as a lower aperture usually on the face of a cliff or hill. The stalagmite floor would be formed by droppings when the immediate action of the water had ceased. The hypothesis of a deluge which accounts for the caves receiving their contents in this manner, also gives a reasonable explanation of the great variety of the animal

remains, and the dismembered and disorderly state in which they are almost always found. The encroaching flood might drive many animals of different kinds to the same spot, a common calamity producing strange companionship, and after the waters had overwhelmed them, and exposure to the elements had decayed the soft parts of the carcasses, the bones might be carried by the currents of the retiring deluge along river-channels into the sea, or into any receptacles, such as caves, that might be suitably situated for receiving them. Lyell states that "from one fissure, called Bosco's Den, no less than one thousand antlers of the reindeer were extracted," and it was estimated that "several hundred more still remained in the bone-earth of the same rent." "Among the other bones, which were not numerous, were those of the cave-bear, wolf, fox, ox, stag, and field-mouse." (*Antiq. of Man*, p. 110.) It would seem that in this instance the collection of animals overwhelmed by the flood consisted principally of a herd of reindeer.

The supposition which has been made that the animals whose bones are found in caves were brought there by hyænas is wholly untenable, considering the number, size, and variety of the remains, and that the bones of hyænas themselves are mixed up indiscriminately with the rest. It is true, however, that subsequently to the palæolithic age the caves were invaded and their contents disturbed by hyænas, the bones having evidently been gnawed and broken by these animals for the sake of food, and in some instances *outside* the cave. (See Lubbock, *Pre-historic Times*, p. 21.) The bones appear also to have been cut and broken by aboriginal hunters of the neolithic period, indications having been found that the caves were resorted to in that age both for habitation and for burial.

Many other instances of the explanation of geological facts by the proposed dynamical theory might be adduced in confirmation of its truth. These will suffice for the inferences I propose to draw finally relative to the explanation on the principles of physical science of the Biblical account of the Deluge. At present I shall only remark that these theoretical explanations do not agree with those of geologists who have treated the same questions deductively, chiefly in respect to the effects of long periods of glacier-action, and of erosion by seas and rivers, and inferences thereon depending as to the antiquity of man. The divergence of the explanations evidently arises from the comprehension by the theory, within a brief space of time, of violent agencies and their results, whilst the other view attributes results to slow action extending over unlimited ages. There are, however, certain points of agree-

ment between inferences by the two methods as to the *character* of the immediate causes of geological phenomena, which, as contributing to the completeness of my argument, I shall now point out.

“The Glacial epoch, though for the most part anterior to the valley-drifts and cave-deposits of the Palæolithic age, was still so closely connected with that period that we cannot easily draw a line of demarcation between them.” (Lyell, *Principles of Geology*, vol. i. p. 192, 11th ed.) “There were also great changes in the form of the earth’s crust, many movements of upheaval and subsidence, and many conversions of sea into land, and land into sea, during the Glacial epoch.” (*Ibid.*, p. 196.) These statements are reconcilable with our theory if it be understood that the Glacial period was synchronous with the interval during which the localities which show marks of glacier-action were much more elevated than they are at present, and that it extended to the epoch of the oscillatory movements (mentioned in the above extract), which issued in bringing those localities to their present level. The period of the valley-drifts and deposits was closely connected with this Glacial period as constituting the termination of it, for which reason also no definite line of demarcation can be drawn between them.

“In Wales the rocks had been exposed to glacial polishing and friction before they sank.” “The evidence of the sojourn of the Welsh mountains beneath the waters of the sea is not deficient in that complete demonstration which the presence of marine shells affords.” (*Antiq. of Man*, p. 313.) Such submergence might be produced by the first oscillatory movement, which, according to the theory, would be *downward*. Marine shells have been discovered “in North Wales, in drift elevated more than 1,300 feet above the level of the sea.” (*Ibid.*, p. 313.)

“Professor Ramsay infers, from the position of the stratified drifts of the Glacial period in North Wales, that the full extent of the vertical movement which brought about first the submergence, and then the re-emergence of the land, exceeded 2,000 feet.” (*Principles of Geology*, vol. i. p. 193.)

Referring to geological observations made by Professor Geikie in Scotland, Lyell speaks of them as “requiring for their explanation several oscillations of level and successive submergences and re-elevations of the land.” (*Antiq. of Man*, p. 295.)

“There can be no doubt that the physical geography of Europe has changed wonderfully since the bones of men and mammoths, hyænas and rhinoceroses, were washed pell-mell into the cave of Engis.” (Huxley, *Man’s Place in Nature*, p. 120.)

As I conceive, the great change was effected *then*, and Nature's operations have gone on since in comparative quietness.

Murchison arrived at the conclusion that the fossil mammalia at Folkstone were destroyed "by violent oscillations of the land, and were swept by currents of water from their feeding-places into the hollows where we now find them." (*Quart. Journ. Geol. Soc.*, vol. vii. p. 386.) Hopkins, in reviewing the question of the Drift, agrees with Murchison in supposing that the Wealden area has been traversed by waves of translation, and in attributing to such agencies much of the drift phenomena. (*Ibid.* vol. viii. p. li.) See in the *Philosophical Transactions*, vol. 154, pp. 250 and 286, the views of Mr. Prestwich, who does not admit purely cataclysmic action.

These instances may be enough to show that geologists have been led by observation and discussion of facts, apart from any *à priori* dynamical theory, to conclusions agreeing in very important points with results derivable from the theory which I have proposed in this essay. That theory may consequently be considered to be capable of embracing in its explanations the classes of facts from which those conclusions of the geologists were deduced, and on that account to be entitled to additional confidence.

Before concluding, it will be right to advert to an argument which might be drawn from geological facts against certain statements in the book of Genesis, indirectly connected with the account of the Deluge. According to our theory, palæolithic men were contemporaries of the antediluvians. Now, it is stated in Gen. ii. 17—21, that the descendants of Cain in the *sixth* generation had arrived at a degree of civilization and art of which there is no trace in the palæolithic race, so far as may be judged from their implements and mode of life with which geology has made us acquainted, which prove, in fact, that they were mere savages; on the other hand it is to be said that this character of the inhabitants of the parts which geologists have scrutinized may be owing to the distance of those parts from the centres of aggregation and civilization of the antediluvians, which centres may all have been submerged, in fulfilment of the declared purpose of the Deluge, and possibly may have remained submerged, like the sunken forests near the coast of Norfolk. Ethnological considerations seem to point to the conclusion that the earth was re-peopled by Noah and his sons, no other designations of the large divisions of the human family having been so generally accepted by ethnologists as those derived from Shem, Ham, and Japhet. This family must have handed down to post-

diluvians the knowledge of art and the skill they had attained to before the Flood, which they gave proof of in the building of an ark; for otherwise the science and civilization which eastern nations were in possession of at no long interval after the Flood can hardly be accounted for. It is true that we learn from geology that the neolithic postdiluvians were also savages, who gained their livelihood for the most part by hunting; but their implements exhibit a much higher amount of art and polish than those of their palæolithic predecessors (in consequence, it may be, of the influence of advancement in knowledge and art in the new centres of civilization), and, in fact, admit of favourable comparison with implements that have been used in this nineteenth century in islands of the Pacific by *our* contemporaries. For these reasons it cannot be affirmed that the revelations of geology respecting the degree and the stages of art among the Palæolithic and Neolithic races are contradictory to the statements in Gen. ii. 17—21.

From the whole preceding argument, I draw the following conclusion. Since it has been shown in Division III. of the argument, that many geological facts and phenomena indicative of the violent action, *at a certain epoch*, of a widely extended cataclysm, may be accounted for by a dynamical theory of physical causation, which, at the same time, as shown in Division II., explains the recorded facts of the Noachian Deluge, being, in fact, suggested by them, it is reasonable to conclude that the cataclysm of geology and the Deluge of Scripture are identical events (only *one* such having befallen the human race), and that so far as the reality of the former is established by physical science, the reality of the other may be inclusively inferred. Also, it follows, as a corollary from the general argument, that geological science does not actually point either to a deluge-epoch, or an antiquity of man, that can be shown to be inconsistent with historical statements in the book of Genesis.*

* Before this paper appears in the Journal I beg permission to add in a note, that on reconsideration of the arguments in Section III., from which I infer that the largest of existing mountain-ranges were elevated at the epoch of the Deluge, I have come to the conclusion that the contemporaneous changes in the contours and positions of continents and islands, caused by the disruption of the earth's crust and its floating on the interior liquid mass, might have been of much greater intensity and extent than, at first, I ventured to surmise, and might account for the occurrence, within a comparatively brief interval, of phenomena which have been supposed to extend over periods of incalculable length. For instance, the discovery of remains of arctic fauna in temperate regions, and the reverse phenomenon, might be explained by a transfer of the floating *habitats* of the animals from, one position to another on the earth's surface; and the existence in caves (as in Kent's cavern) of

The CHAIRMAN.—I am sure that all will join with me in conveying the thanks of the Institute to Professor Challis for his very valuable paper, and to the Rev. T. M. Gorman for having so kindly read it.

The HON. SECRETARY.—Letters have been received from various members, who are unable to be present here to-night, expressing their approval of Professor Challis's paper; and one from General Boileau, F.R.S., commends it as a really satisfactory paper upon the subject.

Rev. H. St. JOHN READE.—Allow me to preface my remarks by relating an anecdote. Not long ago, a schoolmaster of my acquaintance was about to give a lesson on Genesis vii. and viii. He consulted Smith's Dictionary of the Bible, and, being struck with the arguments in favour of a partial deluge, and not seeing its inconsistency with an orthodox belief in the inspiration of the Bible, he laid before his pupils both theories—the universal theory and the partial theory,—and, without pledging himself to either, stated the principal arguments for each. One of the boys wrote home to his father to say that he had been told by one of the masters that the Deluge was not universal. His father wrote to one of the governors to say that the boy had been taught that the Bible had not been inspired; and the council recommended the master to resign his position at the end of the term. That schoolmaster was not myself, but I was his friend, and I am still a schoolmaster, and my boys are taught the elements of science and read manua of geology. I come to this Society to learn how best to teach scientific knowledge in conjunction with Bible History; and I feel sure that the reason why so many parish clergymen have become members is, that they may not denounce as false in the church what they admit to be true in the lecture-room; and I for one shall welcome any hints upon this point. The education of the young is a most important matter in every respect, and this is the question which touches it most nearly in the present day. As things are now, we rest the whole moral teaching of our boys on Bible History; and it is absolutely necessary to find a plain, straightforward interpretation of the Scripture narratives, which shall leave those narratives manifestly consistent with the ultimate standards of what is right and true—with the demonstrable conclusions of science, no less than with the good of mankind in general and with the best aspirations of honest hearts. If this cannot be done, we must alter our system altogether. If you puzzle a boy about the plain meaning of a familiar Scripture narrative, he will puzzle himself about the meaning of a plain Scripture precept. When his faith in the narrative totters, his faith in morality will totter also.

Rev. GEORGE HENSLow.—In any remarks I may make I do not propose to enter upon any consideration of the subject of inspiration; but to deal with the fact of the Deluge as recorded in Genesis, as being such as falls

two layers, separated but in succession, containing animal remains of the same classes, and in large proportion of *the same species*, might be due to the earth's surface being swept over by successive waves of the Deluge consequent upon repeated oscillations of the crust (*see p. 79*).

within the scope of our endeavours to explain it by a purely physical interpretation. With regard to the origin of the account in Genesis, I believe Mr. George Smith's remarkable discoveries in the libraries of the Assyrian kings may throw some light upon it. I will argue on the subject apart from the question of inspiration; for the object of the paper now before us is to introduce physical causes—at least, in part—to account for what we read in the Biblical narrative. It is a curious fact that geologists seem now inclined to adopt somewhat more extensively, the theory of fire instead of that of water, as a mechanical agent, though it is scarcely probable that we shall have the old battle fought over again between the Plutonists and Neptunists. There are the theories of Mr. Belt, however, and of Mr. Croll and others, concerning the glacial epoch; while the first of these endeavours to account, also, for the Deluge by means of melting ice. Thus we have two exactly opposite causes suggested to account for the same phenomenon; and it is for those who take either side to accept the theory which accords best with their own views. With regard to the primary or fundamental cause of the Deluge, Professor Challis proposes to begin with what—so far as I understand it—the facts do not warrant; and that is, an increased heat in the centre of the earth. If he introduces such a physical cause, the question may be asked, Where are you to stop? or where are you to bring in miraculous agency, and where do you limit purely physical causes? He looks to physical causes as far as he can, and beyond that to miraculous agencies; but why should he assume the latter just because at a certain point the causes cannot be explained, but which, by aid of more extended knowledge, would probably prove to be purely natural as well. He ought to show why some causes are physical and others miraculous. Now, granting his supposition, we may observe that the results due to his supposed igneous cause are quite as easily explained by aid of the phenomena of the glacial epoch as well. He compares the earth to a sort of bubble. The central heat causes the upheaval of the sea-bottom, which in turn upheaves the water, and then the evaporation resulting from increased heat, produces torrents of rain. But regarding the same phenomenon from the glacial point of view, the exposure of a certain area of the sea-bottom is accounted for in a totally different way, even to its being *thrust up*, though not by the expansive force of heat from below. Similarly with regard to rain: there is strong evidence of a great "pluvial period"—referred to by Mr. Tylor the other day—subsequent to the glacial period, when the vapour, instead of condensing as snow to increase the ice-caps, came down as rain. Thus we have two phenomena—the exposure of a certain portion of the now submarine area (by the removal of a large body of water by evaporation and its subsequent condensation as ice at the polar regions), as well as a great pluvial period, and both arrived at from totally opposite sources. Professor Challis alludes to the origin of mountains as caused by molten matter bursting through and forming their substance; whereas it is well known that it is only volcanoes that are constructed of ejected matter, and that, too, without any upheaval of their

underlying strata whatever. A volcano is nothing more than matter ejected through a crack. That process of formation cannot be applied to mountain-ranges, which are not at all like volcanoes. They are due to the secular refrigeration of the earth's surface. The superficial crust, by shrinking, must yield along the weakest lines, and so becomes crumpled. It is these crumplings (so to say) which produce mountain-ranges. With regard to the separation of the Palæolithic and Neolithic periods by a certain cataclysm, I do not think the evidence is at present sufficient to warrant it, though there may be some, to a slight extent, which might countenance it. Thus, when we consider the enormous range of the Mammoth (*Elephas primigenius*) throughout Siberia, Northern America, and Europe as far south as Rome, and find that it had become extinct in the Neolithic period, it does look as if they had been swept off by some wide-spreading cause, and which probably was the sinking of the land throughout the whole of these northern areas. In Kent's cavern, at Torquay, there is a fact of some importance bearing upon this; namely, a broken-up mass of gravel with remains of animals intermediate between the earliest deposit containing bears, with excessively rude flint implements, and later deposits with less rude weapons, though *still* of the Palæolithic age, not without bone implements, including an exquisite needle, and delicately constructed weapons,* while the associated flint implements are made from "flakes," and are not merely the flintstone itself which was used, as in the earlier and lowest deposit of the cave. Now this breaking up of older materials between the different deposits seems to point to some violent physical action, which may have, as it were, separated the times; but still we must not forget the whole of the period is palæolithic as represented in Kent's cavern. With regard to Mr. Belt's theory, I do not think Professor Challis does justice to the glacial epoch, and what was then accomplished in nature; whereas many modern geologists lay great stress upon the forces which were in activity at that important period. There is abundant evidence of ice having extended southwards to the 50th parallel of latitude in America, and to about the 40th in Europe; but Mr. Belt says he discovered proof of glacial action in tropical America down to 2,000 feet above the level of the sea. It is imagined by some that that was the time when the earth's orbit was at its greatest eccentricity, and that "glacial periods" alternated at each pole; but Mr. Belt combats that view, and thinks that they existed contemporaneously; so that there was, as now, though to a less degree, an enormous accumulation of ice at both poles simultaneously; and the cause he suggests, and which appears to be the one most generally favoured by geologists, viz., a greater inclination of the earth's axis to the ecliptic. If now, as is probable, the earth's crust be somewhat elastic, the stupendous pressure at the poles would cause the equatorial region to rise, so that there

* See Mr. Whitley's letter at the commencement of discussion on Mr. Pattison's paper, controverting some of these statements in regard to the implements.—E.D.

would be two causes conjointly conspiring to account for the Polynesian continent, and an extension of Central America (eastward), beyond the West Indian isles ; perhaps thus realizing the famed Atlantic isle. A subsequent change in the inclination of the axis, on the melting of the ice-caps taking place, there would be a tendency to restore the equilibrium as it was at first ; the equatorial region would sink, and the sea would rise ; and as the centre of gravity shifted under these circumstances, the sea would overflow many low-lying countries ; so that there would be local effects of inundation at different places, more or less, *all over the world*. In support of this theory, Mr. Belt alludes to Easter Island, in the south-east Pacific Ocean, a small island, but in which are gigantic idols quite out of keeping with the extent of land and the existing population, but which, if forming the summit of a hill, or low mountain overlooking a vastly extended plain, then their position and character is comprehensible. Every nation has some account of a deluge, and Mr. Belt's theory seems, at all events, to be in harmony with the facts of a universal inundation. You will therefore see that in the glacial phenomena there are results just the same as Professor Challis has deduced from an assumed increase in subterranean heat ; but the advantages of the glacial theory are that you have evidence of an enormous abstraction of water from the sea, and then a subsequent return, and which could not be effected without great disturbance in the distribution of land and sea. A very good account of these theories will be found in the address of the President of the Geological Association for the present year.

REV. W. B. GALLOWAY.—I am very glad to have heard Mr. Henslow's remarks, and to have received from him the information, that a change in the earth's axis is now regarded as a probable cause of the Deluge by some geologists, because I brought it forward myself some time ago, and some points referred to to-night appear to me to require an allusion to some of the particulars which I then brought forward. In the Book of Job there is a cause assigned for the shaking of the wicked out of the earth, and that cause is a change in the earth's axis. The passage in Job runs : "Hast thou commanded the morning since thy days, and caused the day-spring to know his place, that it might take hold of the ends of the earth, that the wicked might be shaken out of it ?" Now the sunrise or day-spring being caused to know its place, and to take hold of the ends of the earth, indicates a change of its place and annual range ; and a change of the place and range of sunrise must be due to a change of the earth's axis. It must necessarily be so ; the inclination of the sphere to the ecliptic being the cause of varying the place of sunrise, sometimes to the north and sometimes to the south ; and the increased range of its varying to points much further to the north, and further to the south of due east, so as, in a manner, to "take hold of the ends of the earth," being a necessary effect of the increased obliquity of the earth's axis. That remarkable passage we can place in connection with the Gentile tradition. We know that Pythagoras in his travels picked up many truths from patriarchal tradition, which he

transmitted, and among the rest, the theory of the earth's rotation; and Anaxagoras says that at first the apparent revolution of the starry sphere was without the inclination which it subsequently received, and that that inclination which it now has was given to it afterwards. That is a most distinct statement of a change of axis. Now I am prepared to demonstrate that that change of axis must have produced a universal deluge, and the glacial drift, and what, in a sounder state of geology, was called the diluvial formation. The present glacial theory was unknown in Buckland's day; and that we should be expected, on the assumed evidence of a new theory, to set aside the records forwarded to us from a remote antiquity seems really too much. This glacial theory has been pressed to a degree which it would be almost impossible to credit, if it were not written, and if we could not refer to chapter and page. It is supposed by Mr. Geikie, who has published a learned work on the great ice age, that in Connecticut—and he quotes Professor Dana, a professor of geology and natural history—the thickness of the ice overspreading the continent measured from 6,000 to 8,000 feet. Mr. Geikie introduces a picture of the great Antarctic ice-barrier from Sir James Ross's Antarctic expedition, and gives that as an illustration of the state of Scotland in the glacial age; but that great ice-barrier was limited to 1,000 feet thick, while in Connecticut the thickness is estimated, as I have said, at from 6,000 to 8,000 feet; in Scotland, from 2,500 to 3,000 feet; and in Switzerland, at 3,000 feet. Are we to understand that those who believe in a universal deluge are to be considered credulous, while those who receive these monstrous hypotheses, one of which is that boulders from the Alps were borne to the Jura upon a great continuous glacier which filled that whole wide and deep valley of Switzerland, are to be deemed not credulous but scientific? With regard to some of the particulars in this paper, I rejoice much that Professor Challis has come forward to support the Scriptural record: but that internal heat, which he does not account for, would be accounted for by a change of axis. We find from the calculations of Professor Hansteen that the north magnetic pole is about $18\frac{1}{2}$ degrees from the geographical pole. The inclination of the moon's orbit to the ecliptic is 5 degrees, or thereabouts; while the plane of the earth's equator inclines to the ecliptic about $23\frac{1}{2}$ degrees. If you deduct the 5 degrees of the moon's inclination from the $23\frac{1}{2}$ degrees of the earth's inclination, the remainder, $18\frac{1}{2}$ degrees, is the distance of the magnetic from the geographical pole—the old axis from the new; and you may thus come to some indication of a time when the moon's orbit was in agreement with the plane of the earth's equator. Upon that theory which represents the moon to have been originally an outlying portion of an extended attenuated condition of the earth itself, it is reasonable to suppose that she did originally move in the plane of the earth's equator, or very near it; and if so, the moon is a "faithful witness in heaven" of the fact that the earth's axis has shifted $18\frac{1}{2}$ degrees. The facts of terrestrial magnetism, from which that great astronomer, Dr. Halley, deduced the conclusion that there is a nucleus

of the earth not revolving exactly with the earth itself, but revolving differently, bear the same evidence to a divergence of $18\frac{1}{2}$ degrees. Putting these facts together, there is a basis on which calculations may be arrived at, establishing the fact that there has taken place a change of the equator of the earth. It is very singular that Sir Charles Lyell has shown that the island of Jamaica bears fossil evidence of having had at one time the same temperature with Vienna. How was it possible that these two places could have nearly the same temperature, unless the equator lay differently then from now? If that be the case, I undertake to demonstrate from it the fact of a universal deluge. I hope, if it is considered desirable, an opportunity may be given to me to lay my views at greater length before this Institute. I ought to have mentioned that the change of axis, acting in its effects, principally at the poles, would have caused a rush of water round the world which would be more violent in the more northerly than in the equatorial regions; and the atmosphere would have been affected in a similar manner: the drift formation demonstrates that to have been actually the case. Professor Geikie gives a detailed account of the boulder-formation of Scotland, where, sometimes for 100 feet in depth, the stratum is full of stones and boulders mixed together with clay, as he expresses it, "pell-mell, higgledy-piggledy"—so thick and dense that, in railway operations, the navvies have no greater difficulty than in dealing with that formation. How was that great mass mixed up? Without water it would have been clearly impossible; and that it could have been done in the course of millions of ages by slow deposit is also impossible, because it is not stratified, but is mixed up altogether. It must have been stirred about, and swept along violently, by a tremendous force, and deposited by being allowed to settle all at one time.

Dr. COLEMAN.—I cannot agree with Mr. Henslow, who appears to suggest that we may, in our discussion, argue the question apart from inspiration. I hold by the old system, that the Book of Genesis is inspired, and we must teach that boldly; and if there appears to be any inconsistency between science and Revelation, we must wait until the same God who revealed the Book of Genesis shows the consistency of the two.

Rev. T. M. GORMAN.—A small work on the *Principles of Chemistry*, published in 1721, attempts to account for certain geological phenomena by the hypothesis of a primeval ocean. In one part I find the author saying—"At this day (in Sweden) the timbers and ribs of vessels and galleys have been discovered in places which are now forty or fifty yards above the level of the sea; and that hooks, rings, and hawsers, with many other indications of a port, and of inhabitants, have been found even on the mountains. And it is certain," he continues, "that the Baltic is still gradually subsiding towards the north, at a rate of four or five yards in depth in less than seventy years. So that in many localities, within the last hundred years, the plough has supplanted the oar, and the sower has taken the place of the fisherman. I myself," he proceeds to say, "have seen the marine spots, and have heard old men conversing about them. In Lapland, at the extremity

of the Gulf of Bothnia, within a century, towns have undergone a spontaneous removal from the shore, and are now some thousand paces distant from the original site of their port. And similar things have happened to other places on the same coast. And this may serve to prove that all these circumstances were not occasioned by the universal deluge, but that for a long time afterwards, the northern countries especially lay under a deep ocean, and that as the sea gradually subsided towards the north, they emerged and formed a habitable land. Should this view be established by the future discoveries of scientific men, it will furnish a reason for thinking, although not for positively asserting, (1), that even the horizontal pressure is liable to change, which follows if, according to the allowed opinion, the seas be depressed towards the north, and elevated towards the equator; (2) and, consequently, that the distances of the latitudes vary between the poles; (3), that certain countries in the far north, agreeably to the notion of modern, as well as to the accounts of ancient authors, may once have been islands, which, in process of time, as the sea subsided, united into a continent or contiguous land. Besides these, there are many other things which I shall not venture to publish until I am strengthened by still more numerous proofs, and enabled to proceed on a firmer foundation."

Mr. P. V. SMITH.—As a member of the same University as Professor Challis, I would venture to say one or two words in his defence in reference to two charges which have been made against him. First, as to his mixing up miraculous and physical causes. I think the mixture he has suggested is no greater than the mixture necessarily involved by the other hypothesis: I mean, that of the alteration of the earth's axis. Those who adopt that hypothesis must assume that there was some extraordinary physical cause which produced the change in the position of the earth's axis. In what respect then is there less of a mixture of the miraculous and the physical in this hypothesis, than in Professor Challis' idea that an abnormal increase of the earth's internal heat was the immediate cause of the Deluge? He would of course attribute that increase to some extraordinary or miraculous occurrence. His mode of argument and his language appear to me to be fully borne out by the descriptions we have of miracles in the Scriptures. Take that of the crossing of the Red Sea by the Israelites. We all recognize that to have been a miracle; and yet the Scriptures say, that a strong east wind divided the waters. I do not pretend to say which theory of the Deluge is to be accepted—whether that held by Professor Challis, or that of a change in the earth's axis. I would only say that the attack which has been made on Professor Challis on the ground of his importing a physical cause, appears to me to be unfounded. I would also suggest a defence of Professor Challis in reference to the other charge which might be brought against him—that of not understanding the Scriptural narrative in the way in which we understand it as regards the animals being saved by means of the ark alone, and all the rest being destroyed. It appears to me that we find a justification of Professor Challis' view in the same part of Scripture as that to which I

have already referred. In the account of the plagues of Egypt, we are first told that in the plague of the murrain all the cattle of Egypt died, and then we are told that afterwards the cattle were destroyed by the succeeding plague of hail, which also destroyed every herb of the field. Subsequently we read that the locusts ate up all the herbs and green things which the hail had left. It is evident that these expressions must be taken together, and so taken, they explain what the writers of the books of Scripture understood and meant by the expressions "all" and "every." We gather that they used these expressions in a comprehensive, and not in a universal sense; and that is exactly what Professor Challis has suggested with respect to the preservation of the animals in the ark.

[Mr. CHARLESWORTH having disagreed with the Paper, and objected that the large amount of rain that must have fallen to cause the Deluge would have destroyed the fish in the seas, who could not exist in fresh water,]

The HON. SECRETARY.—Mr. Charlesworth cannot have noticed that his objection is one most satisfactorily answered in the Paper. Professor Challis speaks of the sea coming up on the land by reason of its subsidence, a phenomenon which is going on even in our own day. I find in America Professor Dawson, in his annual address for 1874, before the Natural History Society of Montreal, gives an account of the rapid subsidence of the eastern coast, and the rise of the western coast of the northern continent of America. In the Baltic we find somewhat similar changes going on, and Dr. Beke mentioned, after his last trip, that he had noticed that the whole land of the Gulf of Akaba was rising, and the sea-shore showed a recent elevation of 40 feet. These changes are now gradual, but is there reason to doubt that in earlier times such changes may not have been catastrophic? Indeed, Professor Challis mentions some in our day—referable to volcanic action, and I may, perhaps, be permitted to add to the instances he gives by mentioning that in Iceland the Skapta Jökul, in 1783, in forty days threw out a mass of lava which, if conical, would have covered London, and reached to a height of 13,000 feet; again, Mouna Loa, a few years ago, in ten minutes, threw out a pile of lava 3 miles long, 1 broad, and 20 to 30 feet deep. It is somewhat interesting to note the disturbing influences of atmospheric changes in the case of earthquakes. Milner states that "It is a well-established result of home and foreign observation, that earthquakes are preceded and accompanied by barometrical depression, indicating the diminished pressure of the atmosphere. Hence the occurrence of the greater number in the winter months, when the average height of the barometer is always the lowest, and is also subject to greater fluctuation than in the opposite season of the year. It may, therefore, be considered as highly probable that, while the causes of earthquakes are still shrouded in mystery, they are intimately connected in their occurrence with atmospheric vicissitudes. When the barometer is at 31 inches, the atmosphere presses on the surface of Great Britain with a weight = 291,793,239,406 tons ;

when it sinks to 27 inches there is a diminution of weight on the same area = 37,648,938,386 tons ; being about 427,231 tons to the square mile. Hence it may well be the case that, when the subterranean forces have acquired such strength as nearly to rupture the confining strata, any considerable diminution in the pressure of the atmosphere may bring on the crisis of actual disengagement." As regards the rate of the descent of rain at the Deluge, I have nothing to add to Professor Challis' statements, but may mention a remarkable fact in regard to the possible rate of its descent even in our own day, which was referred to at a recent (1875) meeting of the Geological Society by Professor Duncan, who stated that "on the Khasia hills there is a rainfall of about 600 inches annually ; and this, falling upon ground which does not readily absorb moisture, has cleared away all surface deposits, and even excavated coombs in the granite."

THE REV. PROFESSOR CHALLIS' REPLY.

Professor CHALLIS, who was not present at the meeting, having received a copy of the printed account of the discussion of his paper, requested that the following reply to some of the remarks made by the speakers might be added to the discussion :—

Mr. Henslow appears to have misunderstood the view I take of the physical operations by which the Deluge was produced. It is true that I consider the primary disturbing cause to have been an abnormal increment of the temperature of the interior of the earth ; but the accession of heat is not supposed to "cause upheaval of the sea-bottom," nor to have any other immediate effect than that of generating excessive evaporation at the surface of the sea, in consequence of which there would be a downfall of "torrents of rain" on the land. For reasons which I adduced, it is not improbable that the amount of water which by this means would be transferred from sea to land might have the effect of disturbing the equilibrium of the earth's crust, which, adopting Sir John Herschel's view, I suppose to be resting on a molten sea. Hence, vertical oscillations of the crust, accompanied by transverse movements and occasional ruptures, might be the result, producing eventually the configuration of islands and continents, and the superficial irregularities, which we witness at the present day. I make no objection to the speculations mentioned by Mr. Henslow, according to which results like these might have followed from a change of the inclination of the earth's axis, and the consequent mechanical action of "an enormous accumulation of ice at the poles." But failing to see how such views could conduct to an explanation of the particular phenomena of the Noachian Deluge, *as described in Scripture*, and having found that these phenomena might be intelligibly accounted for by the supposition of an abnormal increment of terrestrial temperature, I had no alternative, considering the purpose of the paper, but

to adopt that hypothesis. And as the same authority that furnishes the record of the phenomena also plainly intimates that the Deluge had a miraculous character, it seemed not unreasonable to assume that the increment of temperature which accounts for the phenomena was *extraordinary*, and due to miraculous agency. In an analogous manner, as was appropriately remarked by Mr. P. V. Smith, the waters of the Red Sea were miraculously divided by the physical action of a "strong east wind." I can conceive of no *ordinary* physical agency whereby a change of the earth's temperature, so sudden and effective as that required to satisfy the conditions of the Deluge, could have been produced.

For the reasons above alleged, I am unable to assent to the view taken by Mr. Galloway, that the internal heat which my theory postulates "would be accounted for by a change of axis."

The facts stated in the passages which Mr. Gorman has quoted from a work on the Principles of Chemistry, published in 1721, are all in favour of the supposition that the earth's crust, as resting on a liquid mass, is susceptible of various conditions of equilibrium.

The remarks made by Mr. P. V. Smith relative to my being charged with mixing up miraculous and physical causes, and taking universal expressions in Scripture in a comprehensive sense, agree so exactly with the views I entertain on these points, that I have no occasion to add anything to what he has said.

The objection raised by Mr. Charlesworth having been met by the remarks of the Hon. Secretary, it only remains for me to take notice of the reference made by Dr. Coleman to the bearing of scientific arguments, relative to Scriptural statements, upon the "Inspiration" of Scripture. On the supposition that Scripture is inspired, it is a necessary consequence that there can be no real inconsistency between the statements it contains and the ascertained truths of physical science; that is, between God's Word and knowledge of His works. It is legitimate, therefore, on that supposition, to bring the results of modern physical science to bear on the interpretation of the Scriptural accounts of natural facts, such as those in the Book of Genesis relating to the Creation and the Deluge. In proportion as the stated facts may in this way be reasonably explained, confirmation is given to the hypothesis of inspiration. Such have been the character and the object of the arguments contained in the present paper, and in another ("On the Metaphysics of Scripture") which I have since communicated to this Society. In the latter, the question as to where natural agency ends and miraculous agency begins is particularly dwelt upon.

INTERMEDIATE MEETING, APRIL 19, 1875.

H. CADMAN JONES, ESQ., M.A., IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following Elections were announced :—

ASSOCIATE :—

L. T. Dibdin, Esq., B.A. (Cantab.), Torrington Square.

HON. LOCAL SECRETARY :—

Rev. R. Pritchard, B.A. (Oxon.), Whitchurch.

Also, the presentation of the following Works for the Library :—

“Journal of the Royal United Service Institution.” Part 79.

From the Institution.

“L'État en face de la Loi divine.” By A. Lombard. *From the Author.*

“Nature and the Bible.” By Principal J. W. Dawson, F.R.S. *Ditto.*

“On the Submergence of the Glacial Epoch.” By J. Croll, Esq. *Ditto.*

A Paper “On the Connection between the Philosophy of Locke and the Sceptical Principles of the Day” was then read by H. Coleman, Esq., LL.D. A discussion ensued, in which the following gentlemen took part :—The Master of the Charterhouse, Revs. Prebendary Row, J. W. Buckley, W. Lawless, and J. Sinclair ; Messrs. C. R. M'Clymont, T. W. Masterman, and J. Rendall. Dr. Coleman having replied, the meeting was then adjourned.

ORDINARY MEETING, MAY 3, 1875.

H. CADMAN JONES, ESQ., M.A., IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—

Rev. H. E. Fox, M.A. (Cantab.), Westminster.
 Rev. J. M'Cormick, M.A. (Cantab.), Lewisham.
 Rev. Canon J. C. Ryle, B.A., B.D., Stradbroke.
 Rev. A. Stewart, Aberdeen.

ASSOCIATE :—

Rev. W. Magill, Presb. Dean of Residence, Queen's College, Cork.

Also, the presentation of the following Works for the Library :—

- “Proceedings of the Royal Society.” Part 160. *From the Society.*
 “Christian Psychology.” By the Rev. T. M. Gorman. *From the Author.*
 “Evidence of Rational Evangelism.” By J. Du Boulay, Esq. *Ditto.*
 “Evolution.” By the Rev. A. Stewart. *Ditto.*

The following Paper was then read by the Author :—

AN EXAMINATION OF THE BELFAST ADDRESS OF THE BRITISH ASSOCIATION, 1874, FROM A SCIENTIFIC POINT OF VIEW. By JOHN ELIOT HOWARD, F.R.S., F.L.S., F.R.M.S., Acad. Med. Fr. Par. Mem. Corr., also Phil. Coll. Pharm.—Société de Pharm. Paris—Soc. Physico-med. Erlangensis—Allg. Oest. Apoth. Verein—Netherlands Industrial Soc.—Mem. Pharm. Soc. of Great Britain—Société Botanique de France—Society of Biblical Archæology, &c.

“Were men led into the apprehension of invisible intelligent power by contemplation of the works of Nature, they could never possibly entertain any conception but of one single Being, who bestowed existence and order on this vast machine, and adjusted all its parts to one regular system.”—*Hume, as quoted by Tyndall, Address, page 23.*

PART I.—*The Introduction.*

THE Address delivered by Professor Tyndall before the British Association (1874) was regarded by the thinking portion of the public as an utterance of much importance; not only on account of the high standing of the speaker in the estimation of the scientific world, but as presumably expressing the opinions of others also.

It was probably imagined by most that the conclusions to which the author had arrived were the necessary and inevitable result of the progress of Science. Comparatively few possessed

either the means or the leisure to submit this hypothesis to the rigid scrutiny which it required previous to acceptance; and when it was understood how vast and how important were the consequences that must result from such acceptance, many were glad to fall back on the delusive hope that this skillful lecturer had really not succeeded in making his meaning understood. In this manner the task of coming to any decided conclusion about the whole matter was avoided.

Whatever ground there might seem for this expectation in the somewhat apologetic tone of the closing portion of the address, there can no longer be any excuse for entertaining so unfounded an opinion; since in the subsequent lecture in the Free-Trade Hall, Manchester, and in the prefaces to the first thousand, and to the recently-issued seventh thousand of this pamphlet, the author applies himself successfully to the task of clearing away all ambiguity; and shows that he entirely adheres to those expressions of his views against which most exceptions have been taken.

It is very evident, however, that Professor Tyndall feels acutely the nature of the opposition which he has evoked. He assures us that the address was not any expression of passing feeling evoked by the cheers of his audience, but that the whole was the result of cool and careful preparation. "In the solitudes" (of the Swiss mountains) "I worked with deliberation, endeavouring (he says) even to purify my intellect by disciplines similar to those enjoined" by the Catholic Church "for the sanctification of the soul."*

What these measures of discipline were can be easily supposed by this comparison; and it is perhaps scarcely consistent with the honour which, in a certain sense, we owe to all men to regard so thoroughly earnest an advocate of his opinions with the feelings which are sometimes expressed. We may think him engaged (according to a felicitous comparison of his own in reference to another person) in sowing intellectual thistle-down†, but such a conviction should call forth other and far different emotions in our minds to those above referred to.

The Professor is rather severe on his critics. He says that "from fair and manly argument, from the tenderest and holiest sympathy on the part of those who desire my eternal good, I pass by many gradations, through deliberate unfairness, to a spirit of bitterness which desires with a fervour inexpressible in words my eternal ill." I trust in the analysis of his opinions here given he will have no occasion to complain either of "bitter-

* Preface to first thousand, p. xxxiv.

† Page viii.

ness" or of "deliberate unfairness." As the result of some patient study at all events, I conclude (strange to say) that whilst persistently advocating Pantheism he has no intention to destroy religion; and that an address of such astonishing character was even the result of cool and careful, and what we must in a sense term *religious* preparation! I think that we must even go further and say that the object which he had in view appeared in his eyes something laudable and heroic.

The inner history of the life of any person (specially of those who have influenced largely the minds of their fellow-creatures) must needs be interesting; for nothing that is human, if described to the life, can be alien to us.* We are indebted to Professor Tyndall for the pains which he has taken, in his seventh preface, to present us with the history of his early life and the record of his early impressions. This enables us to form at once a more correct and a more charitable estimate of his present course.

"Sprung from a source to which the Bible was peculiarly dear, my (Professor Tyndall's) early training was confined *almost exclusively* to it." *Too exclusively*, perhaps, I may be allowed to suggest. It is not unfamiliar to those who know the world, to find a revulsion take place in manhood from a too severe repression of the inquiring faculties in youth.

The next thing mentioned by the Professor shows that he was trained (and who could doubt it considering his parentage) in *dogmatic* theology. "Born in Ireland," he says, "I, like my predecessors for many generations, was taught to hold my own against the Church of Rome."† And what was the *sequence* of all this—the Professor will not allow me to say the *consequence* of this particular training? "I can remember the time when I regarded my body as a weed, so much more highly did I prize the conscious strength and pleasure derived from moral and religious feeling, which, I may add, was mine without the intervention of *dogma*."‡

I need scarcely point out, at least to those familiar with the effects of biblical teaching, the improbability of the assertion that all this took place without the intervention of dogma. Let us turn to page xxxi., where we find alluded to as "spiritual experiences of those earlier years, resolves of duty, works of mercy, acts of self-renouncement." Did these arise spontaneously without any connection with the truths of Scripture in which he was daily instructed?

* "Homo sum, humani nihîl à me alienum puto."

† Preface, p. xxiii.

‡ *Ib.* p. xxx.

We have here the history of the formation of a character which would find a much more congenial home in the midst of those who cherish the Presbyterian traditions of Ulster, than in the arid regions of infidelity.

Such it is quite possible may be the conclusion of this remarkable career. Early impressions are very deep, and he may return to prove the proverbial influence of first attachments. May I add my sincere desire that such may be the case. But in the mean time we may fairly doubt whether such a mind is suited to be the apostle of a new dispensation in which *Science* is to prove itself the regenerator of mankind. He evidently classes himself with those who "believe undoubtingly that out of the coming struggle the truths of Science will emerge *with healing in their wings.*"*

We have become acquainted with Science in many aspects during the last half-century,

"Einem ist sie die hohe, die himmlische Göttin, dem andern
Eine tüchtige Kuh, die ihn mit Butter versorgt." †

But really the above expectation of healing from the truths of Science is the most remarkable that has fallen under my observation.

Is it not true that the effect of all experimental Science is to create a spirit of scepticism, ‡ which (if kept within proper limits) may be really useful, for we ought to prove all things, and hold fast *only* that which is good. Even if pushed beyond these limits, it has this effect (as I think might be illustrated by the works of, at least, one other leading philosopher), that the mind becomes at last sceptical of its own scepticism, wearied with its flights, and almost desirous of returning again to the ark, having found no rest to the sole of her foot.

Is there not something of this tone of feeling in the following utterance of our author in the first preface?

"I have noticed during years of self-observation, that it is not in hours of clearness and vigour that this doctrine ("Material Atheism") commends itself to my mind; that in the presence of stronger and healthier thought, it ever dissolves and disappears, as offering no solution of the mystery in which we dwell and of which we form a part."

All the established results of real practical Science may be compared to the gigantic empire of old Rome, won by the hard

* Preface, p. xxxi.

† Schiller's *Gedichte*, 1818, p. 126.

‡ σκίψις (from whence scepticism) in the sense of "hesitation or doubt" has far less to do with the errors of our "thinkers" than *δόγμα*, or "that which seems true to one, an opinion."—See Liddell and Scott, *Lexicon*.

fighting of centuries, mingled with many defeats, and held together not without much jealous care and supervision of the defensive outposts. Now we see that even so great a general as Julius Cæsar, when he attempted the conquest of Britain, was baffled in his enterprise, not so much by the bravery of the inhabitants as by a phenomenon on which he had not reckoned,—the remarkable rise and fall of the tide in the estuary of Richborough; * a phenomenon which, from the configuration of these “sandy” and flat “shores,” † is there deceptive enough, as I have myself observed.

In setting foot on unexplored tracts of the regions of thought, our author proves himself a singularly rash leader. He is continually exposing himself to be defeated by the unknown power which he has omitted to take into his calculations; and he has moreover failed to secure any line of retreat amid the universally recognized truths of philosophy. He has not made himself master of Gaul before he invades Britain.

The real question, and that to which I now address myself, is whether there is any foundation in the solid acquisitions of modern Science for the speculations of this address?

Science, as it seems to me, is made to bear the blame of an attack upon religion, for which she has not lent her territories as a base of operations. The assault comes from another quarter altogether,—the dream-land of ancient or of modern Conjecture.

P A R T II.

The Address.—a. The Philosophical Argument.

I shall now attempt an analysis of the *Belfast Address*, in the very first page of which I seem to find a confirmation of the views above expressed.

On the authority of Hume (in his *Natural History of Religion*), and not from any discovery of the writer, we are told that mankind pursued a certain course “in forming their notions of the origin of things.” We are instructed that their conception of “supersensual beings” was “a process of abstraction,” resulting from the scientific tendencies or “impulse” “inherent in primeval man.”

* Portus Rutupinus, Richborough, in Kent.—See Smith's *Dict. of Greek and Roman Geography* for description, also the *Atlas of Ancient Geog.*, 1874. by same author.

† “Rhydtufeth.”—See Camden's *Britannia*.

Primeval man then must have had "impulses" very different to those of the brutes, who never trouble their heads about such matters at all. But this process is quite the reverse of all that we learn from history, whether sacred or profane, where we find God revealing Himself, making Himself known in some way or other; and man disposed to suppress this knowledge (*τὴν ἀλήθειαν ἐν ἀδικίᾳ κατεχόντων* *), or at all events to reserve the truth to the custody of their priests or druids, the wise men who alone were suitable guardians of the secret. Do we not learn that this was the case in the earliest history of Egypt? Was not the worship of animals (as Manetho teaches) a later invention? Does not the very oldest writing of which we have any certain knowledge (the Book of the Dead) lead us to the conclusion that God was known as the Judge of all men, distributing rewards and punishments after death? †

The Hermetic creed tells us that "before all things that really exist, and before the beginning of all time, *there is one God*, prior to the first God and Ruler of the world, remaining immovable in the solitude of His unity. ‡ . . .

"These are the most ancient principles of all things," according to Jamblicus, "which *Hermes places first in order, before the ethereal, empyrean, and celestial deities.*"

M. Lenormant, who has profoundly studied the whole subject, says,—

"Aussi haut que l'on remonte dans les documents relatifs à la religion Egyptienne, on y trouve pour fondement la grande notion de l'unité divine. . . . Mais cette notion sublime, si elle se maintint toujours dans la doctrine ésotérique, s'obscurcit rapidement et fut défigurée par les conceptions des prêtres comme par l'ignorance de la multitude. L'idée de Dieu se confondit avec les manifestations de sa puissance; ses attributs et ses qualités furent personnifiés en une foule d'agens secondaires, distribués dans un ordre hiérarchique, concourant à l'organisation générale du monde et à la conservation des êtres. C'est ainsi que se forma ce polythéisme qui dans la variété et la bizarrerie de ses symboles, finit par embrasser la nature entière."—*La Magie chez les Chaldéens, &c.*, p. 71.

Consider the following magnificent description of the Almighty from the Scriptures of our Aryan ancestors:—

"Possessed of illimitable resources, He has meted out, created, and upholds heaven and earth. He dwells in all worlds as Sovereign Ruler. The wind which resounds through the atmosphere is His breath. He has opened boundless paths for the sun which *He placed* in the heavens, and has hollowed out channels for the rivers which flow by His command. By His wonderful contrivance the rivers pour their waters into the one ocean but never fill it. *His ordinances are fixed and unassailable.* They rest on

* Rom. i.

† Comp. *La Magie chez les Chaldéens*, par Lenormant, pp. 77, 78.

‡ See Cory's *Ancient Fragments*, p. 45.

Him unshaken as upon a mountain; through their operations the moon walks in brightness, and the stars which appear in the nightly sky mysteriously vanish in daylight. His messengers behold the worlds, He knows the flights of birds in the sky, the path of ships on the ocean, the course of the far-travelling wind, and beholds all the secret things that have been, or shall be done. No creature can even wink without Him. He witnesses truth and falsehood. The Great One who rules over these worlds *beholds all as if He were close at hand*. When any man thinks he is doing aught by stealth, the Gods know it all, and they perceive every one who stands or walks or glides along secretly, or withdraws in his house, or into any lurking-place. Whatsoever two persons sitting together devise, Varuna, the King, knows it, *being present there as a third*. This earth, too, belongs to Varuna, the King, and that vast sky whose ends are so far off.* . . .

I must quote no more, but add Professor Roth's remarks: †— There is no hymn in the whole Vedic literature which expresses the Divine Omniscience in such forcible terms as this, which is found in the Atharva Veda. There is, however, one in the Rig Veda which is quite equally remarkable; also another in the Rig Veda Sanhitá, which inquires — “Who has seen the primeval Being at the time of His being born? What is that which, having substance, the unsubstantial sustains?—from earth are the breath and blood, but *where is the soul?*”

Now Varuna (from the root *var*, to cover) is equivalent to the Greek *Οὐρανός*; and thus antedates those “theories which took an anthropomorphic form”; for, according to Cicero, ‡ Uranus was the father of Mercury and of Venus. We have probably another representative of the same idea in the “Shang Ti,” the venerated “Heaven” of the Chinese.

These are amongst the most ancient “historic” records, and certainly do not favour the theory of Tyndall.

It would be easy to adduce abundant additional proof; but for the present this must suffice to show that in the opening of this Address, and in reference to no less important a subject than the rise of religion among mankind, our author (relying upon Hume) is deceiving his audience with eloquent but unsubstantial figments of the imagination.

We next are brought into acquaintance with the Greek philosophers, but I cannot say that justice is done to the deeply interesting question (as to its cause and its results) of their search after wisdom. The only phase of thought which seems to command our author's real sympathy is that of Epicurus, who maintained that the unhappiness and degradation of mankind

* See “Contributions to a Knowledge of the Vedic Theogony and Mythology,” by S. Muir, LL.D., in *Journal of the Royal Asiatic Society*, vol. i. p. 1, New Series, page 81.

† *Rig Veda Sanhitá*, by H. H. Wilson, M.A., F.R.S., 1854, p. 127.

‡ *De Naturâ Deorum*, iii. 22, 23.

arose in a great degree from the slavish dread which they entertained of the power of the gods, and from terror of their wrath. To remove these apprehensions was the great object of his teaching. In order to dispel these fears, he called to his aid the atomic theory of Leucippus, by which he sought to demonstrate that the Material Universe is not the result of creative energy, but that all is formed by the union of elemental particles which had existed from all eternity. As to the gods, if such there were, they lived in a state of divine tranquillity (like the Brahm of India), wholly unmoved by and indifferent to the actions of mortals! Indeed, as they also were composed of atoms, it might have happened to them to be resolved into their ultimate elements, if they mixed themselves up with mundane affairs!

It was thought to be unnecessary to address such Beings in prayer, inasmuch as "everything revolves with unchanging laws in one eternal circle."* The true explanation of all this is probably to be found in the Brahmanical or Buddhistic speculations of the East.

Lucretius wrote a magnificent poem to uphold these tenets. His object, we are told, was the destruction of Superstition,—which statement is unquestionably true;—and after reading the poet's thrilling narrative of the sacrifice of Iphigenia, there is no one with any feeling who is not ready to join in with his conclusion—*Tantum religio potuit suadere malorum!*

"Such are the crimes that SUPERSTITION prompts."

But where is the application to our own times and circumstances? *We* are not in the habit of offering human sacrifices in order to obtain favourable weather; and it is very problematical whether "the mild light of Science" will avail much in remedying abuses which still remain, or superstitions which still influence Christian society. We are not at all disposed "to pour contempt upon matter"; and, as far as our observation extends, have little need of exhortation directed against excessive austerity or the danger of regarding our bodies as "mere weeds." On the contrary, I believe that to endeavour to maintain the "*mens sana in corpore sano*" is what most men regard as a dictate of common sense.

It is to be noticed that, little as there was to be valued in the state of society existing in Rome at the time Lucretius wrote, he is not without a fear lest, in seeming to destroy the bond of that society, he should be accounted guilty of a crime against the laws which bind men together.

* See Hardy's *Manual of Buddhism*, pp. 34, 35.

"Illud in his rebus vereor, ne forte rearis
Impia te rationis inire elementa, viamque
Indugredi sceleris."*

"This is what I fear herein, lest haply you should fancy that you are entering on unholy grounds, and treading the path of sin."—(MUNRO.)

I cannot but think Lucretius would have been too cautious to issue a Belfast Address, and I scarcely think he would have been content with Tyndall as a correct expositor of his views. "He refuses the notion that anything can come out of nothing," says Tyndall. Now, what does Lucretius *really* advise his friend? It is this, that he never should allow his mind to entertain the thought that *God* could make anything out of nothing.

"Nullam rem e nihilo gigni *divinitus* unquam," †

"That nought from nought by power Divine has risen."—(DR. GOOD.)

The doctrine which he advocated, was delightful in his view, because it seemed to dispense altogether with Divine intervention.

"Quas ob res, ubi viderimus nil posse creari,
De nihilo, tum quod sequimur, jam rectius inde
Perspiciemus, et unde queat res quæque creari,
Et quo quæque modo fiant, *operâ sine divôm.*" ‡

"Developed then we trace
Through nature's boundless realm, the rise of things,
Their modes and power innate, *nor need from heaven*
Some god's descent to rule each rising fact."—(DR. GOOD.)

It was, then, not without reason that this materialistic philosophy was accounted atheistic. For it asserts that all would go smoothly if we could but get rid of the notion of Divine interposition.

It is necessary that I should follow our author into the examination of these theories, because of the prominence which he gives them as developments of the scientific imagination, and as if they formed in some way the basis of modern discoveries. "Physical theories which lie *beyond experience*," he tells us, are derived by a process of abstraction from experience; which is certainly a favourable manner of stating the origin of those notions of theorists, which are evidently *baseless*. Such was the dream about atoms which we are considering.

* Lib. i. lines 80-83.

† Line 150.

‡ Line 155, &c., "both the elements out of which everything can be produced, and the manner in which all things are done without the hand of the gods."—(MUNRO.)

"The atomists of antiquity had experience of gravity as manifested by falling bodies. Abstracting from this, they permitted their atoms to fall eternally through empty space. Democritus assumed that the larger atoms moved more rapidly than the smaller ones, which they therefore could *overtake*, and with which they could *combine*. Epicurus, holding that empty space could offer no resistance to motion, ascribed to all the atoms the same velocity; but he seems to have overlooked the consequence that under such circumstances the atoms could never *combine*. Lucretius cut the knot by quitting the domain of physics altogether, and causing the atoms to move together by a kind of volition."*

Then it was all a *baseless dream*; and the effort to get rid of Divine power landed them in the singular absurdity of an *eternal* ingathering of atoms towards some *unknown* centre of gravity, which must be *eternally receding* from the downpour!

"Nec quisquam locus est, quo corpora quom venere
Ponderis amissa vi, possint stare in inani."†

"Nor through the boundless void one point exists,
Where things may rest, as if of weight deprived:
No power it boasts to uphold; but still recedes
As nature prompts and opes the needed path."—(DR. GOOD.)

It is important to notice in the above description of the Professor the use of the word *combine*, as if there were here some connection with the doctrines of modern chemistry. So far from this being the case, Lucretius expressly asserts that all things arise simply by the *change of arrangement* of his ultimate particles ("permutato ordine solo"), "the mode but changed, the matter still the same."‡

Leucippus, the first propounder of the theory of atoms, accounted for the formation of the Universe by a difference merely in the magnitude and figure of his atoms. "Owing to the former, there would be, he conceived, an agglomeration of the bulkier particles round certain centres—owing to the latter cause, an entanglement of them, and a consequent cohesion of the particles thus brought together."§

Through Democritus and Epicurus the notion of the combination of atoms took a further development. Space is maintained to be an absolute and perfect void (*inane*), and the atoms ||

* Address, p. 52.

† Lib. i. lines 1076-77. I follow in general Dr. Good's text, but have corrected by Munro (1873), who here translates "nor is there any spot of such a sort that when bodies have reached it, they can lose their force of gravity and stand upon void, and that again which is void must not serve to support anything, but must, as its nature craves, continually give place."

‡ Lib. i. lines 820-828.

§ Daubeny on the Atomic Theory, p. 12.

|| "Omnis ut est, igitur, per se natura duabus
Constitit in rebus, nam corpora sunt et inane."—LUCRETIUS, lib. i. 420.

(nam corpora sunt et inane) are hard, impenetrable, primary bodies of various figures—round, square, pointed, jagged, and possessed of certain intrinsic powers of motion. Under the old school of Democritus the perpetual motions were of two kinds—a descending motion from the natural gravity of the atoms, and a rebounding motion from collision or mutual clash.

“Besides these two motions, Epicurus supposed that some atoms were occasionally possessed of a third, by which in some very small degree they descended in an oblique or curvilinear direction, deviating from the common and right light line anomalously.

“These infinite groups of atoms, flying through all time and space in different directions and under different laws, have interchangeably tried and exhibited every possible mode of encounter, sometimes repelled from each other by concussion, and sometimes adhering to each from their own jagged or pointed construction, and from the casual interstices which two or more connected atoms must produce and which may be just adapted to those of other figures, as globular, oval, or square. Hence the origin of compound or visible bodies—hence the origin of large masses of matter, hence eventually the origin of the world itself.” *

We have here a mechanical theory of the Universe, which so far commands the sympathies of our modern atheists. But into the midst of this mechanical theory we find a wholly discordant and irreconcilable element introduced, in order to account for the freedom and individuality of the *WILL*. Why should any atoms deviate from the force of the laws that govern them? Every chemist knows that such an occurrence never takes place, and that he may reckon with infallible certainty on their never displaying any tendency to vary. Hence any chemist can contrast the laws which govern crystallization, and which result in perfect mathematical forms and arrangements, and those which govern organized bodies; conspicuous among which latter is the fact of constant, and frequently what we should call misguided variety—as in the abnormal development of plants and animals.

Lucretius pleads for the absolute necessity of introducing the idea of this discordant deviation.

“Quâ re etiam atque etiam paullum inclinare necesse est
Corpora, nec plus quam minimum; ne fingere motus
Obliquos videamur, et id res vera refutet,” &c. &c.†

“Hence doubly flows it why the seeds of things
Should from the right decline,” &c. &c.

The poet then goes on to speak in a noble passage of the effects of this *Will*; but is it not obvious that he had constructed a Mechanical Universe from which he had not only shut out God, but the will of man and animals? In order to remedy

* Dr. Good, *Book of Nature*, quoted by Daubeny, p. 16.

† Book ii. lines 243—245.

this, he coolly overthrows the law of gravitation—supposing it to be intermittent and uncertain in its operation !

Gravitation was nothing to Lucretius, when once mounted on his waxen wings, although like Icarus,—

“ceratis ope Dædaleâ
Nititur pennis, vitreo daturus
Nomina ponto.”*

In like manner Professor Tyndall passes from the regions of the *chemical* to those of the *structural* forces, taking leave of all caution when once he has abandoned the reins to his “scientific imagination.”

“It is instructive to note from this point of view the successive introduction of new conceptions. The idea of the attraction of gravitation was preceded by the observation of the attraction of iron by a magnet, and of light bodies by rubbed amber. The polarity of magnetism and electricity appealed to the senses, and thus became the substratum of the conception that atoms and molecules are endowed with definite attraction and repellent poles, by the play of which definite forms of crystalline architecture are produced. *Thus, molecular force becomes structural.*” †

Does the Professor mean to say that “molecular force” is the same with chemical affinity, and that chemical affinity is the same with electricity and magnetism, and also with gravitation? —that we have thus safely reached the brink of an abyss over which we take a fortunate leap in the next sentence, and solve the great problem, landing safely in the hitherto unknown region of the forces which govern organization? The pace takes away the breath; but let us at all events look before we leap.

“It requires no great boldness of thought to extend its play into organic nature, and to recognize in molecular force the agency by which both plants and animals are built up! In this way out of experience (?) arise conceptions which are WHOLLY ULTRA-EXPERIENTIAL.” †

For this last admission I am thankful, and for the elegant words in which it is clothed.

We can understand, in the first place, that “an atom is the smallest quantity of an element indivisible by chemical means, which can exist in a simple body; and, in the second place, that a molecule is a group of atoms forming the smallest quantity of a simple or compound body which can exist in a free state, or is able to take part in, or result from a reaction.” ‡

But no boldness of thought can extend the play either of atoms or groups of atoms, that is, molecules, into the production of organic structure. This conception is *unthinkable*,

* Horace, Book iv. Ode 2.

† Address, p. 52.

‡ An Introduction, &c. By Dr. A. C. Wurtz, F.R.S., pp. 33, 34.

as well as ultra-experiential. That "molecular force should become structural," resembles much the supposition that two and two should, on some occasion, "play" at making five, which would, I presume, be simply *ultra vires*, or impossible!

I must entirely protest against our author's commendation of the Greek philosophy, "in that it had shaken itself free from that fruitless scrutiny by the internal light of the mind alone, which had vainly sought to transcend experience, and reach a knowledge of ultimate causes!"* This neither have the Greeks nor has Tyndall himself succeeded in doing.

Indeed Lucretius gives exactly the opposite account of the foundation of the system which he advocated in such admirable verse. He tells us, in his praise of his great master:—

"Ergo vivida vis animi pervicit, et extra
Processit longe flammantia mœnia mundi." †

His own poem is as full of passages of metaphysical and fruitless scrutiny, and as far from deserving the above commendation as even the Belfast Address.

The Greeks knew nothing of exact Science; and the connection of their doctrines with those of modern chemistry is not to be historically traced. We are more indebted to the experimental researches of the Chaldeans, the Egyptians, and their Arabian disciples, than to all the speculations of the Greeks. We owe probably much more even to the Alchemists—the last of whom, as he was termed, named Wenzel, was the first to establish, by well-conducted experiments, the doctrine of *equivalency*. He foresaw and predicted the conclusions that could be drawn from it respecting the theoretical calculation of the composition of salts, and the control of analyses.

Professor Wurtz, in his admirable "History of Chemistry," ‡ has said, not without some reason, that

"Chemistry is a French science: it was founded by Lavoisier, of immortal memory. He was at once the author of a new theory, and the creator of the true method in chemistry, and the superiority of the method gave wings to the theory."

Instead of overturning gravitation, when it suited him, like Lucretius, he made it, in fact, the foundation of his science. But it must not be forgotten that

"Robert Boyle, the first President of the Royal Society of London, and likewise the first in date of the true chemists, had confirmed the fact previously noticed by Rey, that metals increase in weight when calcined in the air." §

* Address, &c., p. 11.

‡ An Introduction, &c., p. 5.

† Lib. i. lines 73, 74.

§ Idem, p. 8.

These observations, however, remained unfruitful, and it was the great merit of Lavoisier that he applied the balance to all chemical phenomena, and established chemistry as an exact science. Since his time chemistry has continually extended its discoveries and its triumphs; never abandoning the solid and sure ground I have indicated, that of weight and measure; but advancing its empire like the Romans, notwithstanding frequent defeats, and the abandonment of one theory after another, in obedience to the stern logic of fact.

Now Tyndall looks upon Descartes, who did not believe in atoms at all, as one of the two restorers of (atomic?) philosophy, and "the first to reduce, in a manner eminently capable of bearing the test" (not of the balance, but) "of mental presentation, vital phenomena to purely mechanical principles!"*

"Insight" then, and not "weight and measure," is the real test which is valuable in the sight of Tyndall; and *dogma*, and not *Science*, is the result.

But to extend the dominion of (supposed) chemical theory into the region of metaphysics, as in the Address at Belfast, is nothing less than treason against chemistry, and *crime de lèse majesté* against common sense!

It would be well if some of our philosophers would study Democritus in the rules which he proposes for the acquisition of peace of mind (*εὐθυμία*) as the end and ultimate object of our actions.

"Abstinence from too many occupations, a steady consideration of one's own powers, which prevents our attempting that which we cannot accomplish;" †

these are some of the means which he proposes for this end.

Democritus had a sufficient amount of common sense to understand that the soul is somehow altogether different from the body, and therefore he made the soul consist of fine, smooth, round atoms, like those of fire. "These are the most mobile of all. They inter-penetrate the whole body, and in their motions the phenomena of life arise."

This, the Professor indicates, arose from his not understanding the nervous system, ‡ "whose functions were *then* unknown."

He told us fourteen years ago, in the *Saturday Review*, "that every thought and every feeling has its definite *mechanical* correlative in the nervous system—that it is accompanied by a

* Address p. 21, and compare *Appendix*,

† Smith's *Dictionary of Biography, &c.*, *sub voce*.

‡ Address, p. 5.

certain separation and remarshalling of the atoms of the brain."

But if the atoms of the brain are really separated and re-marshalled in the course of every thought and feeling, they must be dissociated and reunited by a force more powerful than the ordinary chemical force which binds them together. What, then, is this superior force, and wherein does it reside? Not in matter, for we have seen that it acts upon matter and dissociates its particles. It is, then, an energy entirely unknown to Tyndall, and irreconcilable with all his ideas. It is and must be a tremendous force, such as that required to dissociate the atoms of water. He must have pondered over this question for fourteen years; and yet is no nearer to a solution than our Aryan ancestors, when they inquired (as we have seen), "Where is the soul?"

We have seen that our Professor's notions of matter were, in his youthful days, rather peculiar; but he has now discovered that this said matter is our master, and that "every meal we eat, and every cup we drink, illustrates the mysterious control of mind by matter."*

Moreover, matter is our god, which we must worship as the author and giver of life, for, "abandoning all disguise, the confession I feel *bound* to make before you is that I prolong the vision backward *across the boundary of the experimental evidence*, and *discern* in that matter, which we, in *our ignorance*, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium" (!) "*the promise and potency of all forms of life.*"*

To this, which he seems to think his "good confession," our author adheres in his preface to the seventh edition; so that it is no exaggeration to say that we have from Ireland the extraordinary spectacle of a religious teacher of Pantheism; and that not on the ground of experimental evidence, but on the internal light of the mind alone. "*Matter is raised to the level it ought to occupy*, and from which timid ignorance would remove it."†

It so happened that almost at the same time at which religious Ireland was thus lending her ear to the advocacy of materialism, the assembly took place of the French Association for the Advancement of Science; and in the introductory discourse, France—that country so often scourged by infidelity—did, greatly to her honour, and through one of her most illustrious

* Preface, p. xxv.

† Address, p. 5.

scientific sons,* render her homage to the one primary, alone, and universal cause of all things, God himself!

“Can such things be,
And overcome us like a summer cloud
Without our special wonder?”

PART II.

β. *The Chemical Argument.*

Remarkable as was the Address itself, the feeble amount of criticism with which its statements were received by the British Association is almost as remarkable. Amongst the multitude assembled—including, I presume, many clerical as well as lay members conversant more or less with chemical as well as with theological knowledge—there surely must have been those competent to trace out the plausible fallacies with which it abounds.

It now rests with me to affirm that modern chemistry has no imaginable connection with atheism. It is “the bold *ecclesiastic*” Gassendi, whom Tyndall seems to delight to follow. It is he who “applied the *known laws of mechanics* to the *atoms*, deducing *thence all vital phenomena*,” and consequently showed that “the principle of every change resides in matter.”

There can be no doubt that the atomic theory in its present form is one of the most extraordinary achievements of human intellect, whatever may be said against it metaphysically. Nor is it susceptible of doubt that the present chemical views of

* Extract from the “Discours d’Inauguration de la Troisième Session de l’Association Française pour l’Avancement des Sciences” (Lille, 20 Septembre, 1874), par M. A. Wurtz, Membre de l’Institut : La Théorie des Atomes dans la Conception générale du Monde :—

“Tel est l’ordre de la nature, et à mesure que la science y pénètre davantage, elle met à jour, en même temps que la simplicité des moyens mis en œuvre, la diversité infinie des résultats. Ainsi, à travers ce coin du voile qu’elle nous permet de soulever, elle nous laisse entrevoir tout ensemble l’harmonie et la profondeur du plan de l’univers. Quant aux causes premières, elles demeurent inaccessibles. Là commence un autre domaine que l’esprit humain sera toujours empressé d’aborder et de parcourir. Il est ainsi fait et vous ne le changerez pas. C’est en vain que la science lui aura révélé la structure du monde et l’ordre de tous les phénomènes : il veut remonter plus haut, et dans la conviction instinctive que les choses n’ont pas en elles-mêmes leur raison d’être, leur support et leur origine, il est conduit à les subordonner à une cause première, unique, universelle, DIEU.”

molecular organization are immensely in advance of the theory of atoms propounded by John Dalton.

When Tyndall, therefore, builds his doctrine of Pantheism on "molecular force becoming structural," he appears to the most part of his hearers to be crowning the edifice of well-established modern Science by an effort of scientific Imagination quite in accordance with, if passing a little beyond, the boundaries of rigid Baconian induction. But I trust to show that this is all delusion.

He begins with the doctrine advocated by Lucretius, which we have seen to be entirely mechanical. The poet's atoms take their place side by side, like the letters in a book, and their combination (if such it may be termed) entirely resembles that of the combination of letters to form a word.

This is not modern chemistry, nor is it, in any sense, connected with the doctrine of combination in *definite proportions*, from which (already laboured upon in measure by others) this great and profound thinker deduced his theory of the Universe.

To illustrate this by a comparison. Some one, in ages past, must have invented the merely mechanical mode of expressing numbers by the juxtaposition of units, thus representing ten 1111111111.

This was an achievement quite beyond the mind of a monkey, but how poor, after all, compared with the decimal system. Every one sees that it *was* a discovery to express the same by 10, and that the whole system of modern arithmetic is founded on the latter, and not on the former. It is remarkable that when Dalton leaned to a mechanical view of combination, as in advocating the one atom to one atom constitution of water, he fought against the strongest elucidation of his own theory from the beautiful researches of Gay-Lussac on the combination of gases by volume.

The doctrine of *atomicity*, in a *somewhat* similar manner, comes in to supplement without overthrowing the doctrine of *affinity*.

I had the opportunity of meeting John Dalton at the assembly of the British Association at Edinburgh, in 1834, and find by my notes that he then contended against Dr. Thompson, who advocated the existence of one-third-parts of atoms. I cannot find in the "Transactions" any mention of this discussion, and, therefore, give this simply as the record of my own impressions at the time. I was there with my father, who was with Dalton on the Committee of the Chemical Class, and contributed a paper on meteorology.

I have little doubt that the discussion was connected with the then somewhat *transitional* state of chemistry. This science

was going through a most important crisis, out of which Dalton's theory may be said to have emerged, fundamentally unimpaired, because it had a solid foundation. It was less a pure speculation than a theoretical representation of well-realized facts.* Dalton had ascertained that in the case in which two substances combine in several proportions, the quantity of one of them remained constant, whilst the quantity of the other varied according to very simple relations. The discovery of this fact was the point of departure for the atomic theory.

It was otherwise with the theory of Berzelius, a great chemist, and "the father of our modern analytical processes";† since he was, in one respect, seduced by a flattering appearance of things, not justified by the event. This has a special connection with my argument, because it is this exploded theory which serves to constitute the basis of Tyndall's speculations.

Berzelius compared his atoms to small loadstones.‡ He attributed to them two poles in which the electric fluids were distributed unequally, in such a manner that one of them was in excess at one of the poles. There exist, according to him, atoms with excess of positive fluid, and others with excess of negative fluid. The first attracts the second, and this attraction is the source of chemical affinity, and maintains the atoms in all their combinations. At the moment when these are formed, motion is created; but in the formed compound they are at rest, and, as it were, distributed into two camps, and kept in opposition by the two electric fluids of contrary name.

In order to account for binary combinations, Berzelius arranged bodies into electro-positive, as carbon and hydrogen, and electro-negative, as oxygen. He thus attempted to apply to organic chemistry the views which he had derived from the study of inorganic chemistry. But it would not succeed. As Dr. Wurtz well describes it, these notions "*ont abouté à une impasse.*"§ In proportion as the riches of the science augmented, it was necessary, in order to sustain the system, to heap up hypotheses (perhaps to divide atoms into three parts!) to construct more and

* *La Théorie des Atomes.* Wurtz, p. 15.

† *Introduction to Chemical Philosophy*, p. 16.

‡ *La Théorie*, &c., p. 67.

§ "Modern chemistry has changed all that. The discovery of substitutions struck the first blow at the electro-chemical theory; and chemists will recall that famous discussion in which Dumas proved that chlorine, an electro-negative element, could replace hydrogen, an electro-positive element—that chlorine could enter into organic molecules otherwise than by molecular addition. This was the commencement of the new chemistry. Gerhardt commenced by saying, 'combinations do not take place by molecular addition—everything is effected by substitution.'" — *Int to Chemical Philosophy*, by Dr. A. C. Wurtz, F.R.S., 1867, p. 32.

more complicated formulæ; until at length what has been termed the old chemistry and the dualistic ideas gave way before the vigorous assaults of two young Frenchmen, Laurent and Gerhardt. I should say that Dumas on the one side and Liebig on the other had pioneered the way by the more attentive study of compound bodies; and chlorine was found to overthrow the theory of Berzelius. But Dumas and Laurent expounded to us the doctrine of *molecular chemistry*. The chemical molecules were looked at *as a whole*, and compared by Dumas to planetary systems. These molecules could become modified by substitution; and it is in vain to say that this theory may fall like the preceding; because in thus seeking out the mode of the Creator we are permitted to become ourselves to a certain extent creators; and to alter these molecules at will, so as to produce new bodies which we think ought to exist. But *we know absolutely nothing of organization*, and no chemist can make the smallest approach to the formation of the most insignificant plant or insect.

Tyndall, for the construction of his organizing molecules, confounds all this together. He says:—

“The polarity of magnetism and electricity appealed to the senses, and thus became the substratum of the conception that atoms and molecules are endowed with definite attractive and repellent poles, by the play of which definite forms of crystalline architecture are produced. Thus molecular force becomes structural. It requires no great boldness of thought to extend its play into organic nature, and to recognize in molecular force the agency by which both plants and animals are built up.”*

We have here the exploded system of Berzelius made to account not only for dualistic compounds, but for all the organization which meets our view! This is neither the old chemistry nor the new chemistry, nor science in any shape; but simple and pure assertion—**DOGMA**, to be received and held on the authority of Tyndall alone!

The new chemistry has made us familiar with the doctrine of types (a wonderful display of the mind that regulates matter); and with the fundamental quality of atomicity which is essential to the formation of molecules. But Tyndall's atoms are devoid of “atomicity”; and his molecules are simply magnets, which yet, under his magic wand, become endowed with life, with will, and with the power to erect organic bodies!

It is really impossible, if we receive the teaching of modern chemistry, to avoid the conclusion that all the properties of matter are arranged by a mind of admirable skill and wisdom. There is here no question of evolution, nor, of teleology, nor of

* Address, p. 52.

natural selection; but such unity of design and infinitely diversified result as must command admiration in every mind that is not debased by its hatred to the conception of an infinitely powerful Ruler.

In all the chemical combinations and adaptations of matter we find something which delights our minds; as meeting our conceptions of that mathematical correctness and harmonious adaptation towards which our own desires (as regards our own productions) always tend. I have spoken of matter as *regulated* by mind, but I should rather have said *dominated* by mind; for we never find in atoms and molecules the slightest tendency to swerve from the absolute laws to which they are subjected. To speak of "promise" and "potency" and "instinct" and "desire"* is to transfer to the ultimate particles of matter words expressive of ideas which have no relation to the subject. It is to prove false to science by coquetting with the language of poetry!

When life, and consequent organization are present, we have no longer the power to express ourselves as I have done above. To illustrate this, without attempting explanation, let us take the case frequently occurring in the vegetable or animal world, of two germs cohering and interfering with each other's organization. Here we have two wholly different kingdoms coexisting, subject to different laws. All the chemical combinations have taken place, as they always do, with rigid and mathematical accuracy; whilst all the living germ combinations have been going wrong.

There never is, nor can be, anything *abnormal* in the structure of the molecules; whilst nothing is more common in organized vital structure.

When we extend our survey to the differentiated and individualized creatures, we find them not unfrequently departing more or less from their normal instincts, and suffering in consequence.

When we rise to the highest type—man himself—we find him ever rebelling against law, ever prone to transgress that which he knows to be the highest and best aim of his being.

"Video meliora proboque, deteriora sequor."

Wherever there is WILL, there is an element of uncertainty.

* Page 82. "The very molecules seem instinct with a desire for union and growth."

PART III.

The Conclusion.

No one can doubt the great abilities of Professor Tyndall as a lecturer ; but these very powers give him great control of an audience, and enable him to place all his characters before his hearers in the light which suits him best. We have in a sort of scenic representation an array of great names, who all are brought before us with the appearance of contributing their respective testimony to the truth of his assertion "that SCIENCE has in great part conquered the domain that was supposed to belong to religion." When interrogated, one by one, however, it is obvious that their witness agrees not together.

Did his Manchester audience really consent to view things exactly in the light in which Tyndall placed them? Were they all persuaded to believe that "the doctrine of the grand old Pagans, Democritus, Epicurus, and Lucretius really received its consummation at the hands of the immortal John Dalton?" Imagine the surprise of this most staid and rather precise north-country "Friend," who used to boast that he could carry on his back all the books he ever read—who never swerved from the paths of pure reason, nor ever brought to its consummation the theory of "*molecules*" at all—when charged with being the reviver of "the dangerous doctrine of the heathen"! Whatever the private sentiments of this "immortal" man might be on the subject of religion, the habitual reticence of his education probably did not allow him to divulge; and most certainly a charge of the above description would have raised in his mind profound wonder and disgust. His atomic views were essentially his own; and Europe did homage to the depth of his intellect, whilst at the same time England was allowing him to wear himself away in the laborious and ill-paid task of a schoolmaster!

I truly think his advice would have been to leave such subjects alone, and not to venture on themes which no one can understand.

I will refer, in the next place, to Mr. Darwin, as one who has deeply influenced the scientific, and perhaps still more, the *pseudo*-scientific mind of our era. It is not necessary that I should express my sincere acquiescence in the universal tribute of admiration to the eminence of this gentleman as a Naturalist; from which concession it must not be inferred that I accept either in whole or in part his ex-

planation of the order of Nature. But, as a witness, to be summoned on behalf of Atheism, Tyndall is himself aware that Darwin's testimony is all the other way. Not only has he brought forward the most beautiful and striking evidence of adaptation in the works of nature; but, if I understand aright, he looks upon all its parts of one great *design*, though he may regard the results as wrought mediately, rather than immediately. But Tyndall tells us that Darwin "rejects teleology, seeking to refer these wonders to natural causes." They illustrate, according to him, "the method of Nature, not the technic of a man-like artificer."*

This is *Tyndall on Darwin!* But we have not Mr. Darwin's authorization of Tyndall as his interpreter. However, let this pass; for the undeniable fact remains that the foundation of Darwin's theory is *not* Atheism, but that it imperatively requires that to which its author frequently reverts—the original creation of things by Divine power.

So Tyndall unkindly turns round upon him with these crushing observations:—

"What Mr. Darwin thinks of this view of the introduction of life I do not know. But the anthropomorphism (!) which it seemed his object to set aside, is as firmly associated with the creation of a few forms as with the creation of a multitude. We need clearness and thoroughness here. Two courses, and two only, are possible. Either let us open our doors freely to the conception of creative acts, or, abandoning them, let us radically change our notions of matter."†

Truly a change somewhere appears desirable, for Tyndall describes with evident approbation and adhesion the notions of Bruno.

"The infinity of forms under which matter appears were not imposed upon it by an external artificer: by its own intrinsic force and virtue it brings these forms forth. Matter is not the mere empty capacity which philosophers have pictured her to be, but the universal mother who brings forth all things as the fruit of her own womb."‡

But what about the *paternity* of the offspring? The universal *father* is not forthcoming. By taking one-half of the old fable of "Heaven and Earth," and obliterating the other, our scientific moderns have made nonsense of the whole.

It would be tedious to multiply examples of the skill of the writer. No doubt, as the author of "*Heat as a Mode of Motion*," he is able to expound to us the theory of La Place. "According to it, our sun and planets were once diffused through space as an impalpable haze, out of which by condensation came

* Page 42. Is it in reference to this that Tyndall quotes "It were better to have no opinion of God at all, than such an one as is unworthy of Him; for the one is unbelief, the other is contumely" ? (BACON.)

† Page 54.

‡ Page 20.

the solar system. What caused the haze to condense? Loss of heat" (that is to say of motion). So loss of motion produces motion, and "the nebulae and the solar system, life *included*, stand to each other in a relation resembling that of the germ to the finished organism"—man is originally the product of "a loss of motion"!*

I cannot allow Tyndall to summon Kant to his aid without a protest, because this illustrious reasoner has in a few words defined a truth which scatters the whole of the Professor's philosophy to the winds.

"*The cause of the particular mode of existence of a living body resides IN THE WHOLE.*"

What, then, becomes of "*molecular organization*," or a power residing in the molecules—that is to say, in an almost infinite number of *parts*? †

I cannot follow out the metaphysical views of our author, nor do I know whether he does justice to those whom he quotes. To use his own expressions, "a word-weariness has taken possession of my mind. I am sick of (metaphysical) philosophy and its verbal wastes, which lead to no issue and leave the intellect in an everlasting haze." ‡ But on one point he shall not find me slumbering, as he does his imaginary bishop—aware, perhaps, that it is not uncommon for admissions to be made under such circumstances.

"I admit," says this imaginary bishop, "that you can build crystalline forms out of this play of molecular force; that the diamond, amethyst, and snow-star are truly wonderful structures which are thus produced. I will go *further*, and acknowledge that even a tree or a flower might in this way be organized."

Before thus giving up the whole question, I should require a refutation of the above doctrine of Kant; which, however, is so unquestionably the truth as to be continually reckoned upon as such by those who have to do with organized structures, whether of plants or animals.

It would be necessary, also, that we should be certified concerning the recondite causes of the fact that the most skilful physicists, and the most eminent microscopists, find themselves face to face with § "phenomena, which we at present call vital, because we do not know any physical causes for them."

* Preface, p. xv.

† See Müller's *Elements of Physiology*, vol. i. pp. 19-26.

‡ Address, p. 18.

§ See works of Dr. Lionel Beale, *passim*; and, as to plant life, "The Action of the induced Current upon the intra-cellular Protoplasmic Circulation in Plants," by Henry Poeklington, F.R.M.S., *Pharm. Journal*, March, 1875, from which I take the above quotation.

Dr. Lionel Beale, who uses the most powerful microscopes in the world, declares that no molecular force will account for the remarkable changes which occur in living matter.

Even Tyndall believes in "a power of organizing experience furnished at the outset to each *individual*"; "possessed in different degrees by different races and by different individuals of the same race." "Were there not in the human brain" (he says) "a *potency* antecedent to all experience, a dog or cat ought to be as capable of education as a man."*

In his most recent revision of his opinions † he tells us that "when we endeavour to pass from the physics of the brain to the phenomena of consciousness, we meet a problem which transcends any conceivable expansion of the powers we now possess. We may think over the subject again and again, it eludes all intellectual presentation,—*we stand at length face to face with the Incomprehensible.*"

This is all very evidently true, but Herbert Spencer, as quoted by Tyndall, ‡ is not content to leave us in our ignorance, without affording us an incomprehensible explanation of his own; according to which "the human brain is the organized register of infinitely numerous experiences received during the evolution of life, or rather during the evolution of that series of organisms through which the human organism has been reached. The effects of the most uniform and frequent of these experiences have been successively bequeathed,—principal and interest, and have slowly amounted to that high intelligence which lies latent in the brain of the infant; thus it happens that the European inherits from 20 to 30 cubic inches more of brain than the Papuan."

Such *latent intelligence*, if made the subject of speculation at all, ought surely to be thought of in connection with the $\psi\upsilon\chi\acute{\eta}$ or soul; for it is impossible to conceive of such powers as attached to the atoms of which the brain is composed; which do not differ at all from those of the air which the man breathes or the dust on which he treads.

If this materialism be the meaning of Spencer, he appears to have succeeded no better than his predecessors in lifting the veil of Nature; and the assistance of this § "Apostle of the Understanding" is of no avail in extricating Tyndall from the difficult position in which, by his own confession, we find him placed above.

If, however, our professor be compelled to admit that there is something more in man than atomic substance—that he is com-

* Page 52.

† Page 52.

‡ Preface, p. xxix.

§ Page 49.

posed of **BODY**, **SOUL**, and **SPIRIT**—the entire purport of “the Address” disappears ; and the stately edifice of molecular and materialistic philosophy crumbles into dust !

On the whole, it appears to me that throughout the very elaborate and skilfully concocted dissertation under our notice, nothing is so much proved as the skill of the lecturer, by which he succeeded in entangling his hearers in a labyrinth, from which they found no clue to escape ; preferring to place themselves at the disposal of this master of the art of captivating the minds of the multitude !

“*Cogito, ergo sum* !” according to Descartes, is the best proof of a man’s own existence. What shall we say, then, of those who never think for themselves, but only hang on the words of their favoured orator ? I cannot understand the reception of such an Address by the body of persons to whom it was delivered, except upon the supposition that his hearers trusted themselves implicitly to the guidance of a great name !

The British Association for the Advancement of Science ought surely to have considered whether Science can be advanced through a departure from the only paths by which it has arrived at results truly beneficial to mankind.

* * * All the above quotations from Professor Tyndall are from the Edition of the Seventh Thousand “with additions.”

APPENDIX.

PHILOSOPHY AS “RESTORED” BY DESCARTES.

“It may prove instructive to the student and general reader to make a brief allusion to Descartes’s doctrine of *Vortices*, by which he attempted to explain the phenomena of the material world, and which created such a lively interest among the literati of Europe when it was first published.

“He maintains there is nothing but substance in the universe. This is divided into two kinds ; one a spiritual, or thinking, and the other an extended substance. Descartes affirms there can be no vacuum in nature ; that the world is full ; as everything which is extended is matter.

“Now he supposes that the Deity created matter of an indefinite extension ; that it was portioned out into little small square patches full of angles ; that it was, by His sovereign power, impressed with two motions. One which made each part revolve round its own centre ; and one which enabled an assemblage of these patches to turn round a common centre ; and thus as many different vortices or eddies were created as there were masses of matter created.

“The mode of operation is thus unfolded by Descartes. The various

angular masses of matter could not move amongst each other without breaking off their angles ; and this necessary friction of the different parts would produce three elements. The first a fine dust, formed from the broken angles ; the second, the spheres formed after their angularity was destroyed ; and the third, those spheres whose angles might remain entire, or be only partially destroyed.

“The dust, or the first of the three elements, would, according to the established laws of motion, take its place in the centre of such system or vortex, on account of its diminutive parts ; and this Descartes thinks, constitutes the sun and fixed stars. The second part, rendered smooth by the destruction of its angles, constitutes the atmosphere. The third element, with a portion of its angles, forms the earth, comets, &c. This is a concise view of this celebrated theory of vortices.”—*History of the Philosophy of Mind*, by R. BLAKEY, vol. ii. pp. 230, 231.

The CHAIRMAN.—I am sure the meeting will return their thanks to Mr. Howard for his valuable and interesting paper.

The HON. SECRETARY.—Before the discussion commences I have to state that Professor Tyndall is prevented from being present on account of a prior engagement in this neighbourhood.

Dr. H. COLEMAN.—In the first place I take exception to Mr. Howard's statement that the Greeks knew nothing of exact science. Certainly, if he restricted that to the higher departments of Natural Science, it might be true, otherwise the assertion is not susceptible of proof. I would call his attention to the speculations of Aristotle in his *Natural History*, and his treatise on the *Principle of Life*, and ask whether he has reviewed Cicero's *De Natura*. I think Mr. Howard has shown the point he set about to prove, namely, that Professor Tyndall favours materialism ; but I wish he had gone further and told us why he did so. It is much to be regretted that treatises like Professor Tyndall's, which tend to Scepticism, receive so much support in the present day ; but I think it is because Scepticism is the only speculative school cultivated in England, and hence the great development of sceptical principles ; and we want, not to prove that these materialistic theories exist, but to account for their existence, and to devise a definite way of meeting them.

Mr. L. T. DIBDIN.—I feel towards Professor Tyndall's address much as the friend of Lysias, in Plutarch's story, did towards his defence. I admired it much on the first reading ; on the third thought it inconclusive. Though I cannot answer the address as Mr. Howard has done, I agree with that gentleman in his argument, and cannot follow Dr. Coleman in his objections to it. But I want to draw attention to a little bit of mental philosophy,

touched upon at the end of Mr. Howard's paper: I refer to the supposed discussion between a Lucretian and Bishop Butler. The Bishop, it is well known, maintained what is called the theory of living agents,—that the body is but an instrument of the soul. The supposed Lucretian brings forward objections to that view which are a characteristic specimen of Professor Tyndall's reasoning. "The true self," he argues, "has a local habitation in each of us, and therefore must possess a form." Is this correct? Has the true self a local habitation? And even if it were localized, would it necessarily possess a form? Then the Professor goes on, "When a limb is amputated, the body is divided into two parts; is the true self in both or in one? You say, in the one which retains consciousness. What do you make of the case where the whole body loses consciousness? Is the true self lost?" Now Butler's argument is this: "Why should we suppose that the soul perishes when the body is destroyed? We may lose large portions of matter without losing any portion of the soul; legs or arms may be removed, but still the self remains intact; why should we suppose the dissolution of all the body to be the destruction of the soul?" He lays down that where consciousness is, the self must be, but not, as Tyndall assumes, the converse, that where the self is there consciousness must be; he does not endeavour to show that consciousness is necessary to the existence of the soul, but only that where consciousness is there the whole self is, and that there is none in the amputated limb. "But," says the Professor, "you never mention the brain or nervous system. The brain cannot be removed without prejudice to the perceiving power." What of that? Butler's argument is that a portion of the body may be removed, and consciousness yet remain; that is not touched by saying that there are parts which cannot be removed without loss of consciousness. The Professor proceeds to draw a distinction between the nervous system and the instruments of a telegraph operator. "Destroy these," he says, "and you sever his connection with the world, but the man still survives, and knows that he survives. What is there that answers to this consciousness, when the battery of the brain is disturbed so as to produce insensibility, or destroyed altogether?" The illustration seems rather to tell on Butler's side; the Professor begs the whole question. What is there to prove that the man does not exist after the body is destroyed? Can any one say he does not? Butler himself might have used the illustration, had the electric telegraph been known in his day. The only evidence of the existence of the operator to the people to whom the message is sent is that they get it, and when the machine is broken they have no proof that the operator survives. Just so when the body is destroyed the evidence to the outside world of the man's existence is at an end; but it does not follow that he ceases to exist. There is much that is amusing in the way in which the Professor compliments himself through the medium of the two interlocutors; but I will only trouble you with a word or two on the whole scope of his address. Its object is to show that philosophy has been all along working towards the point at which he imagines himself and all scientific people

to be about to arrive. Here he has failed. He shrinks from post-Christian philosophy, for that, he says, must necessarily owe something to Christianity; he quotes Epicurus and Descartes with approval, but is obliged to explain away the fact that both believed in a Creator. And he does not tell us, as he ought to do, how matter first began, nor what was the origin of life. In short, he seems to put it thus: "Much evidence has been brought out, but it is not complete, and therefore we request you to accept our conclusions without evidence; and if you will not do so, you must be content to be included among those who stagnate in the stillness of a swamp."

Mr. T. W. MASTERMAN.—With regard to Mr. Howard's remarks on the testimony of History in regard to deity, I think it will always be found that, however far we may go back, both in the monumental and written history of any country, we shall always find that there has been a belief in a deity and a sacrifice to him.

Dr. E. HAUGHTON.—May I venture to say that I think it would have been better had Mr. Howard's otherwise admirable paper contained more quotations from Professor Tyndall's address.

Mr. D. HOWARD.—Lord Bacon's *Novum Organon* may be very profitably studied in connection with much more modern controversies. It is a great pity that Professor Tyndall has not given a true representation of the great thinkers that preceded him, instead of belabouring a straw bishop. It may fairly be said that the Greeks had no science in our sense, for they had not that accurate putting together of facts by induction which we call science, but as metaphysicians they were certainly far superior to us. I must confess I do not entirely share the doubt expressed as to the meaning of Tyndall's system; we have arrived at an important point in modern science, we have learnt very much about the brain, but are we one bit nearer knowing the telegraph operator in the brain; and the whole point is simply this,—our material studies, however far they are carried, lead up to something entirely apart from and beyond matter, which, call it what you will, we must face. The simplest name as well as the truest is "the Will of God," and this answer to the question, "What is it?" is far more truly scientific than that of the pantheist which ascribes it to a universal intellect or some other such term, which is but a confession of ignorance. Tyndall is no more able to solve the question, "What underlies Phenomena?" than were the Greek philosophers two thousand years ago.

Captain F. PETRIE.—I would venture to call attention to some errors contained in the historical sketch given by Professor Tyndall in his Belfast address, my attention having been drawn to them when reading some remarks recently made by Dr. McCosh, and I cannot do better than give his words:—"Professor Tyndall talks of Empedocles 'noticing the gap in the doctrines of Democritus,' whereas, every tyro in philosophy knows that Empedocles came before Democritus. Speaking of the centuries lying between Democritus and Lucretius, he makes Pythagoras then perform 'his experiments on the harmonic intervals,' as if Pythagoras

had not died before Democritus was born. He represents Aristotle as preaching induction without practising it, whereas he did practise induction in his *Natural History*, but certainly did not preach it as Bacon afterwards did. He ascribes, it could be shown, a doctrine to Protagoras the Sophist which no scholar would attribute to him. A writer (Thomas Davidson) in the October (1874) number of the *Journal of Speculative Philosophy*, proves that he has not given a thoroughly correct account even of the philosophy of his favourite Democritus, whom he represents as making all the varieties of things depend on the varieties of atoms in number, size, and aggregation, whereas Aristotle, the only original authority on this subject, says that he made them depend on the figure, aggregation, and position. In the same article it is shown that Dr. Tyndall mistakes throughout, in the few allusions he makes to Aristotle."

The CHAIRMAN.—With reference to what fell from Dr. Coleman, I understood him to express a wish that there should be something more positive in this paper—that we should have something about the reason of scepticism, and how best to meet it. I think that if we went into these questions we should be exceeding our limits as a scientific society. I do not charge sceptics with conscious dishonesty ; no man has a right to make that charge against any other ; but in the case of some sceptics with whom I am intimately acquainted, who profess to be honestly seeking the truth, it is easy to be seen that there is in their minds a bias which makes them cling to every difficulty. They believe they are seeking the truth, but they are not seeking it with unbiassed minds, and I cannot but think that scepticism is mainly founded on a distaste to revelation, often working unconsciously in the minds of those who say they would be glad to believe. To enter into such considerations is foreign to our object ; all we can do is to deal with two branches of the subject. We may show, as far as we can, that science tends in some degree to confirm revelation, and that there is nothing in scientific discovery which properly tends to produce a sceptical frame of mind. I think that Professor Tyndall himself really adduces strong arguments in favour of religion when he admits that physical science is not sufficient to satisfy the wants of the human mind, and when he endorses the opinion of Herbert Spencer, that evolution involves an inscrutable mystery which man cannot fathom. He might have gone further and have said that the simplest facts around us involve a mystery which we cannot fathom. Take one of the most familiar, that of a stone falling to the ground ; we say that it falls because the earth attracts it, but this is only a statement of the fact that there is some cause which induces one particle of matter to move towards another. We are surrounded by mystery. That one mass of matter should thus act upon another at a distance has been pronounced by one of the greatest of modern philosophers to be inexplicable, and the only ground on which the mind can take refuge is that there is a God who is the main-spring of creation. The other branch, which naturally is chiefly dealt with here, is the answering particular objections which scientific men bring

forward in favour of scepticism or to oppose revelation. I think, therefore, that this society is necessarily confined within limits which prevent its entering usefully or properly into the wider field which Dr. Coleman has proposed for it. (Cheers.)

Mr. J. E. HOWARD.—In reply to Dr. Coleman, and in defence of the course I have pursued, I would mention that Professor Tyndall's address has been republished, together with another lecture by him called *Science Lectures for the People: Crystalline and Molecular Forces*. The copy which I have is one of the seventh thousand, consequently the doctrines taught go forth very widely among intelligent people on the authority of a man who is much admired. How are we to meet this? Certainly by plain speaking rather than by taking refuge in mysticism. It would be a superfluous task to combat imaginary theories, propounded by imaginary nonentities. No one would listen to us, and we should not increase in any way the value of the Institute. The next objection which has been made to my paper was in reference to my having said that the Greeks knew nothing of exact science. Of course, I did not speak of mathematics, but of their ignorance of science in the modern acceptation of the term. Dr. Coleman sends me to Cicero's *De Naturâ Deorum*. But what does this book teach of exact science? Dr. Coleman censures me for not having given reasons for the spirit of scepticism, and for not having shown how it was to be met. Well, I never undertook to write on those subjects, or to *prove* that Professor Tyndall is a Pantheist. In my opinion there is no need for this, as he seems to tell us that unhappy fact most distinctly himself. In answer to what was said by Dr. Haughton as to the absence of quotations, I must say that I thought I had given plenty. But whether I have done so or not, I feel certain that I have not misrepresented the sentiments of Professor Tyndall. If he had been here, as he was invited to be, I am confident that he would not complain that I have misrepresented him in any way. These are the chief objections that I have to answer, as I have noted them down, at least so far as the discussion seems to warrant.

The meeting was then adjourned.

ANNUAL GENERAL MEETING,
HELD AT THE HOUSE OF THE SOCIETY OF ARTS,
MONDAY, JUNE 7TH, 1875.

THE RIGHT HONOURABLE THE EARL OF SHAFTESBURY, K.G.,
PRESIDENT, IN THE CHAIR.

The HONORARY SECRETARY, Capt. F. PETRIE, read the following report:—

*NINTH ANNUAL REPORT of the Council of the
VICTORIA INSTITUTE, OR PHILOSOPHICAL SOCIETY OF
GREAT BRITAIN.*

Progress of the Institute.

1. IN presenting the NINTH ANNUAL REPORT, the Council desires to congratulate the Members and Associates on the general improvement which has taken place as regards the progress of the Society, which progress the Council has always felt rested, in no small degree, with the Members and Associates themselves; and this feeling has certainly become very general in the Institute, and has contributed to the firmness of that support which all have given, and which has tended not only to the Institute's strength and stability, but to increase public confidence in it. During the past year the number of new Members and Associates joining has been greater than in any previous year. The increase in the number of foreign and colonial Members has been very marked of late.

2. The election of the Vice-Presidents and Council has been carried out in accordance with the proposition agreed to at the last Annual Meeting; namely, by voting lists being forwarded to the members. The following have been elected:—

President.—The Right Honourable the EARL OF SHAFTESBURY, K.G.

Vice-Presidents.

PHILIP HENRY GOSSE, Esq., F.R.S.

CHARLES BROOKE, Esq., M.A., F.R.S., P.R.M.S., &c.

Rev. ROBINSON THORNTON, D.D. C. B. RADCLIFFE, Esq., M.D., &c.

W. FORSYTH, Esq., Q.C., LL.D., M.P. Rev. Principal T. P. BOULTBEE, LL.D.

Hon. Treasurer.—WILLIAM NOWELL WEST, Esq.

Hon. Sec. and Editor of Journal.—Capt. F. W. H. PETRIE, F.G.S., F.R.S.L., &c.

Hon. Foreign Secretary.—EDWARD J. MORSEHEAD, Esq., H.M.C.S.

Council.

ROBERT BAXTER, Esq. (<i>Trustee</i>).	Rev. Canon TITCOMB, M.A.
Rev. A. DE LA MARE, M.A.	J. A. FRASER, Esq., M.D., I.G.H.
Rear-Admiral E. G. FISHBOURNE, R.N., C.B.	Rev. G. HENSLOW, M.A., F.L.S.
R. N. FOWLER, Esq. (<i>Trustee</i>).	Rev. CHARLES GRAHAM.
WILLIAM H. INCE, Esq., F.L.S., F.R.M.S.	T. W. MASTERMAN, Esq.
ALEX. M'ARTHUR, Esq., M.P.	H. CADMAN JONES, Esq., Barrister-at- Law.
ALFRED V. NEWTON, Esq.	Rev. J. G. WOOD, M.A., F.L.S., &c.
WILLIAM M. ORD, Esq., M.D.	Rev. W. ARTHUR, D.D.
S. D. WADDY, Esq., Q.C., M.P.	C. R. BREE, Esq., M.D., F.Z.S.
WILLIAM VANNER, Esq., F.R.M.S.	JOHN ELIOT HOWARD, Esq., F.R.S.
ALFRED J. WOODHOUSE, Esq., F.R.M.S.	Rev. G. W. WELDON, M.A., M.B.
Rev. J. H. RIGG, D.D.	Rev. Principal J. ANGUS, M.A., D.D.
Rev. Prebendary ROW, M.A.	J. BATEMAN, Esq., F.R.S., F.L.S.
	The Master of the Charterhouse.

3. It is hoped that the Institute will ere long be in a position to revive the office of secretary, the duties of which have been provisionally performed by the Honorary Secretary, since January, 1871.

4. The terms under which the Institute held its late premises being unrenovable, owing to their dilapidated condition, the Council last autumn secured the most convenient new premises obtainable: happily these afford the same accommodation as the old, and are on the same terrace. The rental is higher, owing to the great rise in rents since 1869, when the arrangement was made for the late premises.

5. The number of societies both at home and abroad exchanging Transactions with the Institute is increasing, and the library has received many valuable additions. It is hoped that soon, by the aid of the members, the Institute will possess a larger library fund, and that which is much needed—a good library of reference.

6. The Council regrets to announce the decease of the following valued supporters of the Institute:—

Benjamin Bond Cabbell, Esq., M.A., F.R.S. (Vice-Patron); the Ven. Archdeacon Philip Freeman, M.A. (Associate); Robert Hardwicke, Esq. (Foundation Member); the Rev. Prebendary Charles Kemble, M.A. (Foundation Member); John Laird, Esq., M.P. (Member); William Leaf, Esq. (Member); Charles Lloyd, Esq. (Member); Professor William Macdonald, M.D., F.R.S.E. (Foundation Member); Iltudus T. Prichard, Esq. (Member), for some time a zealous member of the Council, where his high character and talents were of no small value to the Institute; Rev. Canon W. Selwyn, D.D., Margaret Professor of Divinity at Cambridge (Associate); Professor Constantin de Tischendorf, D.C.L., LL.D. (Hon. Foreign Correspondent); the Rev. Prebendary John Twells, M.A. (Foundation Member); the Rev. B. S. Vallack, B.A. (Foundation Member); the Rev. J. C. Vivian (Associate).

7. The following is a statement of the changes which have occurred during the past twelve months :—

	Life		Annual	
	Members.	Associates.	Members.	Associates.
Numbers on 1st June, 1874 ...	27	10	265	190
Deduct deaths ...	1	—	9	3
	<hr/>		<hr/>	<hr/>
	26		256	187
Withdrawn	—	—	6	6*
			<hr/>	<hr/>
			250	181
Struck out	—	—	2	
			<hr/>	<hr/>
			248	181
Changes	—	+1	+6	-7
		<hr/>	<hr/>	<hr/>
		11	254	174
Joined between June 1st, 1874, and June 1st, 1875	3	2	40	74
	<hr/>	<hr/>	<hr/>	<hr/>
	29	13	294	248
	<hr/>		<hr/>	
	42		542	
Total			584†	

Hon. Foreign Correspondents and Local Secretaries, 11.

Finance.

8. The Audited Balance Sheet of the Treasurer for the year ending 31st December, 1874, is appended, showing a balance in hand of £35. 10s. 3d. It will be observed that the Balance Sheet has been divided into two portions, one headed "General Account," exhibiting a balance in hand of £23. 2s. 8d.; the other entitled the "Special Fund for Library," &c., showing

* It has often been gratifying to find that the support of the very few who have retired has not been entirely withdrawn, some having continued as honorary local secretaries, or sought to further the Institute's interests in some other way, others having expressed an intention of rejoining.

† Joined beginning of June, 5 Members and 5 Associates; total, 594, and 11 = 605. The total number on the 1st of January, 1871, was 201.

a balance in hand of £12. 7s. 7d. The total amount now invested in the New Three per Cent. Annuities is £547. 15s. 11d.

9. The arrears of subscription are now as follows:—

	1872.	1873.	1874.
Members	1	5	6
Associates	1	1	4
	<hr/>	<hr/>	<hr/>
	2	6	10

10. The estimated ordinary assets of the Institute for the current year, exclusive of arrears and of new subscribers, are as follows:—

Annual Subscribers.		
294 Members, at £2. 2s.		£617 8
248 Associates, at £1. 1s.		260 8
Vice-Patrons, Life Members, and Life Associates.		
(Dividend on £547. 15s. 11d. Three per Cent. Stock).....		15 16
		<hr/>
Total.....		£893 12

Meetings.

11. The following is a list of the papers for the present session, viz.:—

- “On the Bearing of certain Palæontological Facts upon the Darwinian Theory of the Origin of Species, and of Evolution in General.” By Professor H. A. NICHOLSON, M.D., D.Sc., F.G.S., &c. December 7, 1874.
- “The Early Dawn of Civilization, considered in the Light of Scripture.” By J. E. HOWARD, Esq., F.R.S. January 4, 1875.
- “Observations on some Remarks upon Teleology and Morality by Professor T. H. Huxley.” By the Rev. G. HENSLOW, M.A., F.G.S. (Intermediate, January 18.)
- “The Indestructibility of Force.” By Professor T. R. BIRKS, M.A. (Cambridge). February 1.
- “On Mr. Mill’s Essays on Theism.” By the Rev. Prebendary W. J. IRONS, D.D. (Intermediate, February 15.)
- “On the Chronology of Recent Geology.” By S. R. PATTISON, Esq., F.G.S. March 1.
- “On the Nature and Character of Evidence for Scientific Purposes.” By the Rev. J. M’CANN, D.D. (Intermediate, March 15.)

- “The Relation of the Scripture Account of the Deluge to Physical Science.”
By Professor CHALLIS, M.A., F.R.S., F.R.A.S. April 5.
- “The Connection between the Philosophy of Locke and the Sceptical Principles of the Day.” By H. COLEMAN, Esq., LL.D. (Intermediate, April 19.)
- “An Examination of the Belfast Address from a Scientific point of view.”
By J. E. HOWARD, Esq., F.R.S. May 3.
- Annual Address (*at the Society of Arts' House*). By the Rev. ROBERT MAIN, M.A., F.R.S., V.P.R.A.S., *The Radcliffe Observer*. June 7.—*Anniversary*.
- “On the Etruscan Language.” By Rev. I. TAYLOR, M.A. (*At the Society of Arts' House*. June 21.)

12. The meetings during this session have been as well attended as usual, the Anniversary, and the meeting of the 21st of June being held at the House of the Society of Arts, the rooms of the Institute not affording adequate accommodation.

Publications.

13. The Eighth Volume of the *Journal of Transactions* has been issued, and the several quarterly parts for the current year will appear in due course.

14. In the publication of the *Transactions*, the Council has been careful to include in Editorial notes, and in what may be called “after-papers,” any special points which arose in the papers or discussions themselves, but were not taken up during the meetings. The “after papers” already contributed to the present volume are by Professor Challis, F.R.S., Principal Dawson, F.R.S., and Dr. S. Birch (President of the Society of Biblical Archæology).—

15. The importance of securing a wider circulation for the Institute's Publications has induced the Council—*First*, to publish an increased number of the *Journal*; *Secondly*, to extend the “People's Edition” of the more popular recent Papers, four of which are now issued in this form, and have been largely sought for, especially for circulation amongst friends, and distribution amongst the working classes in manufacturing, mining, and other districts; the Council, however, regret that the means at their disposal have not allowed them to comply with several requests for *grants* of papers for the latter purpose: to obviate this difficulty, and in deference to the wish of many members, a “People's Edition Fund” has been established, to which some, even non-Members, have already sent donations:—(a good fund would be a very

valuable aid to the Institute's work). Twenty thousand copies of the Institute's publications have been published within the last few months. *Thirdly*, to establish agencies in the larger towns of the United Kingdom, so that the publications might be more easily procured by the general public. *Fourthly*, to increase the number of foreign correspondents and local honorary secretaries at home and abroad.

More would have been done last year to extend the Institute's work, now so necessary, and for which the opportunity is so favourable, but that the funds—even with the small amount charged to salaries since 1870 (from £32 to £39 per annum)—did not admit of it.

16. The results of the sales of the Institute's Publications have again doubled, as has been the case in each succeeding year since 1870.

Conclusion.

17. As regards the work in which the Institute is engaged, it is eminently satisfactory to see the important place given to Scientific Research during the past two years, and the encouragement it receives from many governments, notably in the case of the late transit, in urging adequate preparations for observing which, this Institute had the privilege of joining with them. The progress of Science, in the development of scientific facts, is the surest mode of preventing that antagonism between the Book of Nature and the Book of Revelation which obtains when *scientific conjecture* takes the place of *accurate inquiry*.

18. Finally, the Council desires to state that the thorough efficiency of the work of the Institute is most important, and the present Members and Associates may greatly contribute thereto by introducing new Members and Associates; the future of the VICTORIA INSTITUTE rests in no small degree with its present supporters; and that it ought to be no small Society, considering the interests at stake, and the important objects which it seeks to accomplish, all will acknowledge;—that it was needed and can do good service has been fully proved.

Signed on behalf of the Council,

SHAFTESBURY, *President.*

The following Balance-sheet was then read:—

NINTH ANNUAL BALANCE SHEET, from 1st January to 31st December, 1874.

GENERAL ACCOUNT.

RECEIPTS.				£.	s.	d.
Balance from 1873, brought forward	8	15	7
Subscriptions:—						
1 Life Member ...	...	...	21	0	0
1 Member for 1872 ...	...	...	2	2	0
6 " 1873 ...	...	...	12	12	0
251 " 1874 ...	...	...	527	2	0
11 " 1875 ...	...	...	23	2	0
1 " 1876 ...	...	...	2	2	0
134 Entrance fees ...	...	...	35	14	0
2 Life Asso. (less £7.2s. paid already)	...	...	13	18	0
2 Associates, 1873 ...	...	...	2	2	0
180 " 1874 ...	...	...	189	0	0
17 " 1875 ...	...	...	17	17	0
			846	11	0	
Six months' Dividend on £518 11 1		{ New 3 per Cent. }	15	16	7	
" " 547 15 11		{ Annuities ... }				
Sale of Journals ...	...	...	103	1	5
			£974	4	7	

EXPENDITURE.				£.	s.	d.
Printing ...	...	...	...	336	2	0
Binding ...	...	...	...	24	12	6
Reporting ...	...	...	...	33	12	0
Translating ...	...	...	...	7	7	0
Stationery ...	...	...	...	31	7	4
Postage ...	...	...	...	80	1	1
Advertising ...	...	...	...	56	13	5
Expenses of the Meetings ...	...	...	...	19	7	6
Rent to Christmas, 1874 ...	...	...	...	129	1	3
Rent for Clerk ...	...	...	...	5	5	0
Salaries (for the year-1874) ...	...	...	...	39	5	4
Housekeeper ...	...	...	...	19	15	0
Travelling Expenses ...	...	...	...	15	0	5
Coals ...	...	...	...	7	3	11
Gas ...	...	...	...	5	5	10
Insurance ...	...	...	...	0	12	0
Sundry Office Expenses ...	...	...	...	12	18	8
Toward Expenses of the Hon. Sec. ...	...	...	...	100	0	0†
Bankers' Charges ...	...	...	...	0	9	2
Investments—£29. 4s. 10d. New 3 per Cent. Annuities	...	...	...	27	2	6
Balance at the Bankers ...	...	...	...	23	2	8*
				£974	4	7

SPECIAL FUND FOR LIBRARY, &c.

	£.	s.	d.
Balance brought forward from 1873	16 15 5
Subscriptions	22 2 0
			£38 17 5

	£.	s.	d.
Books, Repairs, &c.	26 9 10
Balance at the Bankers	12 7 7*
			£38 17 5

We have examined the Balance Sheet with the Books and Vouchers, and find a Balance in hand at the Bankers of £35. 10s. 3d.*

{ G. C. HARRISON, }
 { JOHN ALLEN, } Auditors.
 W. N. WEST, Treasurer.

† See Section 3.

DONATIONS TO THE ENDOWMENT FUND.

1873.	£.	s.	d.
C. J. BEVAN, Esq. (non-member)	10	10	0
C. W. H. WYMAN, Esq.	1	1	0

DONATIONS TO THE LIBRARY FUND.

1869.	£.	s.	d.
S. MORLEY, Esq., M.P.	100	0	0
I. BRAITHWAITE, Esq.	25	0	0
R. MULLINGS, Esq.	10	0	0
Dr. J. H. WHEATLEY	10	0	0
H. W. BLEBY, Esq., B.A.	5	0	0
T. PROTHERO, Esq.	3	3	0
A. J. WOODHOUSE, Esq.	3	3	0
W. N. WEST, Esq.	2	2	0
G. WILLIAMS, Esq.	1	1	0
Rev. J. H. RIGG, D.D.	1	1	0

1870.

ROBERT BAXTER, Esq.	52	10	0
W. MCARTHUR, Esq., M.P.	21	0	0
JOHN NAPIER, Esq., <i>Glasgow</i>	10	0	0
W. VANNER, Esq.	10	0	0
T. W. MASTERMAN, Esq.	5	5	0
S. D. WADDY, Esq., Q.C., M.P.	5	5	
CHARLES BROOKE, Esq., F.R.S.	5	0	0
Dr. FRASER	5	0	0
Vice-Admiral HALSTED (the late).....	5	0	0
Rev. C. KEMBLE, M.A. (the late)	5	0	0
Rev. W. NIVEN, B.D.	5	0	0
S. PETRIE, Esq., C.B. (the late)	5	0	0
Rev. J. H. A. WALSH, M.A. (the late).....	5	0	0
Rev. A. DE LA MARE, M.A.	3	3	0
Rev. R. THORNTON, D.D.	3	3	0
A. V. NEWTON, Esq.	3	0	0
Rev. J. B. OWEN, M.A. (the late)	3	0	0

	£.	s.	d.
Captain JASPER SELWYN, R.N., <i>Tring</i>	3	0	0
Rev. W. H. BATHURST, M.A.	2	2	0
E. CHANCE, Esq., J.P. <i>Malvern</i>	2	2	0
W. H. INCE, Esq.	2	2	0
JOHN SHIELDS, Esq., <i>Durham</i>	2	2	0
Rev. G. R. BADENOCH.....	1	1	0
J. LEWIS, Esq., B.N., <i>Southampton</i>	1	1	0
Rev. Preb. ROW, M.A.	1	1	0
Very Rev. Dean PAYNE SMITH, D.D.	1	1	0
Rev. Canon TITCOMB, M.A.	1	1	0
G. C. HARRISON, Esq.	1	0	0
W. PAYNE, Esq.	1	0	0
J. SHAW, Esq., M.D., <i>Boston</i>	1	0	0
Rev. C. SKRINE, M.A.	1	0	0

1872.

A. McARTHUR, Esq.	42	0	0
Admiral HALSTED (the late)	2	2	0

1873.

C. W. H. WYMAN, Esq.	1	1	0
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1874.

Right Hon. Lord SHAFTESBURY, K.G.	20	0	0
Rev. C. A. BELLI	1	1	0
J. W. LEA, Esq.	1	1	0

Balance on 31st December, 1874 £12 7 7

(*Expended.*)

DONATIONS TO THE PEOPLE'S EDITION FUND.

J. S. BUDGETT, Esq.	10	10	0
G. HARRIES, Esq.	10	0	0
F. BISSET HAWKINS, Esq., M.D., F.R.S.....	5	0	0
J. H. WHEATLEY, Esq., Ph.D.	2	0	0
Admiral NOLLOTH	1	1	0
Sir W. DE CAPEL BROOKE, Bart. (non-member).....	1	0	0
L. BIDEN Esq.....	0	10	0

(*The above Fund is now expended.*)

The Earl of HARROWBY, K.G.—My lords, ladies, and gentlemen, I have been asked to move the acceptance of this report, and that it be printed and circulated amongst the members. I am not the fittest person to take so prominent a part in your proceedings, inasmuch as I have rarely had the opportunity of attending the meetings of the Institute. The infinity under which I labour as to hearing, makes attendance at meetings where discussions are going on distressing and unprofitable to myself, and therefore I seldom attend them. But at the same time I have had the advantage of reading our valuable and useful Journal of Transactions, and it has been a very great pleasure to me to observe the important subjects which have been handled, and the able manner in which they have been considered. They have been considered in a fair and open way. Every difficulty has been suggested, and the discussion has considerably advanced the object that was proposed. When this Institute was first started, under circumstances of considerable discouragement, there appeared to be a sort of dead set of the scientific current against all our most cherished feelings, principles, and beliefs. People, from some cause or other, partly I think by the excess to which that scientific current ran, became alarmed, and I have reason to hope that the current itself has been considerably checked. But when we have seen the excesses in which the normal sobriety of science has been changed for wild speculation, and the sober spirit of induction has been abandoned for conjecture, I think the popular feeling that science and religion were of necessity antagonistic—that if you believed science you were hostile to religion, and that only by abandoning science could you be true to religion—was a state of things much to be deplored. I cannot but hope there is great reason to believe that this feeling is very much disappearing, and that we may flatter ourselves that the ancient alliance between religion and science, and which has distinguished science and ennobled it—this connection of the knowledge of the works of God with the belief in His existence and attributes—this ancient alliance which was formed so strongly under the care of Newton, Boyle, Leibnitz, and many others, may in our time be revived. I think I have heard it said that there is a friend of ours who has had the opportunity of conversing with many men of science, and who, as became his station, did not disdain to touch upon questions of religion and converse on them, who has found that 99 out of 100 concurred with him in reverence for our Lord and Saviour Jesus Christ. These things are very encouraging. They encourage men to hold up their heads under troubles and difficulties, and not despair in the good cause, the good cause in which we believe the Almighty himself may take a part in defence of His own authority. With regard to the special topics of the report, I have only to remark upon the encouragement we receive from the conditions of our own Association. We find our numbers increasing largely, our resources improving; and we find the circulation of our journal, which is held to be one of the most important elements of our work, constantly increasing. And, I think, we may take

comfort to ourselves that the work which was begun a few years ago by our noble friend, under circumstances of great discouragement, which has required all his courage to face and carry through,—has prospered in his hands and yours. I beg leave to offer for your acceptance the resolution which I have already read. (Cheers.)

Mr. J. E. HOWARD, F.R.S.—My lords, ladies, and gentlemen, I beg leave to second the adoption of the report.

The resolution was agreed to.

Mr. R. N. FOWLER.—In the absence of the Lord Mayor,—for I very much regret that he is not able to be present to testify his sense of the great importance of this noble institution,—I beg to move the second resolution. But much as you have lost by the absence of the Lord Mayor, I possess one advantage that he would not have had, for I was present some years ago (not quite at the opening meeting, when there were only five in attendance, but shortly afterwards), and therefore I am able to bear witness to the great practical service of those gentlemen who are referred to in the resolution which I have the honour to propose. The resolution is:—"That the thanks of the members and associates be presented to the Council and honorary officers for their efficient conduct of the business of the Victoria Institute during the past year." Lord Harrowby has borne witness to the great progress which this Institute has made, and it would be out of place on my part to add anything to his very forcible speech, but I would remind you that we have very much to attribute the satisfactory progress of this Institute to the services of those who manage it. A very deep debt of gratitude is due to your lordship, and I cannot refrain from saying that a deep debt is also due to one who, in the earlier days of the Institute, took a very great interest in its proceedings, but who is now no more—I refer to the Rev. Walter Mitchell. But we must bear in mind that this Institute could not go on unless it had, not only an excellent president, but an excellent council and staff of officers. It is very much owing to their exertions that we stand in the position we now occupy, and I have very great pleasure in proposing the resolution which I have read to you. (Cheers.)

The Ven. Archdeacon * HESSEY.—I feel it to be my duty, as one who has taken some interest in the controversies between science, falsely so called, and religion, to come forward and say a few words in seconding this resolution. The councils of all societies do deserve thanks for the faithful and efficient labours of the committee-room, but our Council deserve thanks especially, because on them rests the proper management of a society which holds a very peculiar and a very delicate position. It holds a province between opposing schools of thought, and seeks to show that science properly understood, and Scripture properly read, cannot be opposed to each other, because both come from the same Divine Author. This, then, is the

* Nominated Archdeacon of Middlesex this day.—Ed.

province of our Society, and we are all bound to do what we can to support it. Our Council have a very difficult and delicate position to fill, because it is the object of the Society to protest, not against science truly so called, but against the unfair manipulation of the facts of science, and it is the province of this Society to set that clearly before the world,—it has succeeded wonderfully well for nine years. (Cheers.)

The resolution was then agreed to.

Mr. C. BROOKE, F.R.S.—My lords, ladies, and gentlemen, as the important business of the evening is still to come, I think it is fitting that I should use the fewest possible words in acknowledging the sense which the Council have of your appreciation of their humble services. I would only add one remark, and that is to point out to you how much the Council owe, in the duties which they have to the best of their ability performed, to one officer—our honorary secretary. (Cheers.) I think it right to say this on behalf of the Council, on account of the large amount of work which has been accomplished for the benefit of the Institute by him alone. To him this duty is truly a labour of love, and I can only assure you that from his indefatigable exertions much additional strength has accrued to the society, and also from his obtaining men of eminence in science or in literature to bring valuable papers before us. (Cheers.) I will say no more than this in returning the thanks of the Council.

Captain F. PETRIE.—My lords, ladies, and gentlemen, I am sorry to say that our honorary treasurer's absence prevents him from returning you thanks on behalf of the honorary officers of the Institute. I am sure that the resolution moved by Mr. Fowler and seconded by the Rev. Dr. Hessey, who, it is now no breach of confidence to mention, has this day been named Archdeacon of Middlesex (cheers), must afford the honorary officers much gratification. I can only say that what the honorary officers have most at heart is the Institute's progress. (Cheers.)

The Rev. Professor MAIN then read the following address :—

ANNUAL ADDRESS.

MY LORD SHAFTESBURY AND GENTLEMEN,

IT is not with unmixed feelings that I have accepted the invitation of the Council of this Society to deliver the Annual Address to-day. On the one side, I feel painfully that the constant heavy occupation of my time and energies, by the laborious work of the Radcliffe Observatory, has not left me in general sufficient leisure to engage deeply in the studies which are necessary for taking part in the conflicts between

religion and science ; but, on the other, I feel also that a crisis is come which imposes a weighty obligation on every believer engaged in science, at the least to accept such an invitation as that which is now offered to myself, for the declaration of his own faith, and, according to his ability, to endeavour to strengthen that of others. I will not further occupy the time of the meeting with any personal remarks, excepting the assurance that I have, since accepting the invitation, endeavoured to get an adequate knowledge of the most prominent subjects connected with scientific theological speculations, which you would naturally expect to see referred to, and especially with such as have attracted attention during the past year.

And first let me offer my congratulations to the Society on its present position and prospects, and on the increasing consideration and respect with which its operations are regarded by men capable of judging. It has attracted to itself representatives in the various departments of science, well capable of defending the faith from the attacks of scientific scepticism, and standing so high in their several departments of science or literature, that their opinions *must* be received with attention and respect. No one also could, I conceive, deny that the philosophical character of the Society has been most severely maintained in all its papers and discussions, and that every theory opposed to the belief of the ordinary Christian philosopher, has been treated with the most scrupulous fairness and respect. Personalities have been altogether avoided, and an example has been set of the proper way of conducting such controversies, which will, we may presume, have considerable influence for the avoiding of bitterness and unfairness for the future.

During the past year several excellent papers have been read and discussed before the Society, and of these I will mention only two, which appear to me to be of great importance at the present crisis. I mean that of Professor Nicholson, on the General Doctrine of Evolution, and that of Canon Birks on the Indestructibility of Force. My reasons for particularly mentioning these will be seen in the sequel.

I would however, in this portion of the Address, take occasion to advert to one or two circumstances which influence my choice of these two essays for particular mention. There are some peculiarities of the present age, which frequently render opinions held by men of eloquence and genius, influential to a greater degree than the value of their opinions, when calmly and philosophically tested, would warrant. If they have had for a long time the ear of the public, which is on the whole ill

instructed or uninstructed with regard to the truth or the real value of their subjects of discussion, the weight of their authority will be out of all proportion to the justness or the truth of their theories; and, by the additional agency of a daily press, which is naturally eager and anxious to get possession of, for publication, every novelty in science, art, or literature, and is supplied with paid skilful writers, quite prepared to advocate or attack, as the case may be, the views in question, very inaccurate theories may for a time gain acceptance. It is impossible that by such means the truth or falsehood of a new and specious theory can be arrived at, and the unlearned public are quite at the mercy of a brilliant lecturer, who may choose to advocate anything respecting religion, however old or exploded.

A paradoxical novelty will attract more than sober truth under such circumstances, and a great deal of mischief may be done before the mistake is discovered, or the idol displaced from his pedestal.

Undoubtedly there is another bar before which every such work will be brought,—namely that of dispassionate and learned critics, who have the knowledge requisite for disentangling the truth and error which are generally mixed up together in such performances; but, for one person who will take the trouble to read the replies, there are twenty who will be content to take upon trust the essay or lecture which has dazzled their imagination, and a new favourite will in all probability soon have withdrawn their attention altogether from the subject.

I am far from complaining of this state of things;—an excited, eager, and intelligent public, together with the complicated means which exist in the present day for gratifying its curiosity on every possible subject, belongs naturally to our advanced civilization:—we must take the advantages and the disadvantages together, and by prudential measures endeavour to make all work together for good.

And it is under this point of view that the advantages of such an association as the Victoria Institute appear most evident and indisputable. It exactly meets the evil which I have endeavoured to describe, as resulting from the joint effects of popularity and the daily press. Its members are men who have become so from the conviction that such an organization is necessary, and who are willing to devote their time and their learning to the distasteful task of stripping error of its delusions, and of assisting the claims of true religion.

At the present moment the duty is far from being a pleasant

one, and the subjects which I shall have to discuss or to advert to, are, to the Christian philosopher, most repulsive.

The great subject of the year indeed, in the conflict between religion and science, is (I say it without disguise) atheism,—material atheism. Some are offended at the word, who do not reject the doctrine implied by it; but, to coin a euphemism to veil or hide it, would be to exercise courtesy at the expense of truth. We have had the *thing* brought prominently forward before our eyes, and we need not dispute or wrangle about the word.

God, in our sense of the word, is the personal and intelligent Ruler and Governor as well as the Creator of the world or cosmos, a being of infinite power, wisdom, and goodness, constantly superintending and providing for the welfare of His creatures. He is as present now presiding over every part of His creation, as He was, in the immeasurably remote ages, when He, by His will and infinite power, brought it into being; and, by His Providence, He guides, adjusts, and preserves all that He has made. The assumptions of this definition are all absolutely necessary for the idea of the Supreme God who is the object of our adoration; and nothing less will satisfy the requirements of religious faith, or the natural desires of the immortal soul.

All the discussions, both ancient and modern, respecting the Supreme Intelligence seem to show that Natural Religion is unequal to the task of arriving at the correct knowledge of a Personal God, and it is only in proportion as we feel our helplessness in this particular that the blessings of Revelation will be fully felt and acknowledged.

This definition will exclude the *anima mundi*, or Pantheistic idea of God, which confounds the Creator with His creation; and also the Epicurean idea of a personal God, who did indeed create the universe at an infinite distance of time, but has left it to evolve itself without farther care or superintendence.

I do not believe that the human mind can obtain a clear conception of either of these ideas of the Godhead, and I am sure that neither the one nor the other idea has been favoured by some of the greatest modern physical inquirers.

As also the origin of sentient or animated beings will necessarily occupy some portion of this discourse, it is well to lay down some definitions with regard to it, or rather with regard to the origin of man. I shall assume that no theory is to be regarded as of any value which does not satisfy all the conditions of the problem with regard to man's nature, that is, which does not afford some satisfactory explanation of his moral and

intellectual as well as of his physical nature. It must also (and that not by mere guesses or unsupported assertions, or by the introduction of a few proofs from existing nature and natural phenomena out of the countless varieties of phenomena to which the nature of man is intimately related) give an adequate account of the means by which he has been placed in harmony with his surroundings. For example, it must show, not in a few isolated instances, but in all, how it comes to pass that the earth and the air which surround it (man's dwelling-place in fact), are adapted to his bodily organs, so as to produce the sensations on which his comfort, pleasure, and well-being depend; and that too in such a way as to satisfy his higher intellectual capacity of receiving pleasure or a sense of enjoyment from his perceptions of beauty, grace, and harmony. Truth as such should be predominant over every other consideration; but it has been the habit in some of the philosophy of the present day to identify a clever hypothesis, supported on some exhibition of facts, with the truth of the hypothesis, however great the antecedent improbabilities of its correctness may be.

As I shall not have occasion to refer in the sequel to Darwin's *Origin of Species* and the *Descent of Man*, I may give these as an illustration. With regard to the former work, of which I desire to speak with the utmost respect and to separate by a long interval from the latter, Professor Nicholson's conclusions, which seem to have been formed from a very careful consideration of the subject in some of its branches, seem to show that Darwin's theories are of very limited application, and that they scarcely need any consideration whatever in a religious discussion. With regard to the latter, the *Descent of Man*, undoubtedly many valuable facts have been collected relating to the continuity of structure of the mammals, and to the habits and instincts of the inferior animals as compared with man; but with regard to its conclusions, which derive man's descent from the ascidian, and more recently from the ape, I, for my part, consider them as an example of the imperfect kind of use of the inductive philosophy, which is so frequent in the present day. The student of natural philosophy is, in my opinion, quite justified, on philosophical grounds, in declining to accept the ancestry here offered to him, and to rejoice still in the assurance that he was made after the moral image of his Creator, who breathed into his nostrils the breath of life.

I am of opinion that it was a bad day for science (not for science properly so called, but for the popular development of

it) when Professor Tyndall composed during a summer holiday, and subsequently delivered at the meeting of the British Association at Liverpool in 1870, his celebrated discourse on the "Use of the Imagination in Science." I heard that eloquent discourse, and I considered at the time that many of the instances adduced from the mathematical sciences were legitimate deductions from established premisses, and implied no use of the imagination properly so called. There has, however, been abundant use made of it since that time, both by the lecturer himself and by others, and I think a note of warning on this head is not out of place.

As this almost concludes the introductory portion of the Address, I will make a passing allusion to Canon Birks' paper on the errors and confusion which have been made in dynamical science, partly by new nomenclature, and partly by a misunderstanding, by some scientists of high pretensions, of the ordinary principles of mechanical science. Change of nomenclature is generally attended with some inconvenience, though in some of the instances produced by Professor Birks the change has been made by two of the most accomplished mathematicians and physicists of the day, namely by Sir William Thomson and Professor Tait, in their excellent treatise on Natural Philosophy. An old mathematician like myself finds some little repugnance to part with his friend *vis viva*, and to find it again under the designation *kinetic energy*; but new nomenclature would be a trifling matter if it had not introduced confusion into the ideas of some distinguished men of science. It must be borne in mind that, with regard to the science of pure dynamics, no new mechanical principle whatever has been discovered, and that the laws of conservation and dissipation of energy (even when applied to the universe or cosmos) must be applied in the same way as they would have been forty years ago, though with greater analytical resources, presuming that we have data enough to solve any particular problem presented to us. With regard however to the conversion of energy of one kind into energy of another, as occurs in the notable instance of heat into motion, or the effects of motion into heat, so that not a particle of either matter or force is wasted throughout the universe; this is a most important discovery of the present epoch, though I do not know that religion is immediately concerned with it.

With these preliminary remarks I will proceed to introduce the several topics which I intend to form the principal subject-matter of this Address.

In the first place I will advert briefly to a few of the most important physical discoveries, chiefly astronomical, which have been made during the last few years, being careful to avoid details, and to consider them only with relation to their bearing on religion.

I will then make a passing allusion to two books recently published, which exhibit perhaps the lowest stage of religious belief which has been given in this century as the result of the final and sober conclusions of two very deep thinkers, devoted the one to the study of philosophy, and the other to that of biblical criticism; and I hope that a few minutes will not be wasted in considering what is meant with regard to our religious and social prospects by the sad conclusions arrived at in both these works.

Finally, I will devote the remainder of the Address to the consideration of the Atomic Philosophy, with reference, of course, but not exclusive reference, to the Belfast Address. And, in this assembly, I am neither ashamed nor afraid to beg from our Almighty God and Father, in whom we all believe, a blessing on the results of our present inquiries.

Astronomical discoveries have been chiefly made in the descriptive and physical branches of the science; they have been very brilliant, and have attracted the attention of large numbers of people. It is therefore very desirable that clear notions of the extent and nature of these discoveries should be gained by all who wish to understand how they affect religion. It will be convenient to consider separately those discoveries which have been made, chiefly by means of the spectroscope, with regard to the solar system; and secondly, with regard to the fixed stars and nebulae.

Let us take the sun first, about which the amount of discovery is, thanks to the unwearied researches of Mr. Lockyer, Monsieur Janssen, and others, very great indeed; and, first, with regard to his parallax or distance from us, the researches for the determination of this element will show, perhaps better than anything else, the activity of science in the present age. It had been suspected for some time that the solar parallax, as deduced by the famed astronomer Encke from the transit of Venus of 1769, was considerably too small, and observations made of the planet Mars in the northern and southern hemispheres in the year 1862, gave a result which it is believed differs from the truth by a very small quantity indeed. At about the same time experiments made to determine independently the velocity of light in connection with

the assumed value of the constant of the aberration of light gave another quite independent result, agreeing very closely with the preceding ; and, finally Leverrier found by researches on the disturbances of the orbits of two of the planets, Mercury and Mars, a result consistent with the others. It is believed that by the observations of the recent transit of Venus a result will be obtained which will certainly differ not more than a hundredth of a second from the truth. This will give us what we have never had before,—a correctly measured base-line for the solar system, as well as for cosmical measures beyond its limits.

But for our present purpose the discoveries made by means of spectroscopy are far more important as showing the unity of structure in the members of the solar system. I need not on this occasion show you the way in which the various elements existing in the incandescent atmosphere of the sun are analyzed by the spectroscope ; it is sufficient to state that at least twenty of the sixty-four chemical elements which exist in the earth are found in a state of incandescent vapour in the sun's atmosphere. The fact that the greater number of our chemical elements (including the precious metals) are not found, is not conclusive with regard to their existence or non-existence in the sun. It may be that their greater density does not allow of their vaporization. But the only fact which concerns us at present is the similarity of the structure and of the constituent elements of the sun and the earth, and this is abundantly proved.

Other facts deduced recently from the study of the sun, though of great scientific interest and importance, do not concern us much from the religious point of view. Thus the periodicity of frequency of the solar spots, which goes through its cycle in about eleven years, is practically of great importance, and opens a great field for speculation and research. It has, undoubtedly, an effect on climate, and I have myself traced its effect in producing a well-marked change of direction of the wind having the same cycle. The solar prominences likewise which are now observed as regularly and with as much care as any other phenomena, thanks to the discoveries of Mr. Lockyer and M. Janssen, indicate disturbances in the solar atmosphere of enormous magnitude, and may be of great practical importance, but they offer no occasion for further remark. The same may be said of the corona or broad ring of light seen during solar eclipses, which is proved to belong to the sun, and gives some indication of dense nebulous matter in his immediate vicinity.

Thus far all the facts which I have mentioned depend on observations of unquestionable accuracy and admit of no dispute, while, at the same time, they offer no materials for speculation on the origin or the probable duration of the solar system. But, in connection with the doctrine of the conservation and dissipation of energy, speculations of a very bold and interesting character have been made by Sir William Thomson, which may profitably detain us for a moment.

Several years ago his attention was called to the fact that the sun is constantly radiating heat into space in enormous quantities; and, to avoid the self-evident conclusion, that this vast globe must inevitably be cooling down, and that thus, at some time or other, however distant, the heat-energy of the solar system would be expended, he proposed the theory that a constant amount of heat was probably kept up by the falling on his surface of nebulous masses, comets, &c., either drawn within the sphere of his attraction from remote regions of space, or gradually brought to that condition by the resistance to motion in the densely nebulous neighbourhood of his body.

This theory, however, was shortly given up, and the conclusion at present held by himself and many other physicists, is that the cooling process is really going on, though we are not sure that any effect whatever has been observed during the term of man's occupation of the earth. If this be so, it is quite certain that a time will come, measured perhaps by a large multiple of millions of years, when the solar system will be a complete wreck, the sun himself a dark inert mass, and the attendant planets, like the moon, unfit habitations for organized and sentient beings.

The earth too, even if the sun were to retain its heat, gives evidence that it was not intended for an eternal existence in its present state. It has been surmised, and the guess assumes something like verification from the accurate mathematical calculations of Delaunay, Airy, and others, that the friction of the tides contrary to the direction of diurnal motion is sufficient to produce a small but calculable increase in the time of the diurnal rotation. No one doubted that the tides would produce *some* effect of this kind, and calculation seems to prove, on certain assumptions, that the effect is sensible, and that it will some time or other bring the earth to rest.

These are grand speculations, and they appear to be based on data which are unquestionable. By analogies drawn from the fixed stars we are also brought to nearly the same conclusion. Many of these are variable, and some, from a high degree of brightness or magnitude, fade away at regular

intervals, which are accurately known, till they become very faint, if not almost invisible, and then in a period of equal length resume their brilliancy; others have been known to blaze out suddenly, with a brightness denoting a conflagration on a scale which we can scarcely imagine; and many of my hearers will remember the star near ϵ Coronæ which suddenly burst out in this manner in the year 1860, and was estimated as of the 2nd magnitude. The spectroscope immediately showed Dr. Huggins that this wonderful change in the star was due to a great evolution of hydrogen and other gases occasioned by some internal convulsion. All persons will remember a similar instance which occurred in the time of Tycho Brahe. Thus all tends to prove that the state of things which we see around us is not, and is not intended to be, constant and changeless; and he, in my opinion, philosophizes most safely who looks up with adoration when he has come to the limit of his knowledge to the Almighty framer and preserver of these countless and wonderful systems.

But discovery has gone on at an equal pace in other directions. Of these I can only mention some of the most important instances. Our knowledge of the nature and physical composition of comets is very much increased since the year 1866, when the large swarm of November meteors attracted so much attention, and the labours of Professors Newton, Schiaparelli, Adams, and others, were the means of identifying the orbit which they described round the sun, with that of the comet discovered by Tempel in 1866, or Comet I of 1866. In the same way the orbit described by the Perseids was identified with the third or bright comet of 1862, which has a period of revolution of about 124 years. Other remarkable coincidences between comets and meteor-swarms have been confirmed or suspected, especially in that which occurred on the evening of November 27th, 1872, the orbit of the meteors being found to be the same with that of Biela's comet. In this instance it is believed that the comet itself, in its passage, either touched or passed across the earth. Comets then apparently are nothing but aggregations of matter of very small density and consisting of very small discrete particles, which have been most probably thrown off from the sun, or from other more remote systems, and have come within the sphere of the sun's attraction. Between fifty and sixty (probably more at this time) of such systems are known to exist, though the most remarkable are those which I have mentioned. In this particular, then, we have more correct notions of the solar system than our forefathers had; but there is nothing in our additional knowledge

which tempts us to throw off our allegiance to our Heavenly Father, but rather to increase our religious awe and admiration. These portentous and mysterious bodies, as our ancestors esteemed them, coming suddenly, and with fearful velocity from the depths of space, and heralding, as they in their superstition believed, war, or pestilence, or famine, are now proved to be harmless.

We do not even fear a collision with them, and their constituent particles, many of which it is believed do not exceed one-third of an ounce in weight, flash across the sky when ignited by our atmosphere, and are only subjects for our curiosity. In this *we* believers may find cause to thank God for His mercies, and for His providence in keeping evil from our dwelling-place.

Discoveries in stellar astronomy have kept pace with those in other branches of Astronomical science.

The spectroscope, with its wonderful power of analysis, has been applied by Dr. Huggins and Padre Secchi to the stars, with as much success as by Mr. Lockyer to the sun. Both Huggins and Secchi have examined with minuteness a great many of the brighter stars, and the results show that the uniformity of structure which was observed in the solar system, is extended to the stars. The most remarkable of the published results of Dr. Huggins, are those arising from the examination of the two stars Aldebaran and α Orionis. In the spectra of both a great number of absorption-lines were found, of which it was possible to compare several with terrestrial substances, as in the case of the sun. In the case of Aldebaran at least nine chemical elements were identified,—hydrogen, iron, magnesium, antimony, and quicksilver being among them; in the case of α Orionis six substances were identified; amongst which were magnesium, calcium, and iron, hydrogen being absolutely wanting. Secchi's researches were of a still more elaborate nature. He was enabled, in the comparatively clear atmosphere of Rome, to examine about 500 stars, and to divide them into four typical classes, distinguished by the nature of their absorption-bands.

The first class contained stars of a white colour, like α Lyræ; the second contained yellow stars, in which the bands bore a close resemblance to those of our sun; the third included reddish stars like α Herculis, β Pegasi, and α Orionis; and in the fourth were included stars of a lower magnitude (never above the sixth), with the interesting peculiarity that the spectrum consisted of bright bands, separated by dark intervals.

How wonderful is all this variety, and at the same time how

distinctly is there marked the impress of the same creating hand that made our sun and our earth, and the other attending planets. How impossible also it seems for the most unimpassioned philosopher to avoid exclaiming with the Psalmist, "Such knowledge is too excellent for me : I cannot attain unto it. Whither shall I go then from thy presence ? If I climb up into heaven, thou art there ; if I go down to hell, thou art there also. If I take the wings of the morning, and remain in the uttermost parts of the sea, even there also shall thy hand lead me, and thy right hand shall hold me."

There is only one other stellar discovery (also due to the spectroscope), which I feel it necessary to mention, namely that relating to the velocity of the motion of the stars, as compared with that of the earth's velocity in its orbit.

I need scarcely explain that the sense of colour depends on the number of vibrations made on the eye in a given time, or on the length of the wave corresponding to that colour.

If then the velocity of a star be not insensible when compared with the velocity of light, the number of vibrations reaching the eye in a given time for a particular colour in the spectrum, or for a particular absorption-band, will not be the same for a star in motion and for one at rest, and the effect will be a slight displacement of any absorption-band, as compared with the chemical substance which is its terrestrial analogue.

This displacement will therefore be a measure of the velocity of the star with regard to the earth, and the latter can be calculated without much difficulty.

Dr. Huggins has bestowed great attention on this difficult class of observations, and has been very successful in measuring within narrow limits of error, the velocities of several of the brightest stars.

For instance in the case of Sirius he found that the relative motion, with regard to the earth in motion, was about 41·4 miles per second, and, as the earth's motion of recess in the direction of a line drawn to the star, was about 12 miles, there remain 29·4 miles per second, as the actual velocity of Sirius away from the earth.

This I consider to be a result which can be relied upon as being derived from observations, difficult indeed, but of which the probable errors can be rigorously determined.

Such considerations enlarge our views of the immense scale on which the operations of nature in the Cosmos, or, as I should prefer to say, the operations of the Almighty architect of the earth and the heavens, are carried on. There is a unity

of plan and structure, which points evidently to the assumption of one guiding and controlling mind, and, even at the distance of Arcturus, we are familiar with the phenomena presented ; in fact we seem to be at home.

With one still more extended survey of the realms of unlimited space, I will conclude this brief and imperfect review of the recent teachings of Astronomical science.

Our speculations and our knowledge about the stars excite our imaginations, and inspire us sufficiently with awe and wonder, though the astronomer has little need for guesses, and is guided in his legitimate deductions by the severe rules of the inductive philosophy.

But we have still to deal with another class of objects which give us a still nearer insight into the constitution of the universe, namely the nebulae and star-clusters.

These, in the telescope, cloud-like looking objects were first observed and described in great numbers by Sir W. Herschel, and to him science owes a very great debt of gratitude, for his wonderful labours in this department of astronomy. The two classes, nebulae and star-clusters, are with ordinary telescopes in general undistinguishable, but Sir William by using high powers on his gigantic reflector succeeded in resolving in a great many instances the nebulous mass into its constituent elements of stars. Lord Rosse with his immense reflecting telescope resolved a great number of others which had not yielded to the inferior optical resources of Sir William. Then came an important question on which depended in a great measure the truth or falsehood of La Place's theory of the constitution of the universe out of nebulous matter; namely, whether there were any nebulae actually irresolvable, or consisting of really nebulous matter, and not of aggregations of stars too far distant to be separately visible by any existing optical power.

The spectroscopic has satisfactorily answered the question, and, in the opinion of most persons competent to judge, decided that La Place's theory was essentially correct, and we may assume that the existing solar system, and all other similar systems, were formed from matter in the nebulous state. The possibility of the truth of the theory on mechanical grounds was seen at once, and the fact of the existence of such matter (proved now beyond the possibility of doubt) scattered about in the heavens in various degrees of condensation, gives immensely greater assurance of the fact that this is the way in which it has pleased the Almighty to act in the creation and formation of the visible universe.

But, grand as is this conception, deduced, as we believe, accurately from observed facts, and wonderful as are the ideas which we gain of the vastness of the works of God, how little does it tell us of the way in which a single globe like ours was in the course of successive periods of geological time prepared for its inhabitants, or of those nice adjustments of temperature, fluidity, rigidity, &c., which were necessarily made before it was possible that life could be sustained at all; and still less of those Fatherly providential adaptations to the intellectual and moral nature of man which are ours to enjoy and to thank the Giver for. We can still, after acknowledging and using all the discoveries of modern science, and making them the basis of future research, only adore the wisdom of the Creator, and confess that we are still only on the threshold of His temple.

There is still something more to be said in connection with this subject, of great interest and importance.*

Mr. Lockyer had been led to the conclusion, in the course of his observations and experiments on the effect of pressure on the gases which form the atmosphere and chromosphere of the sun, that, owing to the great height of the atmosphere, the effect of gravity is to produce an arrangement of the different elements in layers similar to our geological strata. Thus, in the coronal atmosphere exists the cooler hydrogen; in the chromosphere incandescent hydrogen, magnesium, and calcium; and in the reversing layer, sodium, chromium, manganese, iron, &c. He is also of opinion that the metalloids (sulphur, carbon, silicon, &c.) lie outside the metallic atmosphere, and gives reasons for the faintness of their record amongst the metallic lines. He then attempts to answer these two questions: 1st. Assuming the earth to have once been in the same condition as the sun now is, what would be the chemical constitution of its crust? 2nd. Assuming the solar nebulae to have once existed as a nebulous star at a temperature of complete dissociation, what would be the chemical constitution of the planets thrown off as the nebulosity contracted?

Mr. Lockyer suggests that, with regard to the earth, the arrangement of the earths and minerals consequent on the supposition given above, would be that which we find to be actually existing; and, with regard to the planets thrown off, the exterior planets approaching in their constitution to that of the sun's outer atmosphere, and the nearer ones being more

* See Professor Prestwich's Inaugural Lecture.

metallic in proportion as they are nearer to the central portions of the nebulæ.

This is found to be the case in fact, the densities of the exterior planets (Jupiter and Saturn for example) being relatively small, and their atmospheres very large and highly absorbing, as if containing a larger proportion of metalloïd substances.

The above may be taken as an interesting case of legitimate speculation requiring and giving motive for further experiments and research.

I ought now in the natural order, after this brief and necessarily imperfect survey of the chief of the recent astronomical discoveries which have more or less bearing on the subject of religion, to take up the subject of recent discoveries in the atomic theory. But as we shall, in this instance, be brought face to face with material atheism, I think it best, before this, to make a few brief remarks on Mill's *Three Essays on Religion*, and Strauss's *Old and New Faith*, that the whole of this disagreeable part of my duty may be discussed at once.

Many among you have, I doubt not, thought it necessary to read the three essays of Mill, and to those who have not, it may be useful to bring before you a few of the results—probably the final results—of the philosophical system of this really great and profound thinker, of whom it was said (in some instances boastfully) that he lived a long life absolutely without any consideration of God and religion.

These Essays are a melancholy termination to the labours of a lifetime of philosophical research, but they have at least dispelled that illusion. He did not, and we may be permitted to doubt whether any man ever did, live absolutely without God in the world; and the Essays show that he has even thought and, I believe, has been sincerely anxious about those deep questions (which vitally affect every person born into the world), life, death, the immortality of the soul, God, and future judgment. They are all bound up with our nature, and form, as it were, part of ourselves. We must ask at times of ourselves, Whence came I? and whither am I going?; we must all feel (at least I doubt whether any living man capable of thinking has ever avoided the necessity of feeling) that there is something besides ourselves and the visible creation, and that that something is God, whether it be assumed to be the Pantheistic God almost identified with creation itself, or the God omnipotent and eternal of the Christian. Then again man cannot, if he will (even after a life of evenly maintained philosophical scepticism), avoid the occasional or frequent intrusion of the thought

of that which awaits him beyond the grave. Death *must* come, and in the thought of it there is suggested their alternative of annihilation or a future judgment. If the soul is immortal, an immortal and all-powerful God exists, and the idea of responsibility comes in. If it perish with the body, the prospect is not one to be accepted willingly except in the dark hours to which the author of the Belfast Address feelingly alludes in his preface.

And it is plain that Mr. Mill had thought deeply of all these things, and has drawn conclusions from his thoughts which are, in my opinion, amongst the most melancholy perversions of truth which exist on record.

With respect to the supernatural in general, he concludes that the rational attitude of a thinking mind is that of scepticism, as distinguished from belief on the one hand and from atheism on the other.

But from the consideration of the eye, he is led to the conclusion that it has its origin in an intelligent will, and rejects the solution which might be effected by the theory of the *Survival of the Fittest*; and, "on the whole, it must be allowed," he says, "that in the present state of our knowledge the adaptation of nature affords a balance of probability in favour of creation by intelligence."

This admission is important as coming from him, but it will soon appear that we have no great cause for thankfulness. "Every indication of design in the Kosmos," he says, "is an evidence against the Omnipotence of the Designer." This may be a new and strange argument to some, but he means that an omnipotent architect would have accomplished his work without successive steps indicating design. And now comes a quotation which makes us shudder, and which follows the attempted proof, that the intelligent Creator cannot be and is not omnipotent.

"If man had not the power," he says, "by the exercise of his own energies for the improvement both of himself and of his outward circumstances, to do for himself and other creatures vastly more than God had in the first instance done, the Being who called him into existence would deserve something very different from thanks at his hands."

The blasphemy of this passage, from our point of view, is only equalled by the shallowness of its philosophy.*

* There is nothing new or original in this idea of a God of limited power, though it has been proved on *à priori* grounds to be metaphysically impossible. See Dr. S. Clarke's *Being and Attributes of God*, prop. x.; Cudworth's *Intellectual System*, chap. ii. art. xvi., where the arguments of Lucretius are discussed; and Lactantius, *De Irâ Dei*, cap. xiii.

But let us proceed: "If we look for justice" (that is from God) "we find a total blank."

Now let us have his final summing up.

"These are the net results of Natural Theology on the question of the divine attributes. A being of great but limited powers . . . of great, and perhaps unlimited intelligence . . . who desires and pays some regard to the happiness of his creatures, but who seems to have other motives of action which he cares more for, and who can hardly be supposed to have created the universe for that purpose alone. Such is the Deity whom Natural Religion points to, and any idea of God more captivating than this comes only from human wishes, or from the teachings of either real or imaginary revelation."

He now proceeds to discuss the probability of a revelation, and allows, in the first place, "that it has some stand-point from the indications of a Creator which have been proved."

This reasoning is evidently quite correct, and it would have been well if the German writers had always borne it in mind. "The sender of the alleged message," he continues, "is not a sheer invention; there are grounds independent of the message itself for belief in its reality; grounds which, though insufficient for proof, are sufficient to take away all antecedent improbability from the supposition that a message may really have been received from him."

This is also an important admission, and might be used with very great effect on Mill's disciples, who look upon him as the great champion of unbelief.

But all that follows shocks our religious sense by its apparent profaneness, though I am far from saying that he meant to treat the subject with intentional disrespect or levity. He allows primarily the correctness of Butler's main argument in the *Analogy*, but qualifies it in this strange way. The sum and substance of the argument, he says, is this: "The belief of Christians is neither more absurd nor more immoral than the belief of deists who acknowledge an omnipotent creator: let us, therefore, in spite of the absurdity and immorality, believe both."

One or two more specimens of Mr. Mill's reasonings, and I will leave him.

Of miracles he says: "No miracle-worker seems ever to have made a *practice* of raising the dead; that and the other most signal of the miraculous operations are reported to have been performed only in one or two isolated cases, which may have been either cunningly selected cases or accidental coincidences."

Every one will see how weak and inapplicable this is to the miracles of Christ, including His own resurrection.

Still he sees no absolute improbability in miracles.

“Admit God, and you may admit miracles,” he says; and from this severely logical thinker this admission should be remembered.

Again, “The conclusion I draw is that miracles have no claim whatever to the character of historical facts, and are useless as evidences of any revelation.”

Surely, in connection with the preceding admission, we may well ask why the miracles which are included in the historical narration, and cannot be extracted without tearing the whole to pieces and destroying the historical value of the whole, should not be received as historical facts?

One more extract about the Gospel of St. John and I have done with Mr. Mill. “What *could* be added and interpolated by a disciple we may see in the mystical part of the Gospel of St. John, matter imported from Philo and the Alexandrian Platonists, and put into the mouth of the Saviour in long speeches about himself, such as the other gospels contain not the slightest vestige of, though pretended to have been delivered on occasions of the deepest interest and when His principal followers were all present; most prominently in the last supper. The East was full of men who could have stolen any quantity of this poor stuff, as the multitudinous Oriental sects of Gnostics afterwards did.”

The only remark I will make on this ill-written and offensive sentence is that it seems to assume the authenticity of St. John’s Gospel. Renan made the same admission in his *Life of Jesus*, and the German critics found this a fatal obstacle to the reception of his views.

I have already, I fear, wearied you with Mill, but I must, for the purpose of giving you a sufficiently correct picture of the degradation of religious belief in circles called philosophical, read a few extracts also from Strauss’s recently published work entitled, *The Old and the New Faith*.

I have selected a few extracts for the purpose of exhibiting, in as few words as possible, the absolute repudiation by this writer of all religious belief whatever in the latter years of his life. Thus, “An object of religious adoration must be a Divinity, and thinking men have long since ceased to regard the founder of Christianity as such.”

Again, “My conviction is that, if we would not evade difficulties, or put forced constructions upon them; in short, if we would speak as honest, upright men, we must acknowledge we are no longer Christians.”

Again, "It is only an ancient Christian-Hebrew prejudice to consider monotheism in itself, as contrasted with polytheism, the higher form of religion."

The absurdity in the author's case of discussing the relative merits of monotheism and polytheism will be evident from the following passage, in which he rejects altogether the existence of a personal God.

"If we endeavour to conceive of a creator of the cosmos, as an absolute personality, we may be sufficiently instructed by the foregoing that we are merely dealing with an idle phantasy."

In connection with the immortality of the soul, he has the following needlessly offensive passage:—

"Even the apostle Paul . . . believed, or fancied that he believed,—for I deem him better than his speech,—that if the dead rose not, then he and men like him must be fools, if they would not rather eat and drink instead of endangering themselves for the sake of their conviction."

One more instance, and I have done with Strauss.

"If the preceding consideration has conducted us to the conclusion that we can no longer either hold the idea of a personal God, or of life after death, then it would seem that the question with which we have prefaced this section—if we still have a religion—must be answered in the negative."

I have given pain, I doubt not, gentlemen, to you as well as to myself, by dwelling even for so short a time on such miserable sophistry as is contained in Mill's half-admissions and lamentable rejection of divine truth, and in Strauss's absolute rejection of any religion whatever.

The books from which I have quoted are freely circulated amongst our youth,—the one in its original shape as edited by the step-daughter of Mr. Mill, and the other in a translation (which has arrived at a second edition, corresponding to the sixth German edition) by Mathilde Blind.

I do not know whether there is anything significant in the fact that a woman is the editor of each; but, to my own mind, the circumstance adds a deeper shadow to the religious darkness of the age.

And the danger arising from such publications is not to be measured by the effect they have on men who are capable by their learning of detecting the sophistries and falsehoods that are contained in them, and who know that there is scarcely a quibble or a rational objection put forward which was not quite as well known to the ancient philosophers, and in many cases much better discussed. But it is to young educated persons

of high intelligence and imperfect learning that the danger is greatest. Every novelty has its charm, and error clothed in attractive language and armed with the authority of a man of acknowledged genius and learning, is not easily detected by the ardent student of the new philosophies. And here is the proper place for showing you that this danger is not visionary but real and increasing. The Bishop of Oxford, in his recent Charge, wherein his words are necessarily guarded, has exhibited a state of things as existing in the great University of Oxford, of a very alarming character; and, as far as I know, his statement has met with no public contradiction.

“To speak the simple truth,” he says, “a considerable number of graduates who hold office in the University, or fellowships in the Colleges, have ceased to be Christians in anything but name;—in some cases even the name is repudiated, when arguments based upon its retention are pressed. It is not only that text-books in some branches of study are recognized, which assume a disbelief of Christian doctrine, and that some lecturers hint, or express, their own rejection of it;—there is something like an understanding that Christian teachers shall abstain from insisting on the truths they believe. Thirty years ago the ablest and most highly esteemed of Oxford tutors took it for granted, in their ethical teaching, that Christianity furnished the only certain standard in morals, and were accustomed to correct the shortcomings of other systems by its rule: Christians are expected to forget the existence of such an authority, when they cross the threshold of their lecture-rooms now. The historical facts of Christianity fare no better than its precepts; deference to scientific criticism (whatever that may mean) forbids them to be taken for true.

“With self-complacency, which would be amusing if the subject were less serious, they dispose of religion, natural or revealed, with the airy phrases they have borrowed from the latest sceptical review, ignorant of the Scriptures they reject, but, glad to be rid of the restraint which the Divine precepts impose, they wander this way or that, as materialism on one side, or some new phase of philosophy on the other, seems to offer an escape. The practical result of this education is a selfishness of character, far from attractive. Learners in the school of unbelief have been taught it is folly to disturb themselves for the sake of others, they have lost all motive for serious action: self-restraint and self-sacrifice are discovered to be ‘mere moral babble’; it is, at the best, an amiable weakness to do good. Human life is but the interval, longer or shorter, which condemned mortals have to pass before they die. ‘Our

one chance,' it is said, 'is in expanding that interval, in getting as many pulsations as possible into the given time. . . . Not the fruit of experience, but experience itself is the end. . . . The theory, or idea, or system, which requires of us the sacrifice of any part of this experience, in consideration of some interest, into which we cannot enter, or some abstract morality we have not identified with ourselves, or that is only conventional, has no real claim upon us.' So sceptics teach: can you wonder that some who played an honourable part in Oxford life a generation since, refuse to let their sons imbibe lessons so alien from the lore they learned? Can you wonder that to young men who have imbibed this teaching the cross is an offence and the notion of a vocation to preach it an unintelligible craze."

Our only remaining consideration now is that of the atomic theory in its connection with theories of religion. If the subject, in its purely physical aspect, were not so interesting, we might complain of being obliged, on account of recent circumstances, to dig up as it were from its grave of oblivion that old exploded form of atomic atheism, and to go through again the arguments for its refutation. A wearying and unprofitable task surely, but one which the extreme unbelief of some of the philosophical systems of the present day renders necessary. It will be a little relief, and will probably conduce to clearness, if I take the parts of the subject in reverse order and explain first in as few words as possible what is the modern theory as founded on adequate observations and experiments.

The atomic theory in chemistry, due to Dalton, has been established of course for a considerable time, by which it is known that the elementary chemical substances will combine in only definite proportions; but the physical or kinetic theory of molecules and atoms is of much more recent date, and owes its present expansion chiefly to Sir William Thomson and Professor Clerk-Maxwell in England, and to Professors Clausius and Loschmidt on the continent, the experimental researches of Dr. Graham and Dr. Joule having also contributed much to its advancement.

In the theory it is assumed that all matter is an aggregation of molecules compounded of the atoms of the fundamental chemical substances; that these atoms are small almost beyond our power of conception, and are in a constant state of rapid vibration, with velocities differing in different substances, but always absolutely the same for the same substances. It is assumed also that the pressure of gases and

fluids against the sides of the vessels containing them arises from the rapid and ceaseless motions and collisions of the atoms, which in gases are least confined, and are allowed some length of free path without collision, in liquids are more confined, and in solid matter have very little motion indeed.

These are the assumptions which, of course, must, as in the case of the law of gravitation, get their verification by experiment. The experiments which seem to have established the theory (which, however, we must consider to be yet in an infant state) are chiefly those of the rate of diffusion of gases, in connection with the laws of the assumed motions or vibrations of the molecules. And the facts which physicists of the highest reputation of the present day think they have indisputably established are very wonderful indeed, and give us a much deeper insight into the mysterious workings employed in the structure of the universe than we had before. For example, there have been found for the gases hydrogen, oxygen, carbonic oxide, and carbonic acid, and probably, by this time, for many others, the mean velocity for each molecule, and the relative mass, and with somewhat less degree of certainty the relative size, length of free path between collisions, and number of collisions in a second; while conjecturally (that is, subject to very great corrections from future observations), attempts have been made to determine the absolute masses of the molecules, and their number in a given space. To give some idea of the results, I may take the case of hydrogen, for whose atoms the mean velocity is 1,859 mètres per second, and two millions of them in a row would occupy the length of a millimètre, and a million million million of them would weigh between 4 and 5 grammes. Finally, in a cubic centimètre, at the standard pressure and temperature, there are about nineteen million million million atoms. Is not this wonderful? Some of these results are only approximate, but they give an adequate idea of the correctness of the theory, and want only additional observations for their correction. And it must be borne in mind that the atomic theory is true for the whole universe. A molecule for example in Sirius or Arcturus executes its vibrations in precisely the same time as on the surface of our earth or our own sun.

I will conclude this account of these marvellous elements in the excellent words of Professor Clerk-Maxwell at the end of his lecture delivered at Bradford in 1873: "No theory of evolution," he says, "can be formed to account for the similarity of molecules, for evolution necessarily implies continuous change, and

the molecule is incapable of growth or decay, of generation or destruction. None of the processes of nature, since the time when nature began, have produced the slightest difference in the proportions of any molecule. We are therefore not enabled to ascribe either their existence, or the identity of their properties, to the operation of any of the causes which we call natural. On the other hand, the exact quality of each to all the others of the same kind gives it, as Sir John Herschel has well said, the essential character of a manufactured article, and precludes the idea of its being eternal and self-existent. Science is incompetent to reason upon the creation of matter itself out of nothing. We have reached the utmost limit of our thinking faculties when we have admitted that because matter cannot be eternal and self-existent, it must have been created. Though in the course of ages catastrophes have occurred, may have occurred, and may yet occur in the heavens, though ancient systems may be dissolved, and new systems evolved out of their ruins, the molecules out of which these systems are built—the foundation-stones of the material universe—remain unbroken and unworn.

“They continue this day as they were created, perfect in number, measure, and weight, and, from the ineffaceable character impressed on them we may learn that those aspirations after accuracy in measurement, truth in statement, and justice in action, which we reckon among our noblest attributes as men, are ours because they are the essential constituents of the image of Him who in the beginning created not only the heaven and the earth, but the materials of which heaven and earth consist.”

I cannot refrain from adding also the concluding words of Sir William Thomson’s address from the Presidential chair of the British Association at Edinburgh, in 1871, as they are of a similarly religious spirit.

“I feel,” he says, “profoundly convinced that the argument of design has been greatly too much lost sight of in recent zoological researches. . . . Overwhelmingly strong proofs of intelligent and benevolent design lie all around us, and if ever perplexities, whether metaphysical or scientific, turn us away from them for a time, they come back upon us with irresistible force, showing to us through nature the influence of a free will, and teaching us that all living beings depend on one ever-acting Creator and Ruler.”

We have thus had the testimony of two great living physicists to their belief in a personal God, the maker and preserver of all things; and it will be desirable to add in this

place, that of a third who occupied the same Presidential chair in 1869, namely Professor Stokes. At the close of his address, speaking of organic structures, or of life, he says, "Let us fearlessly trace the dependence of link on link, as far as it may be given us to trace it, but let us take heed that in thus studying second causes, we forget not the First Cause, nor shut our eyes to the wonderful proofs of design which, in the study of organized beings especially, meet us at every step. . . ."

"When from the phenomena of life we pass on to those of mind, we enter a region still more profoundly mysterious. We can readily imagine that we *may* here be dealing with phenomena altogether transcending those of mere life, in some such way as those of life transcend, as I have endeavoured to infer, those of chemistry and molecular attractions, or as the laws of chemical affinity in their turn transcend those of mere mechanics; Science can be expected to do but little to aid us here, since the instrument of research is itself the object of investigation. It can but enlighten us as to the depth of our ignorance, and lead us to look to a higher aid for that which most nearly concerns our well-being."

Let us now proceed to devote a few minutes to the study of atomism as understood by the ancients, with the express purpose of offering a few criticisms on the Belfast Address. This would be scarcely necessary if that celebrated Address had been compiled from original sources; but of this I will speak afterwards.

The principle, as expounded, with a large amount of detail and illustration, in the poem of Lucretius, is taken immediately from Epicurus; but he had it, as is commonly believed, from Democritus, who enlarged and improved the doctrine which he had received from his contemporary and teacher Leucippus. It is doubted even whether Democritus did not get it, or a portion of it, from a still earlier source, namely Moschus, a Phœnician, in the course of his long travels in Asia and Egypt. This, however, is of little importance. Its ancestry, as regards essentials, is rapidly traced from Leucippus and Democritus to Epicurus, and from Epicurus to Lucretius. Democritus flourished about 450 B.C.; Epicurus 305, and Lucretius about 70; and it is useful to bear in mind that Cicero and Lucretius were contemporaries.

The works necessary for a study of the philosophy as given by Democritus, are Diogenes Laertius; several treatises of Aristotle (including his *De Generatione et Corruptione*, the *Metaphysics*, and the treatises *Physica* and *De Animâ*); to these must be added Sextus Empiricus, *Adv. Math.*, Plutarch *de*

Placitis Philosophorum, Cicero's *De Naturá Deorum*, and some of his other works. No one also is likely to get a clear idea of the connection of the physical theory with Democritic atheism, without having made himself master of the first three chapters at least of Cudworth's great work, *The True Intellectual System of the Universe*, and probably of some other works which I have not had leisure to attend to in my own research. Of modern works Dr. F. Ueberweg's *History of Philosophy*, translated by Morris, seems to be one of the most useful.

Let us now see with what apparatus the author of the Address undertook to bring before one of the most learned bodies in Europe, and to recommend to them, this Philosophy, including in some degree at least the atheistical principles.

The chief portion of his equipment appears to have been, a recently published work of Professor Lange, entitled *Die Geschichte des Materialismus* ;* a work by an American, Dr. J. C. Draper, entitled *History of the Development of Science in Europe*, of which I would wish to be understood to speak respectfully, and to separate altogether from Lucretian principles; Munro's *Lucretius*; and two or three other modern books. Almost at the commencement of the Address Bacon is mentioned, but it is in a quotation from Lange, and in depreciation of Aristotle and Plato as compared with Democritus.

I am mentioning bare facts, and I presume that the most devoted friend or admirer of the author of the Address, could scarcely venture to speak highly about the amount of scholarship brought to bear on this difficult point of Greek philosophy.

The historical sketch which follows is just what might have been expected: a polished and rapid style is used to give us a sketch of philosophy, chiefly in connection with the atomic

* Since the delivery of the Belfast Address, another volume of this very learned and elaborate work has appeared, forming the second part of the second book.

The following translated extracts would seem to show that Professor Lange's own sentiments are very different from those of the author of the Address:—

Page 149. "We are not in a condition to comprehend the atoms, and we are not able, out of the atoms and their motions, to explain even the smallest phenomena of consciousness."

Again. "One may twist and turn the idea of matter and force as one will, we stumble at length upon the incomprehensible or unknowable, if not altogether upon mere inconsistency, as in the conception of the forces which act at a distance in empty space. There remains no hope of solving the problem—the hindrance is a Transcendental."

theory from the time of Democritus. We are painfully conscious all the time that we are only listening to Lange and Dr. Draper, and are in fact frequently reminded of it by the author. We are also aware, all the time, of the one-sided character of the sketch. Indeed any sketch of a single period of history, to say nothing of so long a space of time (from Christianity and before it till the present time) which regards it from only one point of view, must of necessity be exceedingly imperfect. We are asked to go over, at railway speed, the events included in the time which has elapsed since the breaking up of the old form of society under the Roman empire up to the present day, including the various disturbing elements affecting the political relations of the various European states after the reconstruction of society; the action of Christianity upon the barbarous nations composing it; and finally the general awakening of intellectual activity in the centuries immediately preceding and following the Reformation. We are asked to look at these mighty changes only in their relation to physical science, and with such illustrations as chiefly concern the atomic philosophy.

Why is Giordano Bruno set so prominently before us, but because he revived the doctrine of atoms, though in a very confused way, and asserted pantheistic principles; and because he was a martyr to science, and thus a rare opportunity was given of showing the cruelty and obstructiveness of the Church? Why even is so much space given in so short a sketch to a much greater man, Gassendi (the sketch as usual taken from Lange), but for similar reasons?

For any purpose whatever, except in its relation to materialistic philosophy, the sketch is useless if not mischievous, and we need not be detained with it any longer.

It was my purpose to have gone into some detail with the successive steps of the ancient atomic philosophy, and I have collected a considerable quantity of material; but my time is nearly exhausted, and the subject, in connection with the modern theory, is scarcely worth the trouble.

The theory itself of the construction of the Cosmos by the fortuitous motions and collisions of atoms is so grossly erroneous as to be but a caricature of that with which we are now acquainted by means of the resources of modern science; but, at the same time, there are one or two points which cannot be passed without notice. The germ of truth was there, and the acute Greek intellect had not only speculated correctly on the nature of matter as distinguished from its qualities or accidents, and of motion as of one of its most important

fundamental properties; but the idea once gained was never lost sight of. That Democritus introduced an atheistical theory in connection with it was a backward step, as is clearly shown by Cudworth; and that this view was afterwards retained and expanded by Lucretius with much misapplied ability and in excellent verse, may perhaps be accounted for by the corruption of Roman morals and the debased state of religious belief at that time. In fact the whole subject has become at the present day rather literary than scientific; the modern doctrine is not built upon the ancient theories, nor in the slightest degree indebted to them; and the chief interest which can be felt in the study is of the same kind as that arising from any other branch of ancient philosophy.

In the time of Cicero, a Roman nobleman, C. Memmius, restored the Garden of Epicurus, and, it is said, intended to raise a public building for the advancement of Epicurism. Some celebrated men followed him, among whom was Velieus, one of the interlocutors in Cicero's *De Naturâ Deorum*. To this person (Memmius) Lucretius dedicates his book and seems to be chiefly anxious, throughout the poem, to impress upon him the necessity of imbibing perfectly the *atheistical* principles of it.

Of Lucretius himself very little is known, and that little is not to his advantage, though it appears that his family was a good one. It is supposed that he went to Athens to be educated, and that he listened to the Epicurean philosophy of Zeno and Phædrus. It is said that he was dissipated, but I do not think there is any direct testimony for this, and the fact is probably assumed from the tenor of his poem and his Epicurean tenets. According to Eusebius, he committed suicide in the forty-fourth year of his age, in consequence of the fits of madness to which he was subject from the effects of a philtre or love-potion administered to him by his mistress Lucilla.

Tradition also says, though I do not know any confirmation of it, that his wonderful poem was composed during the intervals of his frenzy.

This is enough to know about Lucretius, and, for his philosophy, I cannot sum it up better than in the epigrammatic sentence of a French biographer: "Ce système (d'Epicure) dans les vers du poète paraît, il faut l'avouer, très-logiquement absurde, en même temps qu'il est fondé sur la physique la plus ignorante et la plus fausse."

Why the author of the Address should have chosen this subject and brought it in its most absurd (that is the religious)

aspect before the British Association, has been always a matter of wonder with myself and many others; and that wonder is not lessened by the explanations which he has offered in the preface to the seventh thousand.

He evidently wishes to keep, by its means, prominently before our eyes the potentiality of the fact, that matter is in some way or other the origin of life without the intervention of other life. And yet, as far as the atomic theory is concerned, nothing could be farther removed from probability. Could an atom unmoved produce life? and could mere motion add to its capabilities? Would the fact that great numbers were moving and colliding with very great velocities alter the state of the case?

And yet, he says, when grasping the true idea of the atom and molecule, "By an intellectual necessity I cross the boundary of the experimental evidence, and discern in that matter which we, in our ignorance of its latent powers, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium, the promise and potency of all terrestrial life."

I have spoken before of the abuse of imagination as applied to science, but this is perhaps one of the most singular instances of misuse which has occurred. If ever there was anything which has put an impassable barrier in the way of imagination as well as knowledge, it is the molecule or atom. "Thus far and no farther" is the address to the human mind, as plainly as to the ocean, that on the shore within a defined range its proud waves are stayed.

It is what the mathematician would call a case of a discontinuous function. A successive set of values of the variable will give tabulated values of the function amenable to law up to a certain point, and then the formula fails to give any finite or intelligible result. And here it is so likewise—we can resolve matter into its elements up to a certain point, and then we come to substances absolutely irresolvable and unchangeable, or, as an eminent physicist has well called them, the foundation-stones of the universe. Imagination has no more place than farther experiment has at present. We can do nothing but look up and adore the *Author* of Nature.

I am unwilling to discuss farther the merits or the demerits of the Belfast Address. Its brilliant style and genuine eloquence and enthusiasm, the jealous love of its author, not only for nature and experimental research, but even for the inert matter on which the experiments are made, have induced some to look upon it with greater admiration than its philosophical

character would warrant, and others to err on the other side by too great a fear of the mischief which the tone of its teachings with regard to religion will warrant. I do not partake of either the admiration or the fears; and, after the full discussion of its bearings on religion in various journals and reviews, entered into by men far more competent for the task than I can pretend to be, I may well decline the office of pursuing the subject farther, especially in an Address which has already taxed your time and patience rather severely.

I have been obliged to take you with me through the dark and dreary places occupied by the philosophical atheism of this boasted age of intellect and light. In the last writings of Mill I have introduced you to his pretended philosophical ideas about the being of a God, and the existence of a revelation as from Him, which, in accuracy, are, in my opinion, far behind those of the Greeks and Romans a little before the Christian era. Groping as they did in the dark, and impossible as they found it altogether to sever the notion of the Creator from the matter which He has created, (for Pantheism in some shape or other pervades nearly all their systems), they were rarely guilty of the unpardonable error of speculating on the existence of a supreme God of limited power. The notion is metaphysically impossible, and we may well believe, both from Mill's admissions and his non-admissions, that in his latter days his keen, incisive, logical intellect was dulled. Assuming the fact of Omnipotence in the Deity (which he will not grant), his admissions give us, unless the whole be written with grim irony, almost all which we Christians can desire, that is, the probability of a revelation from God, which of course includes supernaturalism, and the probability also of miraculous intervention. With regard to Strauss, I consider the melancholy exhibition of some of his latest thoughts which I have read to you, as the *reductio ad absurdum* proof of almost all which we contend for. He has for many years been descending from one platform of semibelief and rationalistic doubt to one still lower, till he has lost *all* religion, and coolly discusses the question, "Are we yet Christians?" by trying to persuade us that there is neither God nor immortality. Few even of the illuminati among our men of science who are engaging themselves, each from his own point of view, in the propagandism of unbelief or the establishment of something else which they call religion, will follow Strauss to this lowest depth, and his example may, under the blessing of God, act as a warning rather than an encouragement.

Then with regard to physical science, I think we have seen that its real advances are in favour of religious faith. This mysterious atom in which some can see "the promise and potency of all terrestrial life," has to my mind brought God nearer to us. We see now the elements out of which it has pleased Him to make the world; we see the presence of that one Supreme Intelligence as distinctly in the weed that grows or the flower that blossoms on our own planet as in the stars and nebulæ which at still unmeasured or unimagined distances reflect His glory and proclaim His unvarying laws.

The BISHOP OF LLANDAFF.—My Lord Shaftesbury, ladies, and gentlemen,—I have the honour to move: "That the best thanks of the meeting be presented to the Rev. R. Main, the Ratcliffe Observer, for the Annual Address now delivered, and also to those who have read papers during the session." It is a great gratification to know that this Address, which unites the two subjects of scientific investigation and true Christian faith, will not only have been heard with very great advantage by those present, but that, being published in our Journal, it will be circulated throughout the kingdom, and will give the same pleasure and profit to many others that it has done to ourselves. The second part of the resolution refers to those who have read papers during the session—papers which are not only extremely valuable from their contents, but also from the discussions which follow them. As I have never before this had the pleasure of being present at any of these meetings, I may take the liberty of saying how thankful I am that such a society as this exists, and that it is pursuing its course with such energy. I trust that every Anniversary meeting may prove that the Society is gaining greater hold upon the intelligence and respect of the public. We live in days of great intellectual activity, and there is no subject to which that intellectual activity has given a greater impulse, perhaps, than that of scientific inquiry and the practical results of science to our daily life. I think we may well believe that there is no desire whatever to limit the progress of scientific inquiry. Certainly we could not possibly do so. But why should we attempt it? If I understand it aright, scientific inquiry, when properly conducted, is nothing more nor less than a devout examination of the works of our Almighty Creator; and the more we become acquainted with these, and the nearer we approach to His presence, the more must every one be filled with devout adoration and a sense of His infinite majesty and glory. As the learned author of this address has pointed out in the course of his observations, that the one circumstance of the Almighty having given us faculties to enable us to pursue these investigations, must be taken *à priori* as a reason and a proof that it is quite consistent with our duty, as well as with our highest interests, that we should pursue

scientific inquiry. But we must always recollect that it has pleased our Almighty Maker to give unto us not only intellectual faculties, but also a moral nature, and something which has to live when this world has passed away. And this moral condition of man brings its own necessities, which must be supplied, and it is impossible that mere science can supply them. Now, there is no necessity that there should be an antagonism between the Revelation of God in His works and in His word. There may be difficulties in Revelation—we should expect such; for how are we to understand those things which have reference to infinity? We find difficulties in nature which we cannot explain: how much more then, when we come to consider the moral and the spiritual things? There may be a difference between the kind of evidence in which we are to receive Science and Revelation; but we should always recollect that, though the truths of religion may not be the subject of demonstration, we have an amount of moral evidence collected from the facts which range over a very wide surface indeed, all converging at one point; and these give us a moral certainty that religion is true. And as reasonable men we are bound to act upon that moral certainty. And if we did what Coleridge recommended a friend to do, who was doubting about religion, namely, to try it, we should no doubt find the truth of what our Saviour has said, that if any man do the will of God he will know whether the doctrine be of God.

Rev. T. P. BOULTBEE, LL.D.—I rise with great pleasure to second the resolution. As an old Cambridge mathematician, I have listened with the greatest delight to Professor Main's address. He has given us certain modern scientific results, and the limits within which these results have been dealt with have been the closest in which they could possibly be laid down. Mr. Main has proved the use and necessity of this Society in two ways; he has exposed the formation of errors, and he has shown a great deal of their fallacies, and he has thrown the great weight of his own personal authority on the side which we all believe in. What we all recognize as the great cause and necessity for this Society is the peculiar tone of certain men of science, who have not limited themselves to their own subjects, but have thought proper to attack the very fundamental principles upon which, not only all religion, but all society is founded; and if it be so, inasmuch as we must live in society, these things are far more valuable to us than any mere scientific discoveries can be. We must live here together, and charity and justice, and all the fundamental virtues, are necessary to us here; but it is not necessary to us that we should know the ultimate constitution of atoms. Therefore, to say nothing of the infinitely greater things that rise up before us as Christians, we are all persuaded of the great value of this Society. This is not simply a clerical society; but in this, as in all other matters, we advance best when the clergy and the laity can advance together. I have much pleasure in seconding the resolution.

The resolution was carried unanimously, and acknowledged by the Rev. R. Main.

Mr. C. BROOKE, F.R.S.—I am requested to address you a second time in consequence of the unavoidable absence at the House of Commons, of Mr. John Walter, who had charge of the following resolution :—“That our best thanks be given to our esteemed President, Lord Shaftesbury, not only for his kindness in presiding on this occasion, but for the inestimable manner in which he has devoted his whole life and energies to the maintenance of all those principles which it is the main object of this Society to support.” (Cheers.)

Mr. A. W. CRICKMAY.—I have the honour and pleasure of seconding the resolution. The resolution was carried with applause.

The EARL OF SHAFTESBURY, K.G.—My lords, ladies, and gentlemen,—I am sure you will readily believe that I accept with much gratitude the vote you have been pleased to pass ; but I should feel a still deeper sense of gratitude if you would excuse a speech from me, for I really shrink from all the great subjects which have been brought before us. I believe I was present at the very birth of this Society, when an address was delivered by my friend Mr. Walter Mitchell, in a small dark room. I had no conception at that time of the work which the Society would do, and of the position which it would hold, and I assure you I feel now very much like an astonished duck that finds it has hatched an ostrich's egg. (Laughter.) I had no expectation whatever of seeing the Society assume such magnificent proportions, and from the bottom of my heart I thank Almighty God that He has so prospered our efforts. (Cheers.) I did at one period give up some time to the study of science, but it is so many years since, that I have lost the little scientific knowledge I once had. Forty-four years ago I was much engaged in Sir James South's place at Kensington, and many hours and days have I spent there, but I am astonished now at the ignorance in which I was, at a time when I thought I had attained to the very heights of science. We are greatly indebted to our learned lecturer to-night for conveying to us so much important knowledge, and for conveying it in so masterly and literary a style. (Cheers.) And imbuing it also with such a noble spirit of piety, religion, and truth. (Loud cheers.) Again I say, I give God thanks that we are brought together to have it manifested before us that there are men of science who can combine the two, and see in science and religion the one God, the Creator of the world. I remember that the object with which this Society was formed was, not merely to beat down the views of others, not to be antagonistic to the progress of science, but to do all that we could do for the development of Truth ; and if I may use the phrase, to give religion “fair play” : for our opponents came down with so much heat, and such a weight of authority, and told us that no man who was not a simpleton could ever believe in science and religion together, that we said, “We will see what we can do—we will bring masterly minds and pious hearts together, and see if we cannot give a great manifestation in favour of revealed truth.” What has been the result ? Has there not been a great reaction in the public mind ? (Cheers.) Do not people now, to a much larger extent, profess to believe in Revelation ? And

do not some of those believers rank among the best scientific men of the day? (Cheers.) My own desire as to science is that she should go on with enormous and uncontrolled rapidity, rather than go so slowly as she does. Our scientific men lag behind too much; they get a fact and rest upon it, and think that with it they can tear down all revealed religion; until after a time they find it no fact at all. (Cheers.) They should not pause so long, they should dive to the lowest depths, ascend to the greatest heights, and leave nothing untouched nor unexamined; but they should be sure of their "facts" before they come forward and proffer to weak and timid minds a "theory," and so establish an unbelief that may never be uprooted: for there are many who hear the statement of a case who never hear its refutation. (Cheers.)

[The Annual Meeting being concluded, the members, associates, and their friends assembled in the Museum of the Society of Arts, where refreshments were served.]

ORDINARY MEETING, JUNE 21, 1875.

Held at the House of the Society of Arts.

The Rev. ROBINSON THORNTON, D.D., V.P., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—

- Rev. Canon R. E. Brooke, M.A., Bath.
 Rev. R. P. Davies, M.A., F.R.A.S., Gloucester.
 Rev. T. Goadby, B.A., President, Chiswell College.
 Rev. Professor J. J. Lias, M.A., St. David's.
 Rev. Canon Tristram, M.A., LL.D., F.R.S., Durham.
 Rev. J. Stephenson, B.A., London.
 T. Croggon, Esq., London.
 J. Moore, Esq., Dulwich.

ASSOCIATES :—

- Rev. Professor S. M'All, Hackney.
 Rev. C. R. W. Nursey, Clapham.
 Rev. H. R. Reynolds, D.D., President, Cheshunt College.
 Rev. J. M. Rogers, Derry.
 F. Beer, Esq., South Africa.
 Colonel S. Denniss, London.
 F. W. P. Long, Esq., Great Yarmouth.
 R. M. Masters, Esq., South Africa.
 O. C. Pell, Esq., Ely.

Also the presentation of the following Works for the Library :—

- "Proceedings of the Royal Society." Part 161. *From the Society.*
 " " " Geographical Society." Vol. xix. *Ditto.*
 " " " Institution." Part 62. *Ditto.*
 " " " Geological Society." Part 122. *Ditto.*
 " " " United States Geological and Geographical Survey,"
 1874. *From the Survey.*
 "Animals not Automata." By Professor Hazard, U. S. A.
From Prof. Morris.
 "The Lost Continent." *From J. Cooper, Esq.*
 "Heroines of the Past." *From W. R. Cooper, Esq.*
 "Syrian Miscellanies." *Ditto.*
 "Records of the Past." Vol. iii. *From H. T. Bagster, Esq.*
 "The Seat of Power." By J. Leith, Esq., (Australia). *From the Author.*
 "Fortnightly Review." *From J. W. Lea, Esq.*
 "Responsibility in Mental Disease." *Ditto.*
 "World-wide Crisis." *From Professor A. Duff, D.D.*

The following Paper was then read by the Author :—

ON THE ETRUSCAN LANGUAGE. By the Rev. ISAAC
TAYLOR, M.A.

THE origin of the Etruscan people and the nature of their language is a mystery which has perhaps excited more fruitless curiosity than any similar question. Niebuhr believed the problem would prove to be insoluble ; at the same time he considered its solution to be of such great importance that he expressed himself willing to share his fortune with the man who should be so fortunate as to make the discovery.

The question is important because it is bound up with the early history of Rome. The first chapter of Roman history cannot be truly written until the Etruscan secret has been discovered.

At the time when legend ceases and history begins, the mighty Etruscan nation ruled Italy from Vesuvius to the Alps, Rome herself being included in the Etruscan dominion, and being ruled by an Etruscan Lucumo. It was from her Etruscan masters that she acquired the rudiments of culture, and learned the arts of masonry, of pottery, of metal-working, and of writing. When at last the Romans had freed themselves from the Etruscan dominion, a struggle for supremacy commenced, which was not finally concluded for six centuries. In two centuries more the Etruscan language died out. This nation—once so mighty, so wealthy, so civilized—disappeared utterly, leaving behind only the crumbling walls of deserted cities, still encompassed by vast cemeteries which have filled the museums of Europe with costly objects of luxury and art—vases, cups, lamps, statues, mirrors, gems, jewellery, and armour. More than all, these tombs have yielded 3,000 inscriptions, written in a strange, uncouth language, wholly different from any form of speech which is known to have been spoken in any of the neighbouring lands.

The interpretation of this language is the only philological problem of first-rate importance which still remains unsolved. I have undertaken to set before you to-night an account of the progress which has been made towards its solution.

Not long ago there were three such unsolved problems. Three ancient civilizations bequeathed to the modern world a sealed literary treasure. The temples of Egypt, the palaces of Assyria, the tombs of Etruria, had preserved three unknown literatures,

written in three unknown languages, the interpretation of which has been the task of our own century. The task is now well-nigh accomplished. The inscriptions of Egypt and Assyria are a mystery no longer; the inscriptions of Etruria, which were the first to be attacked by scholars, have been the last to guard their secret.

The Etruscan riddle differs altogether in its nature from the other two. To explain an inscription in an unknown language two things must be found out. In the first place, it is necessary to ascertain the phonetic value of the signs or letters; secondly, we must discover the linguistic affinities of the language. Now in the case of the Hieroglyphic and the Cuneiform inscriptions, it was the first of these obstacles which presented the difficulty; when that difficulty had been overcome, the rest was comparatively easy. And so when a happy guess had shown that certain recurring sets of signs in the inscriptions must represent the names of Cleopatra and Ptolemy, of Darius and Xerxes, the interpretation of the Egyptian and the Assyrian records followed as a thing of course. It was only a question of sagacity and patience to work out all those magnificent results which have been obtained.

But with regard to the Etruscan inscriptions the obstacle has been of a wholly different order. The value of the Etruscan letters is easily found, as they are only modified forms of the Phœnician or Carthaginian letters, and are themselves the source from which the well-known Roman letters have been derived. The problem is, therefore, to discover some cognate language—some language ancient or modern—belonging to the same family of speech, by the aid of which the Etruscan inscriptions may be interpreted.

Now, if we knew positively the meaning of a single Etruscan sentence containing a dozen words, it would not be difficult to detect the linguistic affinities of the language. A bilingual inscription, such as that famous Rosetta stone which gave the key to the hieroglyphic records, would amply serve the purpose.

It is true there are in existence a few bilingual inscriptions in Etruscan and Latin; but, unfortunately, they are either so meagre or so mutilated as to be of very limited value. One of the best of them comes from a sarcophagus found at Perugia. It contains only four Etruscan words, and these are all of them proper names. On the side of the sarcophagus, in well-formed, carefully cut letters, is the Latin inscription:—

P. VOLUMNIVS A. F. VIOLENS CAFATIA NATVS

On the lid of the sarcophagus we have the Etruscan translation, somewhat rudely scratched, in letters of the very latest forms:—

PUPVELIMNA AU CAHATIAL

These inscriptions evidently date from the early days of the

Empire, when the Etruscan language was dying out, and Latin was the ruling language at Perugia. In this sarcophagus was buried the descendant of a long line of Etruscan nobles—himself the last Etruscan, the first Roman, of his race.

Now if we rearrange the two inscriptions, so as to show how the several words correspond, we have—

Latin:— P. VOLUMNIUS A.F. VIOLENS, CAFATIA NATUS.

Etruscan:—PUP. VELIMNA AU. CAHATIAL.

The agreement of the Prænomen, the Nomen, and the Patronymic is easy to follow. The Latin Agnomen VIOLENS has no direct equivalent in the Etruscan translation, though probably, like other Agnomina, it may be derived by translation from CAHATI, the name of the man's mother.* The most important point to notice is that CAHATIAL, the last word of the Etruscan record, is equivalent to CAFATIA NATUS, the last words of the Latin inscription. In another bilingual inscription the Etruscan word CAINAL is in like manner translated by CAINNIA NATUS. Hence we learn positively the meaning of the suffix *al*, which occurs many hundred times in Etruscan inscriptions. It was the regular Etruscan metronymic; it is usually appended to the mother's name, and means "child" or "born of." Our nearest approach to the names CAHATIAL or CAINAL are the English patronymics, such as Johnson and Thompson; metronymics like Marychild or Lucychild, if we had them, would exactly represent the Etruscan nomenclature.

The bilinguals give us some small further help. The word SEC or SECH occurs in 79 epitaphs, all of which relate to women. The Etruscans must have had a word meaning "daughter"; and such a word must necessarily have been often used in mortuary inscriptions. This meaning is perfectly suitable in all the 79 inscriptions which contain the word SEC. In one case this word SEC appears to be translated by the Latin *filia*.† We may, therefore, take it as certain that SEC meant "daughter."

In like manner there are 89 epitaphs, all of them relating to men, which contain the word CLAN. In one bilingual this is represented in the Latin version by F., which of course stands for *filius*. It is agreed on all hands that CLAN must mean "son," or perhaps distinctively "eldest son."

The suffix -ISA occurs in innumerable inscriptions. There can be no doubt that it designates married women. Thus HERINISA would be the "wife of Herini."

Here then are four definite results. We have the meanings of

* See p. 195, *infra*.

† Corssen, p. 164, note.

the four Etruscan vocables which occur most frequently in the inscriptions. They are—

-AL	“child of.”
SEC	“daughter.”
CLAN	“son.”
-ISA	“wife of.”

We have now reached the first stage of our inquiry. I shall presently recall your attention to these four words, the meanings of which were correctly surmised some eighty years ago.

During the next half-century numerous Etruscan inscriptions were discovered and classified. They were discussed in many learned books, but no real progress was made towards the elucidation of the Etruscan mystery. The key was not found. At last, in the year 1847, a discovery was made not one whit less important in its way than the memorable discovery of the Rosetta stone. The Princess of Canino had the good fortune to find in a newly excavated tomb on her estate a pair of ivory dice. These dice, which are now in the Cabinet des Médailles at Paris, were inscribed with six Etruscan words,—one word on each of the six faces. These words are :—

MACH, HUTH, CI, SA, ZAL, THU.

This discovery naturally excited the greatest interest, as it was at once perceived that these six words could only be the first six Etruscan digits. Bunsen repeatedly declared his conviction that these dice would prove to be the key to unlock the secret of the Etruscan language. Numerous attempts have been made to connect these six words with the numerals used by other races of ancient Italy. All these attempts, however, have failed so conspicuously that eminent scholars, such as Prof. Max Müller and Prof. Corssen, have doubted whether these words are numerals at all. Prof. Corssen goes further; he thinks it quite out of the question that they can be numerals. He is of opinion that the words on the dice are closely akin to Latin. He thinks they are to be arranged and translated as follows :—

Mach	thu-zal	huth	ci-sa.
Magus	donarium	hoc	cisorio facit.

Mr. Ellis pertinently observes that with this arrangement of the words the sentence is good Gaelic, and means :—

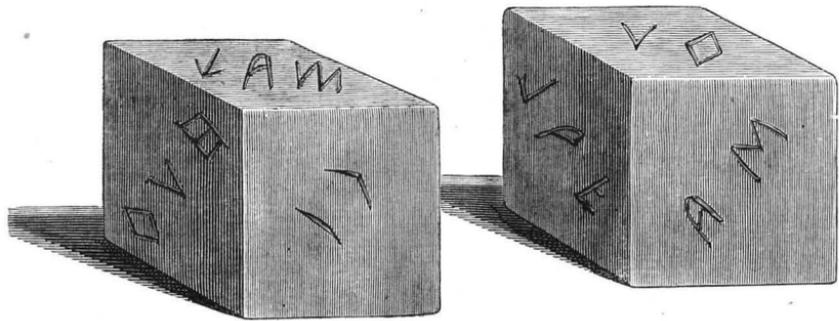
“Mac Dougal gave this.”

It is equally good Armenian with the sense—

“Magus cuts the recompense of his vow.”

Lastly, Lord Crawford takes the words as a mixture of Gothic and Greek, and translates them as a sort of gambler's prayer :—

“May these sacred dice fall double sixes.”



THE ETRUSCAN DICE (*Actual size*).

Everything, in short, can be made out of anything if once the needful license be allowed. We have only to choose our language, arrange our words, allow ourselves as much phonetic license as may be needful, and then the interpretation follows.

Whether, however, any such wild guess-work can be at all permitted,—whether it is possible that these six words can be anything else than Etruscan numerals, this is the question which must be positively settled before we go further. The importance of this question cannot be overrated. It decides absolutely the nature of the Etruscan language.

On the tombstones of all races four facts are commonly recorded—name, parentage, marriage, and age.

Among the thousands of Etruscan epitaphs there are naturally many which record the age attained by the deceased person. Such inscriptions can easily be picked out from the rest by their containing figures similar to the well-known Roman figures. Here, for instance, are a few instances of such inscriptions:—

LARIS : SETHRES : CRACIAL * AVILS : XXVIII
 PEPNA : RUIFE : ARTHAL AVILS XVIII
 VIPINANAS . VELTHUR . VELTHURUS . AVILS XV
 CEICNAS : ARNTH : ARNTHAL : AVILS : XXIX
 SIATHILARNTHU AVILS XXIX
 ANES ARNTH VELTHUAL CLAN LUPU AVILS L
 ARNT . THANA . LUPU . AVILS XVII
 U.IZENI RAMTHAL LUPU . AVI[LS]. XXIII
 AVILS LXX LUPU

In all these cases the figures which denote the age are preceded by the word AVILS. There can be no doubt that this word AVILS means “aged.” Also the word LUPU, which is sometimes introduced, must mean “he died.” We obtain therefore, these three formulæ for expressing the age of the deceased:—

- (1) A. B. avils XXIX
- (2) A. B. lupu avils XVII
- (3) A. B. avils LXX lupu

In all the formulæ the word AVILS is immediately followed by the figures.

Now, sixteen epitaphs have been found in which this word AVILS is followed, not by figures, but by words. Omitting, for the sake of brevity, the names of the deceased, which always precede the record of the age, the sixteen epitaphs are as follows:—

1.	lupu	avils	<i>machs</i>	<i>zathrums</i>	
2.		avils	<i>machs</i>	<i>semphalchls</i>	lupu
3.		avils	<i>machs</i>	<i>mealchlsc</i>	
4.		avils	<i>huths</i>	<i>muvalchls</i>	lupu
5.		avils	<i>huths</i>		lupu
6.		avils	<i>huths</i>	<i>celchls</i>	
7.		avils		<i>cealchls</i>	lupu
8.		avils	<i>cis</i>	<i>cealchls</i>	
9.		avils	<i>cis</i>	<i>muvalchls</i>	
10.		avils	<i>thunesi</i>	<i>muvalchls</i>	lupu
11.	lupu	avils	<i>esals</i>	<i>cezpalchals</i>	
12.		avils	<i>sas</i>		
13.		avils	<i>tivrs sas</i>		
14.		avils	<i>sesphs</i>		lupuce
15.		avils		<i>ciemzathrms</i>	lupu
16.		avils	<i>cis</i>	<i>zathrmsc</i>	

There can be no reasonable doubt that the words in italics, which exactly take the place of the usual figures in the three formulæ for denoting age, must be Etruscan numerals.

In all known languages, numbers between twenty and one hundred are constructed on the same model. Let us take, for instance, the English numbers—

Twenty four,
 Thirty two,
 Forty three.

We see that in every case there is a short word, called the *digit*, and a longer word called the *decade*. The digits, two, three, and four, are dissimilar in form. The decades, twenty, thirty, and forty, have a common suffix *-ty*, which means "ten." The first syllables of the decades are digits which have undergone slight phonetic modifications. If we now examine our Etruscan numerals, it is easy to pick out the decades and the digits. The words MEALCHLSC, MUVALCHLS, CEALCHLS, CELCHLS, SEMPHALCHLS, CEZPALCHALS, ZATHRUMS, and CIEMZATHRMS can only be decades; while the words MACHS, HUTHS, CIS, THU-NESE, ESALS, and SAS must be digits. Here then, without any reference to the dice, we have got six words purporting to be Etruscan digits. It is obvious that inscribed dice, and inscriptions on coffins recording people's ages, can have no words in common except digits. If there is an agreement of a fair proportion, say four or five, of the two sets of words which purport to be digits, the proof is overwhelming that both the words on the dice and the words in the epitaphs are really numerals, and nothing else.

The correspondences are these—

Dice Digits.

MACH
 HUTH
 CI
 SA
 ZAL
 THU

Epitaph Digits.

MACH-S
 HUTH-S
 CI-S
 SA-S
 ESAL-S
 THU-NESI

The last digit is probably a compound denoting either 7, 8, or 9. As to the others, the agreements are as remarkable as the differences. The chief difference is the regular addition of a final *s* in the epitaph digits. This can very easily be accounted for. The dice digits must be the cardinal numbers, one, two, three, four, five, six. Taking AVILS to mean *ætatis*, the epitaph digits would be ordinals, and the final *s* would be the ordinal suffix, corresponding to *th* in the English ordinals four-th, fif-th, and six-th.

We may therefore take it as beyond dispute that we have really got hold of the first six Etruscan digits, and also of at least ten other numerals lower than one hundred. The philological importance of this result can hardly be exaggerated. Jacob Grimm, the great comparative philologist, has laid down the law that numerals take the first rank as evidences of the affinities of language. There are few who will venture to gainsay him.

But here comes a great difficulty; a difficulty so great, that for more than a quarter of a century it has rendered useless the key to the Etruscan language which the dice have supplied. How are we to ascertain the order in which these six words are to be arranged? Any one of the six words on the dice might denote any one of the first six numbers. There are fifteen possible arrangements—all different. How shall we allot the six words to the six digits? Our six keys are of no use till we know how to place them in the six key-holes. It is possible to evade this difficulty by beginning with the decades instead of the digits. Taking our sixteen epitaphs, it is manifest that two of them (Nos. 5 and 12) contain only dice digits, and therefore relate to children not more than six years of age. In one epitaph (No. 14) the word SESPHS is shown by the effigy of the deceased to denote the age of a lad in his teens, while another (No. 13) is anomalous, since the word TIVRS might mean "tenth," or it might mean "days," "weeks," or "months." Setting these four epitaphs aside, there remain twelve inscriptions which certainly contain decades. These decades are of two kinds. We have—

MEALCHLSC	ZATHRUMS
MUVALCHLS (thrice)	ZATHRMSC
CELCHLS, or CEALCHLS (thrice)	CIEMZATHRMS
SEMPHALCHLS	
CEZPALCHLS	

Discarding the final sibilant as being only the ordinal sign, we have nine inscriptions in which the decade ends in *l-ch-l*. This, therefore, must be a decadal suffix corresponding to *-ty* in English, *-zig* in German, *-ginta* in Latin, or *-kovra* in Greek.

Here then, at least, is something absolutely certain and definite, free from all doubts and ambiguities, which may be used as the starting-point in determining the family of languages to which the Etruscan speech belonged.

Now it is utterly out of the question that the Etruscans can have been a colony of Negroes, or Hottentots, or South-Sea Islanders, or Mexicans, or Peruvians, or Red Indians. The portraits in their tombs, to say nothing of geographical considerations, are enough to dispose of any such hypothesis.

Putting aside the languages of such impossible races, the languages of Europe and Asia divide themselves into three grand divisions:—

- I. The Aryan or Indo-European languages,—such as Sanskrit, Persian, Greek, Latin, German, Russian, or Welsh.
- II. The Semitic languages,—such as Phœnician, Hebrew, Arabic, and Assyrian.
- III. The Turanian languages, comprising the various Finnic, Turkic, Mongolic, Dravidic, and Malayic dialects.

Thus the problem reduces itself to this simple question,—In which of the three great families of speech—Aryan, Semitic, or Turanian, are there any decades resembling this Etruscan decade? Are there any languages in which *l-ch-l*, or any equivalent root, is used as a decadal suffix?

To this very definite question there is a very definite answer. The Aryan and the Semitic languages are at once put out of court. The claims of Hebrew, Arabic, Phœnician, Coptic, Celtic, Oscan, Umbrian, Latin, Greek, Gothic, and Slavonic, all of which have been urged by learned men, in learned books, disappear before this simple test. In none of them do the decades end in *l-k-l*.

The Turanian languages are left. If *they* do not satisfy our test, the Etruscan language must, as some have thought, stand apart, solitary and kinless among all the known languages of the earth;—a single shattered peak as it were, emerging out of the deluge which has overwhelmed the whole linguistic world to which it formerly belonged.

Fortunately, however, our test is satisfied by the North Turanian, Altaic, or Finno-Turkic family of speech, a class which includes the languages of the Lapps, Finns, Magyars, Turks, Tatars, Mongols, and Samoyedes.

The westernmost of these languages is the Lapp. Now in Lapp the word *lokke* means both ten, -teen, and -ty. Thus we have—

wit = 5	lokke = 10	wit-a-lokke = 50
kut = 6	lokke = 10	kut-a-lokke = 60
kolm = 3	lokke = 10	kolm-a-lokke = 30

In the construction of these Lapp decades a formative or euphonic α is supplied between the digital and decadal sign, just as in the Etruscan decade, CE-A-LCHL, where the first syllable is obviously the digit which appears on the dice as CI.

The root *l-k*, with the meaning "ten" or "ty," is not confined to Lapp and Etruscan. It appears in various Finnic languages in an abraded and softened form, as in the Wogul *lu* = 10, or in the Tscheremiss *lo* = "ty" in *ko-lo* = 20. It is also found in the Turkic languages. For instance, in Koibal Tatar we have decades ending in *-lex* and *-rek*, as *i-lex* = 50, and *ke-rek* = 40. In Uiyur Tatar the guttural is softened, and we have *lava* = 10, a form transitional to the Finnic *lu* = 10. Therefore, this Etruscan decade exists in each of the two great divisions of Altaic speech. It can also be traced in the Basque, a remote congener of the Finnic languages.*

The second *l* in the Etruscan root *l-k-l* has to be accounted for. Now, there are several reasons for supposing that the Etruscans, like some other Turanian nations, counted by scores instead of by tens. In this case the suffix *l-k-l* ought to denote "twenty." Since the Turanian root *l-k* means "ten," the form *l-k-l* may be taken as a reduplicated form, *l-k+l-k*, or 10+10. Now, supplying a vowel, it is plain that in such a word as *lekkl*, the final guttural would be very difficult to pronounce, and would be certain ultimately to disappear, leaving *lekl* to mean "twenty."

It may therefore be affirmed that the Turanian languages afford a complete and satisfactory explanation of this Etruscan decade.†

The scientific method of research is to subject any supposed discovery to every possible test of its correctness. If the true key has been found, it ought to open all the wards of the lock. Now the two triads of Etruscan numerals—

* Basque, *ogei*=20. Cf. Georgian *ozei*=20.

† I am not prepared to affirm that the Aryan *d-c-n*=10 may not ultimately be connected with the Turanian *l-k*=10. In fact, in some of the Teutonic languages there seem to be faint echoes or survivals of the primitive Turanian form. Thus the *l* has been retained in the English numerals *e-leven* and *two-lee*; while in the Lithuanian, which approximates more closely to Finnic forms than other Aryan languages, we have the exceptional and anomalous numeral *try-lika*=13.

MACHS	MEALCHLSC	CIS	MUVALCHLS
MACHS	SEMPHALCHLS	CIS	CEALCHLS
MACHS	ZATHRUMS	CIS	ZATHRMS

if compared together, show that ZATHRUM must be an Etruscan decade, totally different in its formation from the decades ending in -LOHL. No such decade as ZATHRUM, or anything the least like it, is known in any Aryan or Semitic form of speech. If the Turanian languages can explain this decade as well as the other, the weight of our evidence is not simply doubled, but increased a thousand-fold. A single coincidence between the Etruscan and the Turanian decades might possibly be accidental; that there should be two such coincidences, both of them accidental, is quite incredible.

Rejecting the ordinal suffix (*s*), the Etruscan decade is ZATHRUM. Now, letter for letter,* this is the same as one of the Yenisiseian decades. We have—

<i>Etruscan</i>	z - a - th - r - u - m
<i>Yenisisei</i>	s - ai - th - j - u - ñ

The Siberian decade *sai juñ |* signifies "forty." The Yenisiseian languages leave no doubt as to the composition of this numeral. The first syllable, *sai-*, means "four," and the second syllable, *-thjuñ*, is the usual decadal suffix, equivalent to "ty." Thus we have—

kina	= 2	khin-thjuñ	= 20
khalā	= 5	khal-thjuñ	= 50

Now we find this word *thjuñ*, meaning "ten" or "-ty," running through a host of Altaic languages from China to the Baltic. Thus we have—

<i>Mantshu</i>	DJUAN	=	10
<i>Mongol</i>	DJUN	=	10
<i>Samoyed (Motor)</i>	DJIUM	=	10
<i>Yakut</i>	DJEAN	=	10
<i>Turkish</i>	ON	=	10
<i>Ostiak</i>	JON	=	10
<i>Volga Finn</i>	KJEMEN†	=	10
<i>Baltic Finn</i>	KYMMEN	=	10

* The letter *s* is pronounced like the letter *s* in the word sugar. The sound of the Etruscan *z* was probably the same. The final ñ in *sai juñ |* is the nasal ñ, which is constantly interchanged with *m*. An Etruscan *r* answers to a Turkic *j*. (See *Etruscan Researches*, p. 206.) The letters *r* and *j* are also interchangeable in Siberian languages. (See Schott, *Tat. Spr.*, pp. 28, 29, 35.)

† A primitive *d* or *t* sometimes becomes *k* in Finn, e. g. old Magyar *turck* = Finn *kurku*.

It may, therefore, be asserted not only that the Etruscan decades can be explained by the Altaic languages, but that every Altaic language, from the Baltic to the Amoor, possesses either one or both of the two Etruscan decadal suffixes which we find in such records of age as *machs me-a-lchl-sc*, or *machs za-thrum-s*.

So much for the Etruscan decades. They have given us what seems to be a key to the lost speech of the Etruscans. We have now to see if our key is *the* key. Will it give consistent and probable interpretations of the six digits on the dice which have so long baffled the efforts of philologers?

The great difficulty in interpreting the words on the dice is to obtain a starting-point. This, fortunately, is supplied by the decades. We have seen that the Etruscan decade *ZA-THRUM* meant *for-ty*, hence we gather that the first syllable *ZA* was equivalent to "four" in Etruscan. You are aware that the Accadian, one of the cuneiform languages of Babylonia, presents us with the most ancient form of Turanian speech. In Accadian the number "four" is *sa* or *sa-na*. Therefore, in endeavouring to interpret the numerals on the dice, we may begin by assuming that the word *SA* means "four."

Our next step is also on firm ground. In the Etruscan Museum at Florence there is an Etruscan die marked with pips. On this die the face with four pips has opposite to it a face with two pips. Moreover, Signor Campanari, a well-known archæologist, who collated a number of Etruscan dice marked with pips, comes to the conclusion that the Etruscan practice was to put "four" and "two" on opposite faces. Let us now take our dice and see what word comes opposite to *SA*. In both of the dice it is *CI* or *KI*. This word therefore ought to mean "two" in Etruscan, and if our key is the right key, it ought also to mean "two" in the Altaic languages. This we find to be the case. Throughout the Altaic languages *ki* is the stem of the numeral "two." In twenty-three Turkic and Tataric languages *iki* or *ikke* means "two." In Wotiak *ki* (in *ki-z=20*) means "two." In Tscheremiss *ko* (in *ko-lo=20*) means "two." In the Finnic languages *kik*, *kyt*, *ket*, *kaks*, or some similar word, means "two." In Samoyed *ky-dy* means "two." In Yenissei *ki-na* means "two." In Avar *ki-go* means "two." In these languages the last syllable is a numerical formative. In Accadian, the most ancient Altaic language, *kas* is "two." More than all, in those Altaic languages which have preserved a dual, the dual formative is *k* or *g*.

There are various subsidiary proofs that we are right so far in taking *sa* as "four" and *ci* as "two." First, the effigy of the man whose age is *MACHS ZATHRUMS* represents a man in the prime of life, and we have seen that *ZATHRUM* ought to mean "forty." Again, the decade *CI-EM-ZATHRUMS* must denote some multiple of forty, and

as 120 or 160 are impossible ages, CIEM must mean "twice," and CI-EM-ZATHRMS must be eighty. This is confirmed by the effigy on the sarcophagus, which represents a very aged man.

Now, if CIEM means twice, it must contain as its stem the Etruscan word for "two." That is, it must have as its stem one of the words on the dice. The only word on the dice from which CI-EM could be formed is CI. Therefore CI means "two," and CIEM-ZATHRM is twice forty or "eighty," as the effigy would lead us to expect.*

There is yet another test of the correctness of our results. The effigy of the man whose age was CIS CEALCHLS is now in the British Museum. It represents a man in the prime of life, neither old nor young. According to the preceding analysis, CE-A-LCHL would be "two score," and the words CIS CEALCHLS would inform us that the man died in his forty-second year. Our English numerals "forty" and "two score" denote the same number, so there is no difficulty in supposing that the Etruscan numeral ZATHRUM may have been a synonym of CEALCHL.

Four of the dice digits are left—ZAL, HUTH, MACH, and THU. The word ZAL has not much resemblance to any Aryan numeral, though Professor Max Müller thinks it might be identified phonetically with the Latin *tres*. It is hardly needful to resort to so violent an expedient, as we find the exact word in the Siberian tongues. It is obviously the Yukagir *jal* in *jal-on*, "three."† This is obviously the same as the Ostiak *chol* in *chol-ym*, "three," which again is the same word as the Finnic words for "three," viz., *kol-m*, *kol-on*, *kor-om*, and *har-om*.

The word HUTH (elsewhere written HUT) corresponds very closely to the Finnic words for "six." In Lapp, Wogul, Tschermis, and Ostiak, "six" is *kut* or *chut*. In Wotiak the vowel changes, and "six" is *kuat*. In Magyar we have the further change to *hat*, where the initial letter is the same as in the Etruscan word, though the vowel sound is different.

The two remaining words, MACH and THU, are both explained by the Samoyed *muk-tuh*, "six," or I + V. The first syllable of

* There is no escape whatever from this conclusion. The effigy absolutely restricts the meaning of *ciemzathrm* to either 70, 80, or 90. The first of these meanings is excluded, because seven being a prime number, there is no decade of which 70 can be a multiple. Again, if *ciem-zathrm* were 90, then *-zathrm* must be 30, and *ciem-* must mean "thrice." Hence the dice digits *sa* and *ci* would both of them denote "three," which is absurd. Therefore the only possible solution which the two effigies permit is to take $sa=4$, and $ci=2$.—Q. E. D.

† Dr. Schott has shown that *zal=jal*. (*Tat. Spr.*, pp. 34, 35.) The sounds are so close that the Mongol has only one sign for *z* and *j*. The suffix *-on* in *jal-on*, is a numerical formative, meaning "number," and does not belong to the root.

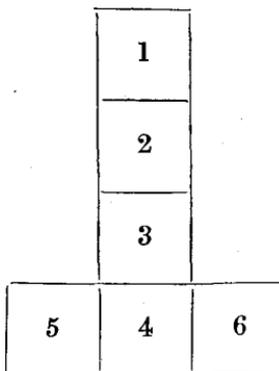
this word means "one," the second means "five." We also have the two elements separately. In Tungus we have *muk* in *muk-on*, "one," which is the same word as the Mordwin (Finnic) *vaike*, "one," the letters *m* and *v* being interchanged according to a common law.* In Tungus we have *tun* in *tun-ga*, "five," and in Magyar "five" is *öt*.

It may be said that the Etruscan word *THU* = 5 does not much resemble the Hungarian word *öt* = 5. Both, however, seem to be derived from a primitive word for "hand," of which the Samoyed *uten*, "hand," may be taken as the primitive type. In Ostiak this word takes the differentiated forms *uta* and *tui*, one of which means "hand," and the other "finger." These words, *uta* and *tui*, have respectively undergone the same changes as the Hungarian *öt* and the Etruscan *thu*.

We obtain therefore the following interpretation of the words on the dice:—

MACH	=	1
CI	=	2
ZAL	=	3
SA	=	4
THU	=	5
HUTH	=	6

Now if we are right in our determination of these words, the disposition of the words on the dice ought to agree with the way in which the numbers were usually placed on pip-marked dice. According to the investigations of Signor Campanari, Etruscan pip-marked dice were marked according to the scheme given by cutting out the following diagram and folding it round a cube.



* Schott, *Tat. Spr.*, pp. 30, 31.

The Turanian interpretation of the dice marked with words gives the following arrangement:—

1		
2		
3		
6	4	5

The correspondence is so close as to clench the argument.

I am, I think, justified in asserting that the Etruscan numerals can be explained by means of the Turanian languages. That neither the Aryan nor the Semitic languages will explain them stands confessed. The task has often been attempted. Pott, the greatest authority on numerals, has reviewed these attempts, and has discussed the dice numerals at considerable length, and he pronounces the verdict that they cannot be Aryan and cannot be Semitic. The latest advocates of an Aryan solution of the Etruscan problem seem to have accepted this decision as final, and they have consequently been obliged, either to contend, with Dr. Corssen, that the words on the dice are not numerals at all, or else, with Mr. Ellis, that the Etruscan was an Aryan language which possessed Turanian numerals. Which of these suppositions is the more impossible I will not undertake to say.

The difficulty of giving an Aryan or a Semitic interpretation to the decades is even greater than the difficulty with the digits.

With one exception, Lord Crawford passes over the decades in silence. He translates AVILS MACHS MEALCHLS, "aged 18—a leper." The decade *mealchl* is, he thinks, related to the Latin *macula*, "a spot." What diseases are denoted by such words as MUVALCHLS, CEALCHLS, and SEMPHALCHLS, he does not inform us.

Dr. Corssen, the latest and most distinguished advocate of the Aryan theory, is quite unable to explain these words MEALCHLS, MUVALCHLS, CEALCHLS, ZATHRUMS, and the rest, as Italic decades. In a sort of heroic despair he has broached the astounding theory that they are the names of peculiarly carved coffin ornaments whose particular nature he cannot explain. The word AVILS, which he admits means "aged," he takes to signify the name of the man

who carved them. The record AVILS LXXI he translates "aged 71," but the parallel record AVILS MACHS MEALCHLSC means, he says, *Avilius Magus meaculos* [*sculpsit*].

That these words are really decades will not be disputed by any one who is not blinded by a preconceived theory. I am therefore entitled to demand that any future advocate of an Aryan or Semitic theory, should any such arise, must fairly meet and answer my argument from the numerals.

But if it be admitted, as it must be, that the Etruscan numerals are decisively Turanian, it follows, I think, without further evidence, that the Etruscan belongs to the Turanian family of languages.

If, however, this should be disputed, there is an abundance of other evidence. We can try our key in other locks, and see if it will open them.

One lock, hitherto unopened, lies ready to our hand. Next to the numerals, the household words denoting the commonest relationships of life are the most persistent in their vitality. Other words change as languages grow old. These words, which are the first to be lisped by baby lips, outlive almost every other element of language. Such words, therefore, rank very high in philologic value.

We have already seen that the bilingual inscriptions determine the meaning of the four most frequent vocables on the Etruscan monuments. All these are, fortunately, words of kinship, so precious to the philologist. They are—

SEC	"daughter"
CLAN	"son"
-AL	"child"
-ISA	"wife"

None of these relationships are thus designated, so far as I am aware, in any Aryan language, nor have any passable Aryan etymologies been proposed for them.* In the Turanian languages, however, we find them all, and with the same meanings which they bear in Etruscan. Thus we have—

Etruscan	CLAN	son	}
Turcoman	<i>oglan</i>	son	
Etruscan	-ISA	wife	}
Mongol	<i>izi</i>	wife	
Tungus	<i>asi</i>	wife	

* As an example of the far-fetched etymologies propounded, I may mention that SEC, "daughter," has been derived either from the Latin *sequor*, or *seco*, as well as from the Slavonic *posagu*, "marriage." For CLAN we are referred to the Latin words *genitus*, *gnatus*, and *grandis*. Mr. Ellis allows that *sec* must be a Finnic word, but does not see that his admission is fatal to his theory of the Aryan character of Etruscan.

Etruscan	-AI	child
Tungus	<i>uli</i>	child
Tatar	<i>aul</i> and <i>ol</i>	son
Etruscan	SEC	daughter
Lapp	<i>sakko</i>	offspring*
Susian	<i>sak</i>	son
Scythic	<i>sak-ri</i>	son
Tungus	<i>a sak-an</i>	daughter

Next to the numerals and the designations of kinship, the words which possess the highest philologic value are the personal pronouns, and some forms of the verb-substantive. Here the correspondence is very close between the Etruscan and the Altaic languages. Thus the personal pronoun of the first person in Etruscan is *in*, and in Magyar *en*. In Etruscan the verb-substantive, first person singular, is *mi*, "I am." In Mongol it takes the forms *amui*, *bui*, and *bi*, while in Tatar it is *mi-n*, the final *n* being a vestige of the pronoun of the first person just referred to.

For the numerous correspondences between the vocabulary of the Etruscans and of the Altaic nations, I must refer to my "Etruscan Researches."†

One of the most certain conclusions of modern philology is that grammar is of far greater value than vocabulary as a test of the affinities of language. How, without guesswork or unwarrantable

* The Turanian root *s-k* seems to have originally meant "child," and afterwards to have been differentiated in meaning so as to designate "son" in some languages and "daughter" in others. The original meaning is seen in the Lapp *sakko*, "offspring," and also in the cuneiform Scythic, where the root *sacho* denotes filial descent, as in the verb *sacho-hut*, "we are descended," "we are the offspring."

† For example :—

Etruscan : <i>ma</i> =land	{ Finn : <i>ma</i> =land
Etruscan : <i>mantissa</i> =a bit, a make-weight	{ Accadian : <i>ma</i> =land
Etruscan : <i>damnus</i> =horse	{ Yenissei : <i>mintus</i> =a bit, a little
Etruscan : <i>etera</i> =young	{ Finn : <i>damna</i> =mare
Etruscan : <i>leine</i> =he lived	{ Lapp : <i>damp</i> =horse
	{ Yakut : <i>edder</i> =young
	{ Magyar : <i>lenni</i> =to be
	{ <i>leny</i> =existence
	{ Finn : <i>elenda</i> =Life
Etruscan : <i>tular</i> =tombs	{ Hunnic : <i>teulo</i> =a grave
Etruscan : <i>cahati</i> =violent	{ Tatar : <i>katti</i> =violent
Etruscan : <i>vari</i> =red	{ Ostiak : <i>wyry</i> =red
Etruscan : <i>Tages</i> =a soothsayer	{ Wotiak : <i>tataja</i> =soothsayer
	{ Lapp : <i>tajeteje</i> =a knower one who knows

assumptions, can we detect any elements of Etruscan grammar in the huge chaos of the Etruscan inscriptions? We can only work, with any safety, from the known to the unknown. Now it is a certainty that the words on the dice are numerals. It is therefore obvious that if any of the words on the dice occur in other inscriptions, some contiguous word may be expected to exhibit a plural form. Now the numerals *CI*, *ZAL*, and *HUTH*, are found not only on the dice but also in other inscriptions. In every case where they are found the next word ends in *r*. We have the following phrases:—

CI CLENAR
CLENAR CI
CLENAR ZAL
HUTH NAPER
HUT NAPER
NAPER CI
NAPER XII

Here there is a very definite grammatical result. It is as certain as any such inference can be that *-ar* or *-er* was a plural suffix in Etruscan. Now Dr. Schott, perhaps the highest authority on the Altaic languages, has expressed his opinion* that in all the Altaic languages the plural has been developed from a primitive form in *r*. This is still the plural sign in many Turanian languages,† though, in others, it has become either *s*, *t*, or *k*, according to well-known phonetic laws.

The Etruscans seem also to have had a plural in *l* as well as in *r*, since we find numbers expressed by figures in juxtaposition with the word *RIL*, which must mean "years." This transition from *r* to *l* is very simple, and has taken place in the Tungusic languages, which mostly form their plurals in *l*, instead of in *r*.

What was the Etruscan genitive? This is not difficult to detect, and is of great importance. The inscription on a recently-found sarcophagus runs as follows:—

RAMTHA: PHURSETHNEI: ARNTHAL: SECH: THANCHVILUS: SEINTHIAL:
AVILS XXXII

Here the first three words constitute the name of a woman; the word *SECH*, as we have seen, means "daughter"; and the two next words constitute the name of a man. What is the inference? If we had such an inscription as

"Sarah Jane daughter William Johnson age 32,"

* Schott, *Tatar. Sprach.*, pp. 48, 49.

† The Dravidic plural is *mar*, the Mongolic is *ri*, *nar*, and *ner*, the Turkic is *lar*, *ler*, *nar*, *ner*, *tar* and *ter*, and in the case of some pronouns it is *r* only.

we should conclude that Sarah Jane was daughter of William Johnson, and died at the age of 32. Hence it appears that the name THANCHVILUS SEINTHIAL is in the genitive case. But there is here no inflection. This genitive can only be explained as a genitive of position.

Other instances of this genitive of position can easily be adduced. Thus the word MARIS is repeatedly used on the mirrors, to denote a divine "boy," the "child" of one of the Gods. Thus we have MARIS TURAN, meaning the "boy of Venus," and MARIS THALNA, the "boy of Juno." Here it is clear that the words Turan and Thalna are uninflected genitives. Again, TULAR means "tombs," "sepulchral niches," or *columbaria*. The inscription TULAR LARNA, found on a stele, must mean "the burying-places of Larna." So also HINTHIAL PATROCLES means the "ghost of Patrocles." In all these cases we have a genitive of position, not of inflection.

The genitive of position is decisively non-Aryan, but is used in various Altaic languages, ancient and modern. We find it, for instance in Scythic, Accadian, and Susian, three cuneiform languages, as well as in the living languages of the Wotiaks and the Tschere-miss. Such a primitive device for expressing the genitive has naturally disappeared from the more advanced Turanian languages.

Side by side with this genitive of position we have in the Altaic languages a genitive of inflection, the sign of which was *-na* or *-n*. This also is represented in Etruscan. In one bilingual inscription VARNAL is translated VARIÂ NATUS. The metronymic suffix is *-AL*, and it is difficult to account for the letter *n*, which does not belong to the mother's name, except by supposing it to be a genitival sign, as in other Altaic languages. Thus, Var-n-al would correspond to Varia's child.

There can be no doubt that the Etruscan suffix *l* means "belonging to." Thus, in a bilingual inscription the Etruscan Gentile name VENZ-ILE is translated by the Latin VENZ-IUS, the suffixes *ius* and *ile* both expressing the formation of a Gentile name from the personal name of an ancestor,* and corresponding to the final *s* in such an English name as Williams. Again, two Bacchic cups are inscribed FUFUN-L, which evidently means "belonging to Fufuns," the Etruscan Bacchus. In another case we have *Truia-l*, meaning a Trojan, "one belonging to Troia," and a similar explanation might be given of the common metronymic suffix in *-AL*. This formative *l* is found in all Altaic languages, as, for instance, in the well-known Turkic formation of the ethnic term Osmanli from the personal name of Osman.

* This is also effected by the genitival suffix *-na*, Thus the Etruscan Gentile name CNEV-NA is Latinized GNÆV-IUS.



AN ETRUSCAN WARRIOR.

(Half size.)

The words VELSNACh, a "Volcian," and RUMACH, a "Roman," show that the ethnic suffix in Etruscan was *ach*. The same suffix is found in Susian, a Turanian cuneiform language, where *Susiak* denotes a "Susian." The ethnic appellations of the Altaic peoples are ordinarily formed in the same way; as Ostiak, Wotiak, Kosak, Jurak, Koriak, Karakalpak, Kalmuk, and many more.

Although my subject is "the Etruscan Language," I must not conclude without reminding you that language constitutes only a portion of the available evidence as to the affinities of nations. The features and the religions of races are transmitted as surely and certainly as their forms of speech. Therefore the sciences of Comparative Anthropology and Comparative Mythology may claim to have a voice in this matter as well as the science of Comparative Philology.

Now we have no lack of evidence as to the outward appearance of the Etruscans, and the testimony of ancient writers agrees with the evidence of the earlier mural paintings and portrait statues.* They are represented as differing altogether from the slender symmetrical forms of the Greeks and Romans. Their appearance must have resembled that of the Turanian races of Northern Asia, such as the Mongols, Tatars, Samoyedes, and Lapps.

This portrait of an Etruscan warrior, which is reduced from a well-known bronze statue found at Ravenna, might be mistaken for the representation of a Samoyed. As a rule the Etruscans had short, stout, sturdy figures, with large heads, thick arms, black hair and eyes, scanty beard, and, above all, the high cheek-bones, so characteristic of the Mongoloid race, as well as the oblique eyes with which we are so familiar in Chinese and Japanese drawings.

I would strongly recommend you to study the wonderfully realistic portrait figures which repose on the lid of the great terracotta sarcophagus which has lately been placed in the British Museum from the Castellani collection. The eyes, you will see, are as oblique as those of a Kalmuk or a Chinese. It may, I think, be safely said that those two portraits are alone sufficient to dispose of a whole library of books which have been written to prove the Aryan affinities of the Etruscans.

Next, if the Etruscans were Turanians, their religion should also be Turanian. This is a very important branch of the evidence, which I can only speak of in the very briefest manner.

Our information as to the religion of the Etruscans is ample. Some four hundred bronze mirrors have been found in Etruscan

* The type changes in later works of art, and conforms itself more to the Roman type. So the modern Turks have completely lost the Mongoloid type of feature which distinguished them when they first entered Europe, and the Magyars are fast losing it.

tombs; they are usually engraved with mythological subjects, and the names of the several deities are frequently given. These representations are of two classes. Sometimes we have scenes from a mythology purely Etruscan, with names wholly strange to all the Aryan mythologies. For another class of scenes the poems of Homer and Hesiod, which were evidently familiar to the cultured Etruscans, are freely laid under contribution. The Greek names are sometimes spelt in Etruscan fashion, as *ACHLE* for Achilleus, and *UTUZE* for Odysseus. Very often, however, though the scenes are plainly taken from the cycle of Hellenic myth, the names of the personages who take part in these scenes are neither the Greek nor the Roman names, but Etruscan equivalents or translations.

Here, for instance, is a very fine mirror which represents the Hesiodic myth of the birth of Athena. We see Athena as she springs full-armed from the head of Zeus, which has been cleft open by Hephaistos with his axe. This is one of the plainest of the nature myths. From the vault of Heaven, which has been cleft by the axe of Fire, springs the full-grown Dawn, armed with her spear-like rays of light. The Day and the Night stand on either side of the Dawn, and assist at the birth of the glorious maid.

Now in this mirror the Etruscan names of the Deities are exact translations of the Aryan names into Turanian speech. The "Sky," instead of being called Zeus or Jupiter, is named *TINA*, which seems to be the same word as the Chinese *tien*, "heaven," "sky," the Tartar *teñ-ri*,* "heaven," "God," and the Accadian *deñ-ir*, which has the same meaning. The wielder of the fiery axe, instead of being named Vulcan or Hephaistos, is called *SETH-LANS*, a word which in Finnic speech means "the fire-god." The Day, the spouse of Heaven, is not called Hera or Juno, but *THAL-NA*, a word which seems to be akin to the Samoyedic *tala*, "day," with the common Etruscan formative *-na*. In like manner, the Night, who uplifts the Dawn above her head, is called *THANA*, a word which we may compare with the Tataric word *tin*, *tun*, *tünna*, "night."

That the Etruscans were Turanians, and that they belonged to the North Turanian or Altaic branch of the Turanian stem, cannot, I think, be denied. To which of the Altaic races they approached most nearly is a more doubtful question. My own belief is that there were in Etruria two races, more or less blended—a conquered race, and a race of conquerors. This conclusion agrees with the testimony of Livy, from whom we learn that in Etruria the speech of the country folks differed from the speech of the towns-people. Count

* The root is *teñ*, the suffix being only a formative.



THE BIRTH OF MINERVA.

(Half-size.)

Conestabile, the most eminent of Italian archæologists, has just announced a discovery which throws great light on this question. From archæological evidence alone he has come to the conclusion that there were two races in Etruria. He thinks there was an earlier aboriginal race who practised the cremation of their dead, and who were the subjects or slaves of a later race of conquering invaders who buried their dead. My own philological investigations entirely support this conclusion. It seems to me that the inscriptions on the cinerary urns, which are usually poor and cheap, can as a rule be best explained by means of the Finnic languages,* whereas the inscriptions on the costly sarcophagi contain words more closely akin to the Tataric languages.†

The belief is becoming generally accepted that, before the advent of the Aryans, the whole of Europe was occupied by a race of Turanian aborigines, to whom the Siculians, Pelasgians, Iberians, Ligurians, Aquitanians, and Silures belonged, and whose language is now represented by the speech of the Finns, Lapps, and Basques.

I believe the older race in Etruria belonged to these Finnic or Pelasgic aborigines, who, about ten centuries B.C., were invaded and conquered by a horde of Tatars—the Rasenna or Tursenna,—who swooped down on Italy, just as in later times the kindred race of the Huns swept over Gaul and Italy; as the Magyars settled on the Danube plain, already occupied by kindred hordes of Bulgarians, Huns, and Turks; as the Seljuks settled on the Bosphorus, or the Tatars in the Crimea.

Such an hypothesis will explain every difficulty. No other hypothesis has been suggested by which the admitted facts can be accounted for.

The CHAIRMAN:‡—If I may judge from the very close attention with which the paper has been listened to, I have no doubt that I shall do right in at once tendering to Mr. Taylor the thanks of all present for the great pleasure he has given us. I shall now be very happy to hear any remarks which any one may like to make upon the subject.

Lord TALBOT DE MALAHIDE.§—I cannot help expressing the gratification

* For proof that cremation was once universal among the Finnic races, see Donner, *Vergl. Wörterb.*, p. 106.

† We have, for instance, two sorts of decades in *-thrum* and *-lechl*, one Tataric, the other Finnic in type. The Tataric decades have as yet only been found on costly sarcophagi, obviously the resting-places of wealthy nobles. Again, the words *THUI* and *LUPU* seem nearly synonymous, both meaning *mortuus est*. The first, a Finnic word, is usually found on cinerary urns, the second, a Tataric word, on sarcophagi.

‡ Rev. Robinson Thornton, D.D., Vice-President.

§ President of the Royal Archæological Institute.

with which I have listened to the interesting and learned lecture which has just been delivered, and from which, I am sure, we have all derived a great amount of information. The subject of the Etruscan language and the history of the Etruscan people form one of the most interesting, as well as one of the most obscure questions with which we have to deal. As Mr. Taylor has told us, a vast number of theories have been propounded on the subject, and some of them have been of a most absurd character. There is no language on earth to which the Etruscan language has not been affiliated at one period or another. Even the country to which I belong, Ireland, has been one of those which has claimed close relationship with the Etruscans. A learned friend of mine wrote a very elaborate work, in which he proved, to his own satisfaction, that every Etruscan inscription could be interpreted by appealing to Gaelic or to Erse sources. He analyzed several very interesting inscriptions, and among the rest that long inscription which has been shown to us by Mr. Taylor, and which, whether it is strictly Etruscan or not, is, no doubt, one of the earliest inscriptions which have been found in Italy, and must have considerable analogy with the Etruscan. After fully considering that inscription, he came to the conclusion that it very clearly indicated that it contained sailing directions for entering the port of Wexford. (Laughter.) This shows that a person may ride a hobby to death; and the case has been very similar with a number of other people who have taken up the subject. But of recent years Archæology has become somewhat more of an exact science; clearer reasoning has been applied, and induction has been brought to bear upon a larger range of facts connected with the subject. Certainly our advancing knowledge of Philology has been one of the matters which have been of the greatest possible assistance to us in determining the origin of many nations, and I trust that it may prove so in the case of the Etruscans. I do not profess to have gone into the details, and I have never seen the cubes or dice which Mr. Taylor has brought under our notice to-night, although I have heard a great deal about them. It would therefore be very presumptuous on my part to attempt to criticise, or to enter into any *minutiæ* in reference to these deep philological questions. Certainly the facts mentioned by Mr. Taylor with reference to the decades and to the mode of numeration are very strong and plausible; and I think that is one of the strongest arguments for pronouncing the Etruscan to have been a Turanian language. Mr. Taylor did not mention whether, among the Turanian languages which he had compared with the Etruscan, he had compared the Basque.

Mr. TAYLOR.—There are faint traces of the Etruscan in the Basque, which is distinctly related to the Finnish. I will show you the comparative nearness of the Basque and Etruscan. The first of the Etruscan numerals—*mach*, “one”—you get in the Siberian languages, as *muk*, “one.” In the Basque you cannot get so near; the nearest you get is *bat*, “one.” No doubt it is the same word, but the letters have changed very much. We know that the *m* and *b* were interchangeable, and that the letter *t* would sometimes interchange

with *k*. But we have in Basque the word *beatz*, a finger; and *beatz* is nearer to *mack* than *bat*. I spent several months in trying to connect Etruscan with Basque; but I found the Finn was very much nearer than the Basque.

LORD TALBOT DE MALAHIDE.—No doubt the Finnic nations spread over a great portion of Europe before the Celts and the rest of the Germanic nations; and if there is any relationship between the Basques and the Etruscans, it would be a most important fact to be made acquainted with. I suppose nothing has been known of the Ligurian language?

MR. TAYLOR.—About half a dozen words, and two of them are decidedly Basque.

LORD TALBOT DE MALAHIDE.—How about the Oscan?

MR. TAYLOR.—That is closely akin to Latin.

LORD TALBOT DE MALAHIDE.—Those inscriptions at Pompeii can be read?

MR. TAYLOR.—Yes.

LORD TALBOT DE MALAHIDE.—There is a suggestion which I should like to make with reference to these cubes. Are they loaded, or are they made to be loaded?

MR. TAYLOR.—I do not know whether they have been played with, but they are very large, very heavy, and of pure ivory.

LORD TALBOT DE MALAHIDE.—If they had been loaded, or intended to be loaded, that would have been a criterion by which you could have ascertained where the highest number was.

MR. TAYLOR.—I did not notice. I had them in my hand nearly an hour, but I did not observe whether there was any loading in them or not.

LORD TALBOT DE MALAHIDE.—With reference to the mortuary inscriptions, have you satisfied yourself that they merely express the years of the age of the deceased persons, because in the Roman inscriptions the months and days are generally given as well.

MR. TAYLOR.—I pointed out one that I thought might contain the days or weeks.

MR. F. A. ALLEN.—This is a very interesting discovery, because it appears that all the civilized countries of antiquity were really Turanian in origin. It appears, through the medium of our discoveries, as if civilization had been handed down by the races which we now call Turanian. It has been observed by writers that the Etrurian year agrees, within eight or ten minutes, with that of the Aztecs in America; and there are several other points of identity which are curious, and which are shown by Mr. Hyde Clarke's discoveries in reference to the antiquities and inscriptions in America, and also Accadian inscriptions. If the Etruscan is shown to be Accadian, we establish a bond of union between the Old World and the New. Mr. O'Brien, the learned editor of a work called *Phœnician Ireland*, was once "twtitted" by some one who said, "You might as well say the Phœnicians got to America." To which he replied, "Well, 'Algonquin' means in Phœnician 'noble people,' or 'noble race,'—a title which has very often been arrogated by tribes both savage and civilized." These things are valuable, as pointing to the unity of mankind,

and they may be very cognate to the questions discussed before us. I have always thought, from the close connection of the Egyptian and other civilizations with the Etruscan, that it must be Turanian in origin, although it has been asserted on high authority that it was Semitic, or even Aryan.

Rev. G. CURREY, D.D.—In connection with this very interesting subject, I may refer to an instance in which the Etruscans are brought into contact with another people. We all know that the Romans derived from the Etruscans their arts of divination. We find in Ezekiel an account of Nebuchadnezzar casting lots and making divinations before he marched against Jerusalem, and we are told "he made his arrows bright, he consulted with images, he looked into the liver" (Ezek. xxi. 21), evidently practising the arts of divination common among the Turanians, and by them introduced into Rome. Now the Chaldean arts of divination seem to have been derived from the old inhabitants, the Accadians. And so, when we find the Chaldeans practising these arts in the same way as the Etruscans, we have a curious point of contact between the Etruscans and Chaldeans.

Mr. TAYLOR.—M. Lenormant has brought out these facts very forcibly in his essay on the magic of the Chaldeans, showing that their magic was the magic of the Finns.

A MEMBER.—I should like to draw attention for a moment to the striking figures which have been referred to by Mr. Taylor, and which are in the British Museum. I believe these figures to be worth many books, and certainly their character shows something very similar to the Chinese or Mongolian type. They show a great length of foot and slightness of body and arms and legs. I should be glad if Mr. Taylor could give us his views in reference to them.

Mr. TAYLOR.—This touches on a remarkable point which I should have mentioned myself, had it not been for fear of exceeding the limits of the time at our disposal. One of these figures is that of a man of extreme old age and emaciation, which accounts for its slightness. It represents, moreover, a man whose body had not been burned, but buried, and, therefore, he ought to be one of the Tartaric, rather than of the Finnic stock. Here, as well as in that portrait of the Etruscan warrior which I have shown you, you have great obliquity of the eyes and height of the cheek-bones; and I should take one as an example of the conquering, and the other of the conquered race. In the later Etruscan portraits you have a greater approximation to the Greek and Roman type of figure. These Mongol features have absolutely vanished from the Turks of the present day, through their intermarrying with Aryan women. The Osmanli have lost their characteristics, just as the Hungarians are losing them.

The CHAIRMAN.—I have listened to Mr. Taylor's paper with a double pleasure; not only because it is a valuable philological and ethnological Essay, but also on account of its logical value. I was much delighted with the way in which the inductive method was put before us. We have been shown by the most complete induction, and by a comparison of resemblances

and variations made in the most careful and convincing manner, how it was that the language of the Etruscans must be identified with the speech of the Turanian races, and with no others. I think the paper is very valuable as a logical exercise, and also because it asserts most distinctly a hypothesis which I have adhered to for some years. I always thought that the Etruscan would turn out to be Finn, and I am glad to find that Mr. Taylor has arrived at that conclusion. When I began to study philology, the Finn hypothesis was sneered at by some savants, but it is now declared to be an indisputable fact. There is a peculiar word used of this people; Diodorus says, "They call themselves Rasena." Now we find the Finns speaking of themselves, and of their equally Turanian neighbours, as "Suomalainen" and "Rossolainen"; and thus we find the root of "Rasena" (the Latin Rhoxolani) in a Finn word. Considerations of this kind inclined me much to adopt the Finn hypothesis. It is necessary to justify the introduction into our Transactions of a paper like the present, and that justification I was prepared to offer, but Mr. Taylor has done it for himself. Before I conclude, I should like to ask Mr. Taylor one question, on a subject mentioned by Dr. Lepsius; and that is, whether there are any remains of Etruscan roots in the language of the Grisons in the Alps.

Mr. TAYLOR.—With regard to the name of Rasena, I think it can be philologically shown that the Etruscans were closely related to the Accadians, and in the tenth chapter of Genesis we find that two of the cities that were built were called Accad and Resen. As to the remains of the Etruscans in the Grisons, a scientific commission was sent out to try and find Etruscan words, but it met with no marked success. I do not think Dr. Steub's work carries much conviction. No doubt there are some resemblances, but they are very feeble, and we cannot tell what the Etruscan words are. In the Grisons a glacier is called *käse*, and that word, I believe, is the name for a snow-covered mountain in Lapp.

A vote of thanks to the Society of Arts for the use of their room brought the proceedings of the session to a close.

ORDINARY MEETING, DECEMBER 6, 1875.

C. BROOKE, ESQ., F.R.S., V.P., IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—

The Right Honourable the Lord O'Neill.
 The Right Rev. C. Perry, D.D., Bishop of Melbourne.
 Rev. Professor J. M. Hoppin, D.D., Yale College.
 Rev. Principal T. W. Gotch, LL.D., Bristol.
 Rev. Principal T. C. Edwards, University College, Aberystwith.
 Rev. H. M. Butler, D.D., Harrow School.
 Rev. Canon Walsham How, M.A., Oswestry.
 Rev. S. Garrett, M.A., Ipswich.
 Rev. F. S. Cook, B.A., Clifton.
 Rev. J. H. James, D.D., Bow.
 Rev. W. B. Philpot, Bersted.
 Rev. F. Schreiner, New College, Eastbourne.
 Hanbury Barclay, Esq., Tamworth.
 E. Clarke, Esq., Macclesfield.
 J. E. Cranage, Esq., M.A., Ph.D., Salop.
 C. H. Dent, Esq., London.
 J. Knight, Esq., F.S.A., Hildenborough.
 R. Moon, Esq., M.A., London.
 F. Smith, Esq., Weston-super-Mare.
 G. Thorp, Esq., 21, Eastcheap.

ASSOCIATES :—

The Most Rev. S. Butcher, D.D., Bishop of Meath.
 Sir J. Kennaway, Bart., M.P., Devon.
 The President of Queen's College, Belfast.
 The Very Rev. Dean Hamilton, F.R.S., F.R.A.S., Salisbury.
 The Rev. Professor Applebe, LL.D., Belfast.
 Rev. C. Bigsby, M.A., Bidborough.
 Rev. A. F. Giolma, Chatham.
 Rev. Prebendary Griffith, A.M., Clapton.
 Rev. J. W. McKay, Belfast.
 Rev. J. Rate, Penkridge.
 Rev. J. Sharp, Musulipatam.
 Rev. G. Vance, Sligo.

ASSOCIATES (*continued*):—

Rev. W. D. Walters, Dalston.
 I. Ashe, Esq., M.D., Londonderry.
 T. Barber, Esq., Northampton.
 H. M. Blair, Esq., London.
 S. B. Earl, Esq., Blackheath.
 W. Q. Ewart, Esq., M.A., Belfast.
 R. L. Hamilton, Esq., J.P., Belfast.
 J. G. Middleton, Esq., London.
 F. W. Mildred, Esq., Middlesborough.
 H. Morris, Esq., Blackheath.
 A. I. Paice, Esq., Wallington.
 Principal B. Ralph, Dunheved College.
 T. H. Richardson, Esq., Middlesborough.
 S. Scott, Esq., Bungay.
 Major-General A. Taylor, R.E., London.

HON. LOCAL SECRETARY:—

Rev. J. T. Willis, A.B., Rhosmarket, Milford.

Also the presentation of the following Works to the Library:—

- "Proceedings of the Royal Society." Part 162-3. *From the Society.*
 "Proceedings of the Royal Geographical Society." Vol. ix. *From the Society.*
 "Proceedings of the Royal U. S. Institution." Part 82. *From the Institution.*
 "Proceedings of the Royal Colonial Institute." Vol.; 1874. *From the Institute.*
 "Proceedings of the Geological Society." Part 123-4. *From the Society.*
 "Proceedings of the Society of Biblical Archæology." Vol. iv. *Ditto.*
 "Proceedings of the United States Geological and Geographical Survey."
 7 vols. *From the Survey.*
 "Proceedings of the American Philosophical Society." Part 93-4. *From the Society.*
 "Proceedings of the Smithsonian Institute, 1873." Report. *From the Institute.*
 "Proceedings of the Watford Natural History Society." Vol. i. *From the Society.*
 "London Quarterly." *From A. McArthur, Esq., M.P.*
 "Conservation of Moral Force." By the Rev. H. Griffith. *From Professor Reynolds.*
 "Religion and Science." By the Rev. H. Griffith. *From the Author.*
 "Divine Origin of Christianity." By Dr. Ashe. *Ditto.*
 "Machærus." By Captain Dumergue. *Ditto.*
 "New Englander," 1875. *From J. Sturtevant, Esq.*

- "Origin of Life on our Planet." By Principal Dawson, F.R.S.
From the Author.
- "Philosophy without Assumptions." By the Rev. T. Kirkman, F.R.S.
From the Author.
- "Papers on Shakspeare." By E. H. Pickersgill.
Ditto.
- "Rector and his Friends." By Professor Lias.
Ditto.
- Page's "Geology."
From T. Barber, Esq.
- Crofton's "Genesis and Geology."
Ditto.
- Morell's Tanneman's "Philosophy."
Ditto.
- "Egypt." By Dr. Russell.
Ditto.
- Alford's "First Principles of the Oracles of God."
Ditto.
- Mahan on Romans ix.
Ditto.
- Letters of Gregory VII.
Ditto.
- Six other smaller Works.
Ditto.
- Abdiel's Essays.
From the Rev. Prebendary Brooks.
- Bascombe's "Epidemics."
Ditto.
- "Cottage Construction." By Strickland.
Ditto.
- Hershon on Genesis.
Ditto.
- "Pentateuch according to the Talmud."
Ditto.
- Phillips's "Pomarium Britannicum."
Ditto.
- Taylor's Hebrew Poetry.
Ditto.
- "Communion of Saints." By the Rev. Prebendary Brooks.
From the Author.
- "Infidelity." Ditto. *Ditto.*
- "Prophetical Interpretations." Ditto. *Ditto.*
- "Solomon's Proverbs." Ditto. *Ditto.*
- Fourteen smaller Works, presented by Sir D. Salomons, Bart., Prof. Duff, D.D., W. H. Ince, Esq., Rev. J. McKay, F. Madden, Esq., Rev. R. Main, Prof. Morris, Captain F. Petrie, Dr. Sexton.

The following Paper was then read by the Author :—

PRESENT-DAY MATERIALISM. By Rev. J. McDougall.

VARIOUS, and some of them august, voices tell us that man is outliving religion. Mr. John Stuart Mill has left this testimony : "the world would be astonished if it knew how great a proportion of its brightest ornaments are sceptics in religion." Dr. Strauss this: that in publishing the negations of his last work, he only wrote for a great number. Almost all the more important Magazines of the day give ample space for the enunciation and exposition of non- and anti-religious views. In the "Contemporary," Archbishop (now Cardinal) Manning and Mr. Fitz-James Stephen held recent tournament, in which, amongst other things, they fought over

the elements of religion, the eminent lawyer taking the sceptical side with the declaration that he was the mouth-piece of most intelligent men, who do not believe that the doctrines of our faith are demonstrable—such a doctrine as the Being of God, for instance ; so that influential and cultured people of his class now only accept religion because, on the whole, they deem it a better thing for society than no religion. I do not pretend to be able to measure the amount of truth which such assertions contain. That they do hold some, I feel convinced. That they are exaggerations, I am equally convinced. But that they should be true to any extent, and that they should be so boldly announced by such men, are sufficiently serious facts for me as a Christian, and I have responded to the request made to me to speak on the latest and most influential form of scepticism with much willingness, albeit with grave doubts of my worthiness.

My subject is *Present-Day Materialism*. Time was, and not long ago, when a shorter and simpler term would have conveyed the same meaning: the term *Atheism*. But it will not now. There are utterances of Dr. Tyndall (as Dr. Lionel Beale showed by quotations in the *Times* twelve months ago), which admit of only one interpretation: the total denial of the being of a God. I suppose, however, that we must date such utterances not in Dr. Tyndall's "hours of clearness and vigour," but in his hours of less strong, and somewhat unhealthy thought.* Be it so. The eminent scientist's own description of his atheistical mood accepted, what does he offer as a confession of faith? Something which I am quite unable to distinguish from Pantheism. As a plain man, desiring to exhibit intellectual sincerity *to*, and to see it exhibited *in* all, I have felt that to make the whole universe into God—a process involved *in placing in the atom of matter the initial, developing, and perfecting power of the universe, as Dr. Tyndall does*, comes to much the same thing as denying altogether the God in whom I believe. As I read Dr. Tyndall's address, the old and irrepresible question comes up for answer: Is there a living God? Is there a Supreme Spirit "immanent" in, but separate from, the universe of matter and force? On the reply to this momentous question hang all the essentials of the Christian faith; and the discussion of it, and of other related questions, has been forced upon us by Dr. Tyndall in his opening address, as President of the British Association, at its late meetings in Belfast. From this, the very best authority, we learn the latest views of the

* Note I. Appendix.

Materialists, and the nature (at least), if not the details, of their defence. If Dr. Tyndall is not the Chief Prophet of the Sect, he is certainly the most prominent, as he is one of the most eloquent and fearless, and we may accept his utterances as truly *ex cathedra*. I make his Belfast address, therefore, in some sort, my text, and solicit your patience while I comment upon some of his teachings which affect the foundations of our religion, and at such length as the time I can reasonably occupy will allow.

I shall not attempt to criticise the historical and descriptive portions of Dr. Tyndall's address, although a closer examination of them than I have given has enabled many to discover errors which its author ought not to have made. These excepted, I am very grateful for it; very glad to get it in a form so fresh and suggestive. As to the scientific results announced in it, I am bound to accept them as correct, until some other authority discovers them to be erroneous; or, as is not at all impossible, seeing his candour and fearlessness, Dr. Tyndall himself shall say that he wishes to retract or to modify them.

Taking up the subject with which the address first deals, I will speak of Creation, and human ideas about it.

We are told that the same impulse which turned the thoughts of primeval man towards the sources of natural phenomena, is the spur of scientific action to-day. Determined by this impulse, we consult and test experience, and "form physical theories which are beyond the pale of experience, but which satisfy the desire of the mind to see every natural occurrence resting upon a cause."* This fair statement helps to explain how, as Dr. Tyndall says, men began to form theories in harmony with their characters and dispositions. Some used only their knowledge and experience of man, *i.e.* of human nature. Others, whom Dr. Tyndall chooses to elevate into thinkers of "exceptional power," used their knowledge and experience of physical nature,—endeavouring to connect natural phenomena with their physical principles. The first were ethical and poetical men; the second were rationalizing and logical men. The first attributed the universe to gods,—capricious beings having exaggerated human faculties and dispositions. The second, seeing that science repudiated caprice, and required absolute reliance upon law in nature, attributed the universe to self-evolution. I would here repair one omission of the address—the record of the growth in the world of a conception of creation different to both these: the conception found in the sacred

* Dr. Tyndall's Address, p. 1.

books of the Jews. Whether we choose to say that those books contain a supernatural revelation or not, there the conception is, which Dr. Tyndall does not notice in his first passages. Its appearance as an item of belief is not accounted for by the explanations just given. While religious heathens attributed all things to deified men—and non-religious heathens to innate and inseparable potency in the atoms of matter—the children of Israel ascribed all things to One Spiritual Being—absolute, infinite, eternal. This belief has come down like the other beliefs, and somehow it has commanded the assent and acceptance of the most intelligent and highly cultured of the most civilized races of the Christian ages. I admit that this belief has not always been clearly apprehended or carefully stated. I admit that religious communities have often held it ignorantly, expressed it grossly, and defended it foolishly. But the same may be said of any and every subject known to mankind,—yes, even of scientific subjects. Many supposed scientific facts having been proved to be fictions; many scientific theories having no better foundation than had the Ptolemaic system of astronomy. Nay, is not science itself—its whole array of facts and cyclopædia of results—a simple proof of the tremendous cost of knowledge and the fearful penalties of ignorance? I will admit more: that even now the best-trained religious minds find it a very difficult thing to speak in fitting terms of the God in whom they believe. They strive, and seldom successfully, to do so; human thought fails—and much more human words. But it is the business of a leading scientist to deal with the highest and best thought of religious men, not with the lowest and worst; and it is his business, also, to endeavour to seize their real meanings,—meanings too often, alas, distorted rather than revealed, by the imperfect medium of language in which they have to be embodied.

These admissions made, and this affirmation of the duty of a professed leader of science set forth, I think it unnecessary to notice the vein of scorn which runs through Dr. Tyndall's address, aimed against the cosmical ideas of religious people, except to say that it savours of the very spirit of intolerance which he ascribes to them. A fair and natural remark would be: "It is your business as a student of the physical universe to improve those ideas, and all truly Christian men will gladly welcome your facts, while eagerly helping to kill the spirit of bigotry which, as you show them, is not confined to religious breasts only."

The universe a fact—nature real and knowable—what of its "first beginnings"? What of a First Cause? if, as Dr. Tyndall

admits, an "inherent impulse" spurs men to try and find this out? In the "cosmical ideas" which we as Christians hold, there is a primary and fundamental one. It is stated in a few simple words by John, disciple and apostle of Jesus Christ. Conceiving, as best he could, the Supreme and Invisible to whom his faith ascribed the "first beginnings" of the universe, John wrote thus: "All things were made by Him, and without Him was not anything made that was made."* A similar statement is made by the author of the Epistle to the Hebrew converts, but suggesting, perhaps, other ideas: "By faith we understand that the worlds were framed by the Word of God, so that things which are seen were not made of things which do appear."† And in repeating these words I may as well point out that whether they humanize the conception of the Supreme Power or not, they are not chargeable with the notion (sometimes urged against them) of creation out of nothing. The contradiction involved in that use of the word *Creation* is not to be charged on the writers of the New Testament. The Apostles had in their minds (as I contend) the causation of the physical universe as we know it,—a sphere of life and activity for sentient beings. The already and competent cause they affirm, was God. How caused, *i.e.* by what means or by what methods, the Apostles nowhere suggest; except in the simple phrase "by the Word of God."‡ I suppose that Dr. Tyndall refuses the supernatural activity of God in the universe, as it is conceived of by Christian people, who accept, subject to the modifying light of ever-increasing knowledge, the simple confessions of the Apostles and the even simpler confessions of the Hebrew book of "first-beginnings," the book of Genesis.§ And yet great and good men, like Newton and Boyle (as he reminds us), lived and worked under the conception of the Godhead with which the Bible furnished them. Dr. Tyndall calls the idea of his great predecessor in scientific research, Sir Isaac Newton, that of a "detached Creator," like a human agent moving the wheels and handling the levers of nature. This is anthropomorphism, of course. But I venture to doubt if Sir Isaac Newton, or later, Dr. Faraday, would consent to allow Dr. Tyndall to state this conception for them. Even an unscientific person, of humble attainments, would object. You have only to meditate, for a few minutes, on your idea of God, to see reasons of a

* John i. 3.

† Hebrews ii. 3.

‡ See a fuller consideration of this view in Sermon IX. of my published discourses.

§ Note II., Appendix.

sufficient kind why you refuse to let another formulate it for you. You discover that you cannot satisfy yourself with a form of words that shall adequately embody your conception,—while you repudiate with all your soul the phrase which the Materialist kindly invents for you, that of a “detached creator,” man-like in his procedure and effort. The charge of anthropomorphism is chiefly based upon the fact that religious people speak of God as a *person*, of which more anon. Meanwhile, I desire to affirm that it is a mistake to suppose that the elements of *personality* are inseparable from limitation, or compel us to make the Deity only an indefinite projection of man. The “Builder and Maker”—the Mover and Changer of the worlds and what they contain—is not such a creature as man; and we are not driven to furnish Him with physical organs and limbs in order to do His work. Christians believe in God, and believe in Him as a personality, and in so doing we are to be ranked with neither Polytheists, nor Atheists, nor Pantheists, but are to be known as Christian Theists. This title has never failed to produce a correct impression on the minds of fair and sincere inquirers. The Bible and the whole literature of Theology explain it fully. We cannot say as much of the name *Materialist*. Materialism has not yet produced a text-book or compiled a library of reference for the use of men. For the first time, and at Belfast, we learn what a Present-day Materialist is. Of course, he is either a practical student or an enthusiastic worshipper of science; but he is not merely an analyst, an experimenter, a questioner of nature, and a recorder of her transactions. He may be all these things, as Messrs. Huxley, Tyndall, and Darwin are; but he is more. He is (we are now told) a conceptive being,—an imaginative being. Some years ago, at Liverpool, Dr. Tyndall enforced this in his remarkably eloquent essay on “The Scientific Uses of Imagination.” Therefore he tells us that the Materialist is one “who prolongs his vision backward across the boundary of experimental evidence, and discovers in that matter, which we in our ignorance, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium, the promise and potency of every form and quality of life.”* The first remark suggested to me by this description of the attitude, conduct, and discernment of a Materialist, is that it carries him from the region of fact to the region of speculation. The region of fact is safe and unassailable. The region of speculation is unsafe and

* Note III., Appendix.

vulnerable. Dr. Tyndall will admit this, because he avows that he carries his vision across the boundary of experimental evidence. Now, to speculation as such, no objection can be made. What I shall object to is being required to accept as infallible truth anything that a Tyndall may think he discerns, even by the scientific use of his imagination. Given equal knowledge, culture, and ability, the speculation of one scientist may be set against that of another. I will venture to do this. Not long ago Faraday was living, a fellow-labourer with Tyndall, and of at least equal eminence and authority as a scientist. Faraday was not only devoutly religious, but a diligent Christian preacher. Faraday, full of scientific lore, and a daily student of nature, ascribed the "first beginnings" of things to a God,—a Being of power, wisdom, skill, foresight, and goodness infinite,—a Being equal to the work of the Universe. Tyndall, the Materialist, ascribes the "first beginnings" of things to things themselves, discerning in the particles of matter "promise and potency" equal to the work of the Universe.* The two solutions of the awful mystery are thus before you; they are the speculations of two of the greatest of scientific men. Accept which you please. For myself, I do not shrink from saying that I feel compelled, on every rational ground, to choose the solution of the religious experimenter, who places a Being of absolute and infinite power and intelligence above and before the raw material of the universe. Above and *before* the raw material. And in saying this I touch a critical subject in debate. The "promise and potency of matter" is Dr. Tyndall's scientific gospel. He declares the sufficiency of matter for all physical, plant, and animal life. The absolute competency of matter,—that is, his cosmical faith and confession. But to matter he gives *movement*. For movement he requires *force*. To get force he must postulate *power*. And in and over, above, below, around,—everywhere indeed,—he declares that there is *law*. Matter there is not, *as matter* endowed with absolute and infinite potency, but matter plus *form*, plus *power*, plus *law*. Put these into it, and matter will do everything you want without a God.† As if startled by his own gospel, Dr. Tyndall proceeds to confess mystery in the whole business. Even evolution, wonderful hypothesis as it is, does not get rid of mystery. Mr. Herbert Spencer, whom Dr. Tyndall refers to, confesses that "Evolution is the manifestation of a power absolutely inscrutable to the intellect of

* Note IV., Appendix.

† Note V., Appendix.

man." Dr. Tyndall echoes Mr. Spencer's avowal: "As little in our day as in Job's day can man by searching find this power out." Considered fundamentally, he declares "it is by the operation of an insoluble mystery that life is evolved, species differentiated, and mind unfolded from their prepotent elements in the unmeasurable past." Without staying to object to his terms or phraseology, I may for the moment join with Dr. Tyndall, and say, "There is no very rank materialism here." Perhaps not. But when we come to state our theories definitely in an attempt to realize, however imperfectly, a whole idea of the Universe and its life, we find out where we disagree. The matter in debate between the simple-minded Christian and the Materialist is not the *mode of procedure* but the *nature of the power* which causes all procedure. Is that power part and parcel of the physical world? Is it inseparably united with or inherent in particles of matter? Is it unable to separate itself from matter? Is it, for instance, indissolubly wedded to the bit of protoplasm of the first beginning? Or is it another thing,—another reality? Is it not independent and distinct? Is it not, indeed, extra physical, as it is superhuman? And are we not compelled by the "impulse inherent in our natures," which Dr. Tyndall starts with, to assign to this mysterious Power an entity, an ability, and an activity which can belong only to that which is Absolute, Infinite, and Eternal? I have heard it charged against Christian ministers that sometimes we put into the Bible that which the good and great men who wrote its books never dreamed of. But I think that Dr. Tyndall is even more truly open to a similar charge, that of first putting into his raw material of the Universe living power, and quality, and promise to the displacement of the necessary God. This result is certainly wonderful, even in its human productions. That ridiculous-looking thing, the "Marine Ascidian,"—nay, that even less worthy thing, a bit of protoplasm, whatever it may be in the original, contains the promise of potency of all that a Milton, a Shakspeare, a Bacon, or any genius ever was? We say, in reply to this teaching, that scientific experiment does not sanction it. It is the effervescence of the fancy. It is not the outcome of the scientific use of the imagination. It is, I venture to think, contradictory. It involves more than mystery, nothing less than impossibility, and does violence to reason and experience. Our reason will not allow us to place mind lower than the materials of its dwelling; will not allow us to say that it is a phenomenon of the brain only, the result of certain grey matter in excitement: while experience shows us that we must make the mind master

of the material. Nay, the more real and solid the physical world is, the more essential is it to place above it, around it, and within it, a spiritual power to rule, guide, and master it: "to load it with God." *

For again: Matter is not the only element required. Everywhere we hear of force or forces — mechanical, chemical, dynamical forces, but all resolvable into aspects or modes of one central force. What is force? As Sir John Herschel has shown, we must come at last to regard it as the manifestation of power. But what of power? Where does power arise? Where does it reside? † The most profound thinkers fail to suggest any source of power but mind; any residence of power but mind. And when I recall the fact that such men as Herschel and Clerk-Maxwell declare the atoms of matter to be "manufactured" articles, I suggest to you the only sufficient and satisfying idea of "first beginnings"—beginnings, that is, in which power was manifested and force employed equal to the causation, evolution, and eternal government of the universe. From the thing made, an "inherent impulse" lifts us to the Maker: from the created universe, to the Creator. ‡ If there be law, there must be mind; if order, there must be reason; if skill, there must be intelligence; and if everywhere and at all times, there must be causes and effects, there must be mind behind them. Take any of the postulates of thought and an argument for God may be safely conducted. Take *law*, which the scientist assures us, is universal and everlasting. What is the first and most natural remark we have to make about *law*? Clearly this, that the things subject to it did not make it, and did not impose it upon themselves. Need I add, that the subjects of physical law cannot repeal the law? It is above them, beyond them, independent of them. Though some of the creatures in the world,—man, for instance,—can rebel against law, he cannot annul it. He is obviously under laws of health, against which he very frequently sins. But he is powerless to annul any law of health. Let him break one of them and he will suffer. He would, if he could, so modify, or suspend, or annul physical law, as to secure for himself immunity from pain. But he cannot. He is impotent to do so. As he feels his utter subjection to law, and his inability to escape or annul law, what does man reason-

* I borrow this phrase from an able paper on "The Principles of Modern Pantheistic and Atheistic Philosophy." By the Rev. C. A. Row, M.A. See *Transactions of the Victoria Institute, or Philosophical Society of Great Britain*, 1874.

† Note VI., Appendix.

‡ Note VII., Appendix.

ably conclude? Simply this, that there is law in the universe independent of him, and of his will. And when, by inquiry, he finds that such is the fact throughout all history, he becomes finally convinced that everywhere and at all times in the physical world, there is law independent of the will of the creature, law which somehow or other asserts, defends, and avenges itself.

What is law? Law, say the philosophers, is another and convenient name for an invariable order, or change, or for a method of action,—an order, change, and method which are natural and invariable, and, as we may discover, indispensable. We learn what law is by observation; and, when observation has been sufficiently long, extended, and exact, we can make safe decisions about it. What always happens in the same circumstances happens according to law. Bodies fall through space, or they assume definite shapes, or they attract or repel each other according to law. Everywhere and in all things there is law.

Whence comes law? As we have seen it does not administer itself. As Mr. Fitzjames Stephen has well written in the *Contemporary Review* of May last,—“This idea of law does not, and indeed cannot stand alone. It involves other ideas of right, duty, sanction, and sovereignty.” Now, if we are told that physical law involves no moral ideas of right or duty, we cannot be told, with reason, that it involves none of sanction and sovereignty. If there be law, the mind, by inherent impulse, refers to sovereignty, and to the sanction of sovereignty, in some form. “Yes,” Dr. Tyndall would interpose, “but science and experiment do not uncover any such thing.” Perhaps not, I answer, but I am free to use my reason,—nay, if I please, my imagination,—but here reason and logic are quite sufficient. If there be sovereignty and sanction, there must be ideas of will and power. We cannot put away these ideas. And further, if, as scientific men affirm, there can be no caprice, law proclaims method. Now, call the depository of power a personality or not; call the power and will which create order and use method the elements of a personality or not—the mind can have no rest or satisfaction until it ascribes them or assigns them to an entity, a substance, a living, knowing thing like itself. Mind implies mind. Mind declares mind. The human will points to the Infinite will; human reason to the Supreme reason; human intelligence to the Absolute source of all knowledge, which is immanent in, but independent of all nature. Nay, take the most familiar of all ideas of the position—the scientific man above all others—the idea that he is the contemplator of a

universe which appeals far less powerfully to his bodily than to his mental self. He is reading what? The so-called Book of Nature. It would not be a book if it did not suggest thought and evoke emotion. But is not an author needed for every book? Whose thoughts are these, he asks? Whose emotions tremble in every page? As I put the question and feel that there can be but one answer in the mind, heart, and conscience of every sincere man,—I think I see new and irresistible meanings in that famous saying of the Old Book,—“The fool has said in his heart, ‘There is no God.’”

The Old Materialism denied the existence of a soul in man, and, with the Sadducees, denied resurrection after death. What says the New Materialism? It is not easy to make out. We have to learn by inference rather than from any positive statement. Dr. Tyndall and Dr. Huxley have both used the expression, “Soul of force,” to describe the Mysterious Power which they declare to be inscrutable. I hold it to be a fatal expression for men who hold religion at arm’s length, and thrust Christianity aside. It is an admission which undermines their whole philosophy. But as I desire to adhere strictly to an examination of this philosophy on its own teachings, and to avoid every aid which revealed truth offers, I invite you to take up with me one or two of the accepted teachings of science, and inquire how they affect the great object of man’s spiritual nature and its continued existence in another state. The human body, science says, like the body of every animal, is subject to the law of change. Every seven or ten years a man has quite a new body. Daily waste goes on. Daily supply is therefore necessary. Meal by meal, breath by breath, the body is nourished. Particle by particle it disappears; particle by particle it is sustained. The sustaining process is a process of renewal. What is renewal? It is simply the replacing of lost particles by fresh ones. The infant begins its life in a little plump, soft body, very familiar to us. At the age of ten it has become quite a different creature. Physically it is in no sense child. Science says so—will not have it otherwise. Follow the same child up to seventy years of age, and what will be seen? A very different body indeed; so changed that except by those who have personal means of identification it could not be recognized. Who, indeed, having seen me in my cradle, and not seeing me again until to-day, could recognize the infant in the man? No one. And yet that I am the same person in the cradle forty years ago and in this place now, cannot be questioned. How the same? Not the same materially; but the same mentally and morally. The softest parts of our bodies change most rapidly. The brain,

being a soft part, is doubtless changed very frequently during life. What follows from these facts? This fact, viz., that after several changes—entire disappearances, indeed—of my body, my personal identity remains. This being so, it results that the maintenance of my personal identity does not depend altogether (if at all) on the particles of matter which compose my body. Something there is which lives on continuously amidst all the physical changes and disappearances. Something there is which remains. What is it? The particles of carbon, oxygen, hydrogen, iron, and what not, come and go. They are clearly particles only—fragmentary, separable, dismissible atoms. They have not, in themselves, even the “promise” of continuity. If they have not its promise, still less have they its potency. And yet continuity there is. And there must be something which not only possesses it, but guarantees it. That something is not one or any number of these wandering atoms. Of that there can be no doubt. But if so, then does matter, even when we add to it, or put into it, motion and force and law, fail to account for that continued identity of the living man, which is the most astonishing fact of all. Declaring that, as a piece of matter, *I*, a living man, disappear every seven or ten years, Present-day Materialism fails to account for my continued personal identity.*

Again: Science teaches that there are certain natural or physical forces. I suppose they are called such because they affect matter. But we are now assured that those various forces are all phases or modes of one Master-force.† However this may be, I desire you to observe that those forces—separately or conjointly—do not account for all kinds and qualities of life, as Dr. Tyndall affirms,—I mean, of course, the forces of gravitation, attraction, repulsion, electricity, and the forces called chemical affinity, and so forth. Physiologists declare that when they examine organized creatures they are brought face to face with a quite independent force: nay, an unknown force. This new force they call the *life force*, and we are assured that without this force the phenomena of living bodies cannot be explained. All organization pre-supposes this special life force.‡ And you will perceive how true this must be when you think upon Death. What is a dead body? A body from which the life-force has disappeared. What happens to it? It becomes the subject of the activity of all the physical forces—chemical and mechanical—unaffected by the life-force. Heat, light,

* Note VIII., Appendix.

† Note IX., Appendix.

‡ Note X., Appendix.

attraction, repulsion, gravitation, and electricity,—these do not cease at death. Only their *Master-force*—Vitality—has ceased. They go on playing within and upon the dead body; and, as we know, to its rapid change, yes, to its speedy destruction. That which resisted these changing and destroying forces is gone. Once dead, the body is seen in its pure materialism—a mere lump of matter—the subject of the chemical and mechanical forces which never cease to act. How evident, then, is it that quite independent of, and separate from, the mass of silent, motionless, unanswering matter we call a corpse, there is a life-force which was only continued in it for a time, but was not of it, or inseparable from it,—a force outside of it, and giving the living potency which Materialists assert belongs essentially to the atoms of matter.

Again: This vital or life-force only accounts for life—that is, for vitality—in an organized body: it does not account for other facts and phenomena of which you and I are conscious. Physiologists confess that they cannot account for thought, memory, fancy; for any of the feelings such as love, hate, joy, fear, hope, despair. And yet this other life of thought and feeling is more real to us than anything else. That I *think*, that I *love*, *fear*, *rejoice*, and *grieve*, are facts of my most real life. They need no evidence, no proof, no demonstration. I am conscious of them; and no one can reason, or persuade, or frighten me out of this consciousness. For these facts of personal consciousness physical science cannot—does not pretend to account; and yet they form the most certain, constant, and unchanging life of man. He knows far more about them than he does about his digestion, the motion of his blood, or the activity of any vital organ. Once more, then, science is face to face with an unknown reality—call it force, or substance, or life. Life it is—whatever meanings the word life may cover. Life which is not physical but *Psychical*, or *spiritual*. And Science has been compelled to call the force which is so visibly active in the life of thought and feeling, the *Psychic force*. There is thus a duality of unknown unanalyzed forces manifested within us, and the most eminent and trustworthy men of science accept this duality. Once more: If the mechanical and chemical forces be attached to matter, are not the phases or kinds of spiritual force attached to spirit? Is there not an entity, appropriate and real, to which they belong? In answer, I quote the following passage:—“There are various kinds of *Psychic activity* propagated in various impulses, and through different organs, but proceeding from one centre, ruled and directed by one force. They have a common direction. There

is unity in the consciousness which attaches to them (or to which they are attached) and this points, of course, to the unity of the Psychological reality—that is the soul. The soul is not and cannot be an atom, or a group of atoms. Atoms of matter as we have learned, are atoms merely—detached, fragmentary, dis-missible particles without continuousness. *The soul*, the seat of consciousness, thought, and feeling, must be a continuous and independent reality or substance, for *unity* is visible in all its phenomena. The soul once discovered, we discover what the Materialist fails to supply, because his atoms of matter fail to supply it, the ‘promise and potency’ of consciousness and personal identity.”*

Allow me now to apply these scientific facts and deductions to those elements of our Christian faith which scepticism has so persistently assailed: Man’s spiritual nature and his immortality. What bearing have they upon those elements of our faith? We do not look for moral and religious truth from the study of natural science. We do not go to the laboratory for our religion—nor do we seek for its essentials by the help of the crucible, the retort, the blowpipe, and the spirit-lamp. But we are confident that the teachings of true science will not contradict the teachings of true religion. And this confidence is not vain; for we are able to see that if the latest revelations of science have any effect on our religious faith, they rather strengthen it, and in no way weaken it. For, reviewing what I have said:—

(a.) As the two forces, the life-force and the spiritual force, are not dependent upon the presence and permanence of the same particles of matter now and here, they will not be in any other period or in any other state of existence.

(b.) As the consciousness of one’s personal identity is not dependent upon the presence and continuance of the same particles of matter now and here, it will not be in any other period or in any future state.

At this point I remind you of another canon of science, which says that no force, no substance, no existence can be annihilated.

Therefore, with the approval of science, I affirm—

(c.) That the soul-substance, or the soul-existence, will not cease when the dissolution of its union with the body arrives. It has been well said that self-consciousness may be confused, disturbed, or suspended by such an organic dissolution. But, let the interruption cease, and then the consciousness will

* *British Quarterly Review*, July, 1874, p. 115.

return. We can test the reasonableness of this view for ourselves. We are witnesses of the temporary suspension of consciousness in some states of severe illness. In high fever, for example, the consciousness is confused, disturbed, and even suspended: but when the fever abates, consciousness returns, and the soul resumes its usual power and activity. These facts have a very definite value in their reference to the Christian doctrines of immortality and man's spiritual personality. The substance of the soul, like every real thing, being indestructible (as science admits), it may exist after death takes place. Nay, if science teach the truth, it must exist unless destroyed by a higher power than any now known to science. And the soul will live on in a consciousness of personal identity, whether it be joined to the same particles of matter or not. The same identical physical body is not necessary to mental and moral life and personality here. It is a fact, as we see, that we live on for 20, 30, 40, 50, or more years, in very different bodies now, while knowing that we are still the same selves all the while. Therefore, science cannot object to, nay it must favour the idea, that man may live on in real self-conscious identity, in a very different body hereafter.

It would be very interesting to take another line of thought, science being still our guide, and show that from all we see of physical change and development here, it is reasonable to expect new bodies for the self-knowing and continuing soul. Science assures us that every atom and every substance once set free from any union by any cause, instantly seeks union with other atoms and other substances to form new unions and to play new parts. Even so, the soul may with confidence be expected to obey the same universal law: may be expected, at its separation from the body at death, to seek new associations or new surroundings. The soul, like every other reality, will not live in isolation. But live it will, if our greatest scientists speak the truth—on grounds, as I have shown—of pure human investigation and acquired knowledge. Need I remind you how all this harmonizes with the teachings of Christ and Christianity? Our faith in the unseen things which are eternal—God, the soul, eternal life—does not stand in the “wisdom of men but in the power of God.” That divine Power which first caused the soul to be and placed it in the flesh, on earth and in time, can surely continue it out of the flesh, in heaven and throughout the future. The great elements of personal identity are not material but spiritual. Even here and now we recognize the wonderful and inexplicable changes which nature exhibits. The caterpillar becomes the chrysalis. *There* a living creature is formed into

an apparently lifeless object. The chrysalis bursts, and out comes the winged moth—a quite new creature, for which old things are passed away,—a creature with a new body, new powers, new life, new purposes. Science has no key to such mysteries. The human intellect can but prostrate itself in confessed incapacity before them. And yet what do we see in the mystery of caterpillar life? Simply the passage of living creatures into new bodies and new conditions. Its identity cannot be disputed, but the change it has undergone is simply marvellous. What of the power which wrought such change? It is just infinite. To say that it is superhuman and extra-physical is to say little. It is transcendently mysterious and divine. Unseen it is and must be. Unseen it is, but real. The Christian places it in the only source which enlightened reason will sanction—in the Absolute Being we call God. For the use of such power, infinite wisdom; for its beneficent control, infinite goodness; for its direction to the innumerable needs of innumerable worlds and creatures, infinite skill are required. Thus again, are we led from nature up to nature's God. And once more I declare, that it is in this Power alone we Christians stand. It is the cause, the reason, the eternal sustenance of our faith. Where mystery is, there faith is needed. Our life is laid in a universe of mysteries. The highest efforts of genius, the grandest achievements of scientific capacity, will never accomplish more, in this state of being, than the disclosure and application of principles and facts *within the range of human endowment*. Beyond the human is the divine. But we must bide our time ere we are permitted to pass through the veil which shrouds it. Meanwhile, have we not a noble calling and work? What are we in relation to the unknown and inscrutable things of the Universe? "We are stewards of the mysteries of God."* Let us be faithful stewards. Let us look onward, as we labour and wait, in faith and patience. The Power we trust will gradually lead us into all the truth. All light comes from one source: be it natural or spiritual—scientific or religious. And the light will never cease to shine upon the darkness. What we know not now we shall know. The soul was made for eternity—the body for time. The infinite and eternal await us after the inevitable change. There are awful mysteries ahead. But they do not alarm us: still less do they cause us to doubt the power, the wisdom, or the love of God. Nay, having His own assurance of eternal life, we stand firm amidst the cares and ills, the sorrows and separations of this state of being. We strive to

* 1 Corinthians iv. 1.

endure as "seeing Him who is invisible."* Invisible and omnipotent. Invisible and ever-active: directing omnipotence by love. Active in a mode, and by a medium, science knows not of, and which Materialism rejects, for it refuses to permit the Soul of Force in the universe to take possession of a human body and incarnate itself in one personality for specific spiritual purposes. We cannot thus think. We dare not limit the freedom and power of the Absolute. Nay, we hold that if He were pleased to undertake the glorious enterprise of the religious and moral salvation of His creature, man—He must do so by a personal manifestation which would furnish the means of closest communion and most intimate intercourse with man. The world yearned to know a God of mercy, pity, love, and patience. It needed to be drawn by the "very cords of a man" †—the chords of sympathy, fellowship, tenderness, and grace. It needed to have God brought down from far-off clouds and inaccessible heights—from the regions of air,—and brought up and out from atoms of matter and physical force into human nature and life, into the common ways, the common haunts, the common hearts of ignorant and sin-ruined men. A true all-sided science will say so. A false and narrow science will not; it will shut God out of the one sphere in which He is most needed—the soul of the man made in His own image.

From such false science I turn for the satisfaction of my soul to the God manifest in the flesh, in whom I believe. Once in the flesh He proved Himself to be God by His control of all forces, material and spiritual. His last visible act gave a crowning proof of His Divinity. He ascended into heaven. There, as my faith believes, He re-assumed His invisible Spirituality. There He began a new epoch in the history of the Spiritual universe. There His activity took a new direction. Having put a new factor into human history by His Gospel, He adapted His invisible operations thereto—the operations carried on in the kingdom of heaven. And, in perfect harmony with the laws of change and development—call them the laws of evolution if you will—the Divine Being, the Word, the Christ of God, is now preparing the conditions necessary to changed creatures. He is preparing places for us in the many-mansioned universe, which is as truly His as this earthly globe: making ready a habitation for us when we shall have put off this fleshly body and shall receive a glorious spiritual body. "For this I say, brethren, that flesh and blood cannot inherit the

* Hebrews xi. 27.

† 1 Hosea xi. 4.

kingdom of God, neither doth corruption inherit incorruption. Behold I show you a mystery. We shall not all sleep, but we shall all be changed." * From the natural to the spiritual. From the mortal to the immortal. From the corruptible to the incorruptible. "And as we have borne the image of the earthly † we shall bear the image of the heavenly." ‡

All round us we see the rising of a tide of scepticism which we must do our best to keep back—or at least confine within narrow limits. From all quarters we hear the warning notes of an intellectual and spiritual conflict. I trust that the young men of our families—Christian families in every sense—will not flinch from taking their proper share of the solemn duties which such warfare involves. Let them not be alarmed. Religion is not going to disappear. Christianity is not going to be dismissed. History has shown how God refuses to leave Himself without a witness in the hearts of men, and history will show, too, how God in Christ will maintain His Sovereignty and retain the universal inheritance upon which He entered, that day He left this earth to re-assume His own glory. In the conflict of future years new facts will come to light; new aspects of truth will appear; new conceptions will be created; new words will be coined; new phrases invented to suit the larger life and vaster knowledge that are to be true. But firm in our faith in God and in His Christ, we know that the Spirit of grace and truth will overrule all for good. His truth is changeless and eternal as Himself, and while new facts, new ideas, new forms crowd upon men's minds, they will only live and last, as they harmonize with the eternal verities of God—as they lead to the acknowledgment of His perpetual presence and activity in the physical universe, and in the Spiritual Kingdom, which He has called into being.

The CHAIRMAN.—I am sure you will join with me in returning our best thanks to Mr. McDougall for his very interesting paper; it is now open for any one desiring to do so to offer remarks thereon.

Rev. G. CURREY, D.D.—I feel scarcely competent to enter upon a subject which involves so many abstract thoughts. At the same time I have great pleasure in expressing my sincere thanks to Mr. McDougall for the able manner in which he has maintained some of those truths which are dear, I trust, to the hearts of all now present. The feature of the paper which struck me most forcibly was this, that while Mr. McDougall

* 1 Corinthians xv. 50, 51.

† χοϊκός—ἐπουράνιος.

‡ 1 Corinthians xv. 49.

pursued the subject with a strictly scientific mode of examination, he did not shrink from entering upon, and from showing the bearings of, the highest and the most abstruse doctrinal truths which form the foundation of our religion. In a meeting of this kind, it is desirable that different views should be put forward, with the object of bringing out any points upon which differences may arise, which may be cleared away by examination. I am afraid that, upon this occasion, I cannot offer any contribution towards that end, for I really do not feel competent to advance any views or hints with regard to the propriety or the logical force of the arguments which have been adduced. These arguments were thoroughly satisfactory to my own mind, and I have nothing to bring forward as a point on which differences might arise. The author's aim seems to be to establish the existence of an independent power, an independent will, and an independent thought, apart from our own selves, and from those beings whom we see around us, and whom we believe, by a natural analogy, to partake of the same kinds of thought and feeling as ourselves. The belief in a power independent of and superior to us is naturally impressed upon us by our finding within us two forces, of which we ourselves, if I may so speak, are composed—a material force, which we exert by means of our body, and a spiritual force, independent of and controlling the material. Hence we arrive at the conclusion of the existence of a Supreme Intellect, an eternal and all-powerful God; because, as we feel within ourselves that we possess some power independent of the matter which composes our frames, and yet that matter does contribute and give to us a force by which we accomplish many ends. I shall, however, not now dwell upon differences, but try to gather up the sum and substance of the paper, as it has presented itself to my mind. To have the general scope of the paper before us may facilitate the comprehension of its abstruser arguments. So we conclude by analogy that there is, superior to the whole material universe and to ourselves,—who, in one sense, form part of that universe,—some great and supreme Will, Intelligence, and Power, who is using that universe and the beings that are upon it, for His own great, wise, and beneficent ends. If we conclude that there is such a Being, we only conclude that which our own experience tells us exists, in a certain sense, in our own personal beings. This I understand to be the ground upon which the paper of this evening rests, and is the substance of the argument that has been drawn out with regard to the existence of a supreme, intelligent, and beneficent Creator; and I think it is an argument which is perfectly unassailable. It is one which, as has been well pointed out, is entirely independent of the special discoveries of modern science, which, after all, only reveal the different modes in which the material forces act and have their influence, but do not approach, in the least degree, the source of that independent power which controls material things and uses material instruments. Though, with regard to our own being and our own persons, we may discover, with greater particularity, by science, the mode in which our will may move certain members of our body to perform certain acts, and

so we may resolve the actions and motions which we are thus enabled to put into exercise to certain mechanical or any other laws ; still, we do not approach any nearer to the solution of the great question—the connection between our spiritual and our material being. Just in the same way the discovery of the laws, or the rules, or the modes of operation, of certain portions of the material universe, or of certain persons residing upon that material universe, if we could resolve those motions or those actions, or even those mental operations, into their laws, and simplify or classify them, and our comprehension of them, by such discoveries, we should not touch the great question of the connection between the universe and the one Supreme mind and intelligence which directs and controls it. We need not, therefore, shrink from any result of science, which is engaged in classifying, simplifying, and explaining, either the operations of matter or the operations of mind. If we can resolve the phenomena of the mind into certain laws, and explain the connections between them, we do not lessen or alter the truth, that all these mental operations are the result of one mind. We may classify and describe mental operations, but that does not affect or alter the question, that those mental operations are the operations of one mind, just in the same way as all the operations and proceedings in the material universe itself, however much we may classify, simplify, or arrange them, are guided and arranged by one Supreme Being to work out His will. I have only said these few words because our Chairman called on me to speak. I heartily thank Mr. McDougall for his paper, for he has addressed himself to his subject in a manner which, to my mind, carries not only reasonable probability, but comfort and assurance. I am glad to find these great truths, which are dear to my mind and heart, stated ably and forcibly by one who does not shrink from placing them upon a scientific basis. (Cheers.)

Mr. M. H. HABERSON.—I cannot but admire the very close logic which characterizes Mr. McDougall's paper, and the general way in which he has dealt with the subject must have commended itself to every one present. It occurs to me, however, that there was one omission from the paper, inasmuch as Mr. McDougall did not refer to animal life as well as to the spiritual life. I think an objector might possibly say, "What about the intelligence manifested to a certain extent by the lower animals?" The life-characteristic of man, Mr. McDougall has shown, will continue, but what about the intelligence of the lower animals? The paper needs something in anticipation of the objection which an unbeliever might raise in reference to its logic upon that point.

Mr. W. THORP.—Mr. McDougall's able paper will be of great importance not only to the religious, but to the scientific world. But it seems to me that there is a difficulty, meeting us at the very outset, for which we are entitled to demand an explanation, and that is, the connection between the attributes of matter and the particles said to constitute that matter. That map yonder is hung upon a nail which is driven into the wall. If you ask why the nail supports the weight, you will be told that it is in consequence of the cohesion

between the particles. But does that tell us anything? What is cohesion? *Why* should the particles keep together?—Take another illustration from chemistry—a fertile field. Some of the compounds to be found there form bodies which are known to chemists as isomeric,—that is to say, they are absolutely identical in a material sense, but they have different properties. Take an instance of this: the common form of phosphorus is a yellow, waxlike substance, easily fusible, and taking fire at a very low temperature; but there is also a substance known as amorphous phosphorus, which is well known and seen by us every day on the sides of safety match-boxes as a red powder, and that cannot be fused except at a high temperature, and does not take fire except at a comparatively great heat. Yet those two substances are absolutely identical, so far as their material essence is concerned. What is the difference between them? Some chemists say the particles are differently placed; but why should that different arrangement bring about so great a difference in their properties? The same difficulty arises in the explanation of the force of gravitation. We are told that by it bodies attract each other. But why should they be so attracted? It seems to me that Professor Tyndall's remark, that he sees in matter "the promise and potency of every form and quality of life," may well be challenged. How can particles of matter have any potency in them at all? That was felt by the great Faraday—an authority which we must all receive with respect—who, when writing on the subject, said, "As to the little solid particles which are by some supposed to exist independent of the forces of matter . . . they greatly embarrass me; for after taking account of all the properties of matter, and allowing in my consideration for them, then these nuclei remain on the mind, and I cannot tell what to do with them." Professor Tyndall gives us no explanation whatever as to the connection between matter and its properties. There is one term used by Mr. McDougall which is, I think, a little unfortunate. He speaks of "psychic force"; but that phrase has already been used for a totally different force to the one he suggests. Mr. Crookes has used it for quite another purpose; and, however appropriate it may be for Mr. McDougall's meaning, I think it would lead to confusion to employ it in a new sense.

The CHAIRMAN.—It seems to me that there are one or two arguments which may be used respecting that potentiality of matter which is asserted by materialists—its potentiality, of its own accord as it were, to enter into the formation of all organized beings. Undoubtedly the particles of matter are capable of entering into those combinations which constitute all organized beings, when that property is called into action, but not otherwise. The meaning I wish to express is this: take for example a field; you have the various elements of matter composing the soil, and the various elements composing the atmosphere—the oxygen, nitrogen, aqueous vapour, and other gaseous matter which composes the atmosphere overlying the field. We know perfectly well that from these same elements ten thousand different vegetable organisms may be produced; but how are they produced?

By putting into the soil the appropriate seeds. That is to say, the matter of the field and the matter of the air, by which it is surrounded, would not of themselves form any plant. In order to determine the inherent powers of the matter itself to form any particular plant, it requires the presence of a seed, that is to say of a certain germ—a certain organism derived from a previous plant of the same species, the result of which is, that the presence of that germ, by some inscrutable power residing in it, determines the action of those forces by which the various elements of which the earth and air are composed, unite together, so as to form that particular plant. A great deal has been said about protoplasm as the physical basis of life, and it is perfectly true that in order to form an organized being, protoplasm is necessary; but the protoplasm itself is not able to produce the organized being, except under such an influence as arises from the presence of an element derived from a plant or animal of the same species. The presence of such an element is necessary to call into action the organic forces—the merely material forces—of the matter itself, so as to produce the plant or animal in question. Now there is not a particle of reliable evidence that the most simple monad—the simplest organic plant or animal—was ever produced by the mere concurrence of inorganic particles. All the reliable evidence goes entirely the other way. If only sufficient means are taken to exclude the possibility of the presence of a germ derived from a similar organism, no organism will be formed, although the materials to produce it may be present in close proximity to each other, and so apt to run into those combinations which will produce the organization in question that the mere presence of a germ is alone necessary to cause that production to go on with the greatest rapidity. Therefore, so far as evidence goes, there is no evidence whatever that the inorganic matter possesses the property of combination of itself, of its own accord, to form even the most simple and lowly organized being in existence; and as we go higher in the scale of organization the difficulties are greater still. It appears to me that there is no sufficient ground for assuming the possibility of matter itself producing any organized being without an influence derived from a previous organization of the same kind; if this be the case, we must go back *ad infinitum*, and we cannot come to any logical conclusion except that the first organism, or the first element, which was capable of producing the formation of a given organism, must have been originally the subject of creation. With regard to the doctrine of evolution, the only thing that needs to be said is, that no one can deny that the Divine Will, with regard to the successive formation of organisms, may have worked in that way or in any other way; we cannot limit the Divine power, and we must admit that it is quite possible that successive developments from a lower to a higher form of organization have been made. The existence of such a state of things is quite compatible with Divine power, but we have no evidence that Divine power worked in that way: it is quite possible that it might have done so, but evidence that it has is absolutely wanting.

Rev. A. BLACK.—I seems to me that one argument which Mr. McDougall

has used is not altogether borne out. He says the body changes its atoms continually, so that every man has an entirely new set of atoms in his body every seven years, and then he goes on to argue that since man, in 30, 40, or 50 years, has had bodies composed of different atoms, while the soul has continued to exist without change, therefore the soul cannot be destroyed, but must have an existence elsewhere when the body perishes. Now that does not seem to me to be conclusive, because, though the atoms of which the body is formed change, yet when one set is taken away it is replaced by similar atoms.* It does not, therefore, follow that the soul cannot undergo any change or suffer any diminution of life, so to speak, when it goes into perhaps a totally different form of organization. The arguments of Mr. McDougall are similar to many I have heard and read. You will recollect Plato's statement that the soul is a simple un-compounded substance; but whether that affects the proof or not is another question, and certainly it is one of those statements which we have not the slightest scientific grounds for making. Another objection which strikes me is this, and I do not state it as my own objection, but as one which has occurred to my mind, and on which perhaps Mr. McDougall in his reply may throw some light. The objection is this, that the arguments brought forward in support of the immortality of the soul of man would hold good of the immortality of the soul of the lower animals. Mr. McDougall talks of man's various feelings, thoughts, and affections; but, in a lower degree, similar things may be said of the lower animals. They have memory, and they can love and hate; so that if such arguments are to hold good in man's case, may they not also hold good in the case of the lower animals. I have seen this same objection urged with reference to the views of Bishop Butler and others, and I only advance it now in order that Mr. McDougall may deal with it when he comes to address us again.

Mr. L. DIBDEN.—Butler says that that may be true of the lower animals.†

Rev. J. W. BUCKLEY.—The question depends very much upon this—whether or no we have any revelation upon the point. Will not somebody undertake to show that, whatever science may do with reference to the power of matter, we are driven to this conclusion, that we must have a revelation upon the subject. Let science do all that is in its power: still reason says that there is a Power immensely above matter; and we are driven to the conclusion, that we must have a revelation. *We* may argue that we have that already; but we must not assume it here. *We* believe it clearly and distinctly, without any doubt or hesitation; but I should like to see a logical argument put forward which would show that, let science do what it will, there is a Supreme Power over all, and that that Supreme Power must be the subject of revelation to us before we can take cognizance of it.

Mr. McDUGALL.—In replying to the discussion which has been raised

* Still they are changed.—Ed.

† But Butler can scarce be said to *admit* it.—Ed.

upon my paper, I have to thank Dr. Currey, and the other gentlemen who have spoken, for the very generous way in which they have dealt with it ; and I am also obliged to them for the points they have suggested as to where its deficiencies might have been supplemented. With regard to the gentleman who spoke of the connection between the imperishable soul and the perishable, changing body, he rather misapprehends my meaning. I did not enter into any argument apart from the fact that the accepted teachings of science do not contradict that element of our faith which leads us to accept the revelation of the immortality of the soul. What connection there can be between that and the question of the possibility of animals also living hereafter, I really do not see. I am not bound to defend or to enter into that matter at all : it is a question which is open to discussion upon quite other grounds, I am not involved in it in any way, for I have advanced nothing which requires me to answer the question as to whether the dog shall or shall not live in another world. All I have to say is, that the Christian view of the immortality of the soul is that it is revealed to us, and that all the accepted teachings of scientific men cannot invalidate it. An impression has obtained currency, that scientific teaching contradicts the teaching of the immortality of the soul ; but I think I have shown that that is not the case, and that is a very important point ; for we should take hold of these men according to their teaching, and not merely according to their theories. Speculations we can indulge in, as well as they ; but their speculations are not to be accepted as truths. What I try to prove is, that there is something in man beyond the material atoms ; in other words, that the atoms of oxygen and hydrogen and carbon and iron contained in his body do not constitute the identity of a man, but that there is something else which does give him a continued identity ; and that much even Professor Tyndall has been obliged to admit in his last paper ; for he states that the process by which consciousness is infused into the material atoms is unthinkable ; that is to say, he has no answer at all to give to this important question. I am very much obliged to our Chairman for the very clear way in which he has stated the argument which shows that the original elements out of which organized life is produced are not the products of inorganic matter. If you take a field of soil, you certainly cannot get a crop of corn from it unless you sow the living seed. That opens up one of the greatest questions which we have to consider ; and I believe that a very useful book, both to ministers of religion and to men of intelligence, is Professor Janet's *Modern Materialism*, in which the mistakes of Buchner are exploded. I would recommend the gentleman who spoke of the immortality of the soul to read that book with care, and I think he would derive much assistance from it. What has been said by our Chairman is in exact accordance with the latest experiments and the best teaching as to the production of life from inorganic matter. I have only to repeat my thanks to those who have spoken, for their kind appreciation of my paper.

The meeting was then adjourned.

ORDINARY MEETING, JANUARY 3, 1876.

VICE-ADMIRAL E. GARDINER FISHBOURNE, C.B., R.N., IN
THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following elections were announced :—

MEMBERS :—

The Right Hon. the Earl of Shrewsbury and Talbot.
T. E. Heller, Esq., M.S.B.L., Wandsworth.
Rev. W. J. Packe, M.A., C.C. Oxon., Feering Vicarage.
Rev. T. B. Stephenson, London.
Rev. A. Thomson, LL.D., Edinburgh.

ASSOCIATES :—

W. Boshier, Esq., Middlesbrough.
T. K. Callard, Esq., F.G.S., London.
L. C. Irons, Esq., London.
T. Outhwaite, Esq., Middlesbrough.
Rev. H. White, B.A., London.

Also, the presentation of the following works to the Library :—

"Proceedings of the Royal Society." Part 164.	<i>From the Society.</i>
"Proceedings of the Royal United Service Institute." Part 83.	<i>From the Institute.</i>
"Immortality." By Dr. Sexton.	" <i>Author.</i>
"Materialism." By Dr. Winn.	<i>Ditto.</i>
"The Westminster Confession Tested." Rev. A. Stewart.	<i>Ditto.</i>

The following Paper, the fourth of a series, was then read by the Author:—

THE SORROWS OF SCEPTICISM. By the Rev.
ROBINSON THORNTON, D.D., V.P.*

IN three papers, which I have had the honour of reading at different times before this Institute, I have endeavoured to discuss, or raise a discussion on, the Scepticism of the present day in various aspects. In touching on the Logic of Scepticism, I have called attention to the illogical character of the reasoning process by which most, if not all, sceptical conclusions are deduced from their premises. Those who employ these arguments have generally proceeded as if it were their object to produce action rather than to attain to truth. Far be it from me to say that those great men of science who have unhappily identified themselves with the cause of Scepticism have knowingly ignored truth, or even permitted themselves for a moment wittingly to deflect from the course that they have adopted to lead to its attainment. But the sceptic, in general, I maintain, has, intentionally or unintentionally, so shaped his arguments as to appear to aim rather at inducing men to quit their profession of Christianity than at demonstrating the truth of his own principles; he has been content with the rhetorical enthymeme or example, where the subject-matter demanded the syllogism or the induction. In short, I have urged that the processes of sceptical thinking appear to violate the *formal* laws of thought. In treating of the Credulity of Scepticism I have endeavoured to point out that in the assumption of premises the sceptic has generally made a far greater demand upon faith than rational believers in Christianity have done. He has demanded absolute assent to propositions of very low probability, and has deduced conclusions which are, either directly or by implication, more startling than those which they were intended to contravene: while blaming those who accept

* Being the Fourth and concluding portion of the arguments brought forward in the Author's Papers on "The Logic of Scepticism," "The Credulity of Scepticism," "The Varying Tactics of Scepticism," read in 1866, 1869, and 1874.

statements on authority, he has himself been a blind worshipper of authority, taking on trust as much at least as Christians do; but with this difference, that the authority to which he defers is, by his own admission, merely human; theirs, on the other hand, they maintain to be Divine. In a word, I demurred to the *material* part of sceptical logic.

The historical view of Scepticism I have endeavoured briefly to unfold in writing of its Varying Tactics. I have tried to show how it has shifted ground: becoming, it may be, from time to time more astute, but not necessarily more truly scientific; availing itself of, and seeking to direct or divert, the currents of popular thought, but never taking up any definite and intelligible position which should vindicate for it the reputation of being something more than a pertinacious denial of truths which wise and good men have prized, and struggled for, even to the very death. To these logical and historical discussions of Scepticism, I venture to add a few words on its metaphysical aspect: I propose to look at it psychologically. Having suggested that its history is not ennobling, nor even respectable, and that its logic is materially and formally fallacious, I now proceed to inquire whether it responds to the requirements of man's higher being, and satisfies its needs and its laws any better than it does the needs and laws of the ratiocinative intellect.

I entitle my paper the "Sorrows of Scepticism." There is no sorrow produced directly by an historical shortcoming or a logical failure. We may be disappointed in a character of brilliant promise, we may feel dissatisfied if detected in a fallacy or unable to establish a projected conclusion; but these vexations are, in logical language, accidental, and not of the essence of history or logic; whereas a metaphysical failure, a coming short of the attainment of that which the very nature of the man yearned after, is in itself a pain to that higher nature which experiences it.

I have been led to employ this term, Sorrows of Scepticism, from an observation of the physiognomies of sceptics. I have never, or scarcely ever, looked at the faces or photographs of those who cherished doubts about revealed religion, without being struck with the expression of pain which they exhibit. It would be invidious and undesirable to particularize in this matter; but I may say without hesitation that this appearance of pain, disquiet, disappointment, unrest, is to be seen in nine-tenths of confessed unbelievers. No doubt it may be said that they, like Heraclitus, are weeping over the folly of mankind, though one would wonder why a Democritus did not now and

then appear, with an amiable or sarcastic smile on his face; no doubt it may be said that a lugubrious expression is not confined to those who cherish honest or dishonest doubt, but is seen in those whose orthodoxy is unimpeachable. Still I give you the fact, as it appears to me: most sceptics look unhappy, most believers look happy; and so, as a counterpoise to the Nemesis of Faith, I claim a right to speak of the Sorrows of Scepticism.

Whence then is the sorrow, and what is its nature?

"Dolor," says the old Scholastic, "est solutio continui." The definition is intended for physical pain, which was supposed in every case to be essentially connected with some interruption of that which is normally uninterrupted. That the definition is not adequate I presume our modern physiology would tell us; but we may accept it as containing within it a condition of many kinds of corporal suffering. And we may, *mutatis mutandis*, apply it to the higher nature with even greater correctness. If physical pain be caused by the severing of that which should be continuous, mental pain or sorrow is caused by the sundering of the soul or the mind from that which it yearns after, or with which it imagines itself to be, in some way or other, united. The great poet of the world to come was right when he pictured, plunged in unfathomable woe within the impassable portals of the city of despairing grief,

"le genti dolorose
Ch' hanno perduto il ben dell' intelletto."

Their sorrow was that they were sundered from that *ἀγαθόν* which the intellectual, in all its varied forms, according to Aristotle, *ἐπίσθαι δοκεῖ*, that nearer view of the Self-existent which Plato would consider the necessary ultimate destiny of intellectual being.

I. *The Sorrow of mere Negation.*—The mind, from its very nature, seeks for the positive and affirmative, and cannot rest in the negative or destructive. We should hardly, perhaps, be ready to endorse the Hegelian doctrine, that negation and affirmation are two necessary parts of a truth, and that absolute truth consists in the relation between the two; but I think we may maintain it thus far, that negation without affirmation is indefinite and incomplete, and that the mind cannot rest in it. Now the whole of Scepticism is essentially negative. Its scientific propositions, certainly, so far as they are concerned with phenomena, are positive enough; but its conclusions are destructive. Each of its arguments tends not so much to establish a new truth, as to dethrone what has been recorded as one; and in too many instances one seems to feel that the

eager delight with which the sceptic enunciates some startling inference arises not so much from the value of that inference to true philosophy as from its presumed contrariety to something which believers hold to be the revelation of God. This delight, however, is no true pleasure. The mind refuses to be satisfied with the love of that which is not, while it longs for the knowledge of that which is.

In this we may see, I think, a reason for the shiftiness and disposition to vary the ground which we cannot fail to remark as we review the history and development of the various sceptical schools. They will tell us, of course, that new discoveries have widened the field of human inquiry and knowledge; that this shifting of ground is only the occupying of more commanding heights from whence to attack superstition, not the abandonment of the old posts as untenable, nor the restless relinquishment of them as unsatisfactory to those seekers after change to whom that which is is distasteful because it is. They will tell us this; but we shall reply that they are unquiet because they cannot be quiet; that the sorrow of negation clings to them like the tunic of Nessus to Hercules, as a torment which they may sigh under, but are powerless to cast away.

II. *The Sorrow of Doubt.*—As the intellect cannot be satisfied with negation alone, and seeks for affirmation, so does it also long for Assent, and refuse to be contented with Doubt. A pure Pyrrhonism is as inconsistent with mental satisfaction as the absence of a definite centre would be with mechanical revolution. There cannot possibly be any acquiescence, on the part of a rightly-ordered intellect, in a system of teaching which consists either of a number of contrariant propositions of equally low probability, or of a continual assertion of the imperfect probability of another system. Yet such is really the character of sceptical doctrine. Either we have it laid down for us that it is vain to try to determine which is the fact, A, B, or C, all being nearly equally improbable,—this I should term pure scepticism;—or we are told that whatever may be the real fact, one thing is certain, that our assent must be withheld from C (Christianity).

By Doubt I do not here mean that which Descartes considers as the primary position from which all true philosophy springs. The two are often confused together,—one cannot help thinking sometimes of set purpose,—by those who wish to allege the authority of a great name in favour of their own unhappy system. But Descartes was no sceptic. His doubt was never intended to be a part of his philosophical system. It cleared

the ground for Philosophy; but was no more to be rested in as an end than the extirpation of Virgil's "horrida silva" of weeds and brambles is to be held for the completion of agricultural operations. Nor probably would Descartes have urged the application of his "doubt" to that higher class of propositions which we speak of as eternal truths. If, according to him, we cannot doubt of thought, so we may not venture to introduce our doubt where the object-matter is cognate with thought; but be that as it may, the Cartesian dubitation was to be anterior to philosophy, and not an integral portion, still less the principal portion, of the system itself.

Scepticism, however, as such, offers us little but doubt. It does not offer us a definite set of propositions to which we may assent, but, as we have seen, points out a set to which we must not assent. Now, as I have said of negation, so I say of doubt, that the mind cannot possibly rest in it. There is a longing for the credible, as there is for the affirmative; and wherever assent is withheld without some definite assent, in another sense, being propounded, there the intellect is disappointed of its aim, and cut off from that fixed positive truth which it identifies with itself. This the earlier seekers after truth felt to their deep sorrow, when they missed of what they were seeking, though they felt sure it was to be found, and hoped even beyond hope of a Time and a Man who should bring it to them; and the sceptics find it, too, when they turn away from the unchanging Truth to wayward doubt, and its chill, like the prison fetters of Joseph, enters into their very soul. They may call this freedom, but it is bondage; they may exult in a pretended emancipation, but they are in the bondage of disquiet, the servitude of unrest.

III. *The Sorrow of Insufficiency.*—I have said already that regret at a logical failure must not be considered as essential, but accidental, a supervening discomfort not connected with the logic itself. Yet I may without inconsistency append this to the two sorrows already discussed. They arise from the very essence of scepticism; this, like the Aristotelian pleasure (for contraries correspond) is ἐπιγιγνώμενόν τι τέλος τῇ ἐνεργείᾳ. It must, however, be very real at times. I mean by "sorrow of insufficiency" the regret that many, if not all, sceptics must feel at finding that, do what they will, they fail to clear away all the difficulties which attend the rejection of Revelation; and scarcely, indeed, are able to deal with all the arguments alleged in its favour. It is not those who tell us loudly that the game of Christianity is played out, and that it must now take its place among the effete superstitions of humanity, not with the worst, perhaps, but still by no means

with the harmless,—it is not these, I say, who are really content at heart with the position of their own system. There is a latent feeling that all is not right; or, at all events, one seems to see, amidst all these “grave ’ords,” traces of a lurking dissatisfaction with their own method and their own conclusions. The most decided and intolerant unbeliever must see that he himself, in contravention of his own principles, asserts something, assents to something, believes something, while he censures others for assertion, assent, belief. In short, it must be one of the sorrows of Scepticism to see her despised adversary still standing fast, assailed at all points, but consistent and undismayed, while she is herself not altogether free from the fear of seeming self-condemned.

IV. *Sorrow from the absence of God.*—There is a sorrow above sorrows for the sceptic; not merely the disappointment of his intellectual longings, but the blankness of severance from the ultimate end to which soul and spirit alike look upward, towards which the moral and intellectual alike desire to struggle.

It is a hackneyed question, whether the mind does or does not habitually entertain a true conception of the absolute, the infinite, the unconditioned, as distinct from, and elevated above, the contingent, the finite, the conditioned. That there is some such notion present in the educated mind, the personal consciousness of every one probably testifies. We *have* a notion of that which is endless, and self-existent, and unlimited, differing in that very self-sufficiency from all that we experience in ourselves, or are aware of in the phenomenal existence which surrounds us. But does this notion correspond to some exterior existence, or is it merely evolved by us by a mental removal of limit from that of which we have experience as limited? Is our conception that of the Infinite, or of the Indefinite? This is, as I have said, a hackneyed question; but I must be pardoned if I touch on it in pursuance of my purpose.

That every conception has some external object corresponding to it, so that it is not only true that “*cogito, ergo sum,*” but “*concipio, ergo est,*” is well known as a bald statement of the doctrine of the realists: not that the realists probably ever maintained the doctrine in exactly the same form as it has been imputed to them. Doctrines are too often caricatured in a ghastly manner by those who gainsay them: the lion painted by man is quite another creature from the lion as he would be painted by lions. We may take it, however, as a realistic form of argument, that if there

is really such a conception present in the mind, it necessarily involves the existence of an external antitype: as therefore we have the idea of the Infinite, the Infinite must needs exist; as we have the idea of the Perfect, there must be a Perfect Being to correspond to it; the notion could not have been generated in the mind itself by a process of tampering with notions already there, derived from experience, but must be traceable to some external and independently existent origin.

The opposite view I cannot set forth better than in the words of Locke. He repudiates the view that there can be any notion of the Infinite as such; and therefore, of course, would deride as a mere fancy the belief that there was any existence corresponding to a mere negative notion. He accounts for the origin of such notions thus:—

“Every one,” he says (ii. 17, § 3) “that has any idea of any stated length of space, as a foot, finds that he can repeat that idea; and joining it to the former, make the idea of two feet; and by the addition of a third, three feet; and so on, without ever coming to an end of his addition, whether of the same idea of a foot, or, if he pleases, of doubling it, or any other idea he has of any length, as a mile, or diameter of the earth, or of the orbis magnus; for, whichsoever of these he takes, and how often soever he doubles or any otherwise multiplies it, he finds that after he has continued his doubling in his thoughts, and enlarged his idea as much as he pleases, he has no more reason to stop, or is one jot nearer the end of such addition, than he was at first setting out. The power of enlarging his idea of space by farther additions remaining still the same, he hence takes the idea of infinite space. . . . As by the power we find in ourselves of repeating as often as we will any idea of space we get the idea of immensity, so by being able to repeat the idea of any length of duration we have in our minds, with all the endless addition of number, we come by the idea of eternity.”

It would be over-refinement to point out here the confusion between linear extension and space, the more so as the confusion does not affect the argument. The answer to Locke, it seems to me, would be this, that he is describing not the formation of a notion of the Infinite from the perceptions of the Finite, but the struggle in the mind to bring down its transcendental notion of the unlimited to its experience of the concrete and limited; he does not prove that there is no idea of the absolute, but shows that, there being such an idea, we are always endeavouring to realize it.

But it would be an unwarrantable departure from my subject to fight the battle of Aquinas against Abelard, Locke against

Cudworth, and Berkeley against both, or to uphold with Schelling the intellectual intuition (*intellectuelle Anschauung*) of the Absolute. I should simply venture to lay down thus much: we have a notion of the Infinite, no matter whence or how derived, as truly as we have of the Finite; not an image, of course, but a conception; and this Infinite is to us a necessary correlative of the Finite: so that—even as the distinct knowledge of good implies in it the knowledge of evil, its correlative—we cannot conceive of the Finite without the Infinite, of the Limited without the Unlimited.

But has this conception of the Infinite, the Absolute, the Unlimited, necessarily any personal existence corresponding to it? One would say that as the finite man has personality, so the Infinite, too, may be expected to be personal; and, as we have a conception of the one finite nature in many finite persons, we infer that there is an Infinite Nature personally existent corresponding to our idea of it. Thus we come to the well-known arguments of Descartes (*Med. iii. and v.*):—“The idea of an All-perfect, Infinite Being, is, without controversy, in my mind—how did it get there? Not from the outer world; not from education; not from any finite source, because the finite and imperfect could never give me a conception of the Perfect and Infinite; the effect could not transcend the cause. Hence, if I have the idea of God, a God must necessarily exist.” And again: “As the existence of a triangle is implied in the very nature or essence of the conception we have of it, so the existence of God is implied in the essence of our idea of Him.” This may be flat realism, but, if it is, so much the better for realism. The conception of the superhuman is neither, as Locke would tell us, a mere abstract notion of humanity with human conditions removed, nor, as Fichte might say, a projection of our own self-consciousness into the region of the unknowable, but a real representation of a real existence. A representation, but, as I said above, not an image; or else that argument might hold good which presses the impossibility of there being an idea of the Infinite at all. Can that which is finite, it is urged, take in the Infinite, the measured comprehend that which is immeasurable? We know the old tale of St. Augustin of Hippo; that when designing to write an exhaustive treatise on the Triune mystery of the Divine Being, he saw in vision by the seashore a child who had scooped a hollow in the sand with a shell, and smilingly told the Saint that he was going to pour the ocean into it with the same instrument. “Nay,” said St. Augustin, “surely it were foolish to think of taking up the wide sea with a little shell, and

inclosing it within a tiny receptacle." Suddenly the child disappeared, and in his stead an angel form was there, while a solemn voice replied, "Not more foolish than to hope with a finite mind to understand the infinity of God." In fact, we may well echo the poet's words,—

"In this wild maze their vain endeavours end ;
How can the less the greater comprehend,
Or finite reason reach Infinity ?
For what could fathom God were more than He."

True: but the human may conceive of, though it cannot fully fathom, or take in, or image, the Divine. Man's intellect, we must remember, is in the likeness of God's; it is immortal, and though limited *in esse*, is intended for an unlimited and eternal growth; so it may possess, if it cannot itself form, a conception, though an inadequate one, of the Immortal and Perfect; and, having a potentiality of infinite advancement, may formulate the Infinite within itself: just as a finite formula in mathematics is capable of representing an infinite extension.

To this Personal Being, All-good, All-wise, Self-existent, the longings and yearnings of humanity, frail, weak, and ignorant, yet ever conscious of a possibility of better things, are eagerly directed. The sceptic himself knows that in the midst of the impure and false he involuntarily longs for, and by that very longing admits the existence of, the pure and the true, and that not as an abstraction, but as a Person. The affections seek Him as their rest; for rest they must have, and they cannot rest in the restlessness of the finite. The intellect seeks Him because it must have, and rest in, truth, and it cannot rest in the half-truths of the finite. Affections and intellect, heart and mind, soul and spirit, alike stretch forward to Him whose very Being is so wondrously impressed upon them.

And this is the great Sorrow of Scepticism, that it cuts man off from his highest good. There must be, it tells us, no Personal Deity; no "golden chain" which binds each soul to "the feet of God"; no Providence, though the inmost recesses of the heart seem to testify that there cannot but be one.

"Mother! some Hand, through sky, o'er sea,
Leads wandering birds protectingly;
'Mid floating piles, and ocean dark,
That Hand will guide thy homeless bark."

A rigid "self-denying ordinance" bears all these away, and

weeps over fair children whom it has, like Brutus, doomed to death by a mistaken fanaticism.

If we inquire into the metaphysical conditions of this sad engenderer of sorrow, we shall find, I think, that it is an intellectual malady; a mental imperfection somewhat similar to colour-blindness, only not, like that singular defect, unattended with pain. The imperfection consists in an inability to admit, at the same time, the existence of the contingent and the absolute, and to appreciate the province or district, so to speak, which belongs to each. That form of the imperfection which refuses the contingent leads to mere transcendental idealism, but not necessarily to religious scepticism. Though Schelling was not a fervent Christian, Malebranche was. The other form, however, the rejection of the absolute, must inevitably end in a logical and a metaphysical deception. The logical fallacy I will not enlarge on now. It would take the form, usually, of that called in our logical treatises the fallacy "*a dicto secundum quid ad dictum simpliciter*," or its converse; and would lead us to an utter confusion between will and mechanical power, between the fitfulness of the imperfect and the steady consistent energy of the perfect. The metaphysical error would rather resemble the incorrect perceptions of a sight which, in other respects of normal power, will not bear focussing to the usual extent, and therefore deprives its possessor of the advantage of seeing what is within, or beyond, a certain distance, while at the same time its goodness disposes him to doubt or deny the existence of what he is unable to perceive. The absolute being withdrawn from view, and the contingent alone remaining, the sceptic is left to the contemplation of force in the place of Divine Will; and to the ultimate choice (an unhappy one) between Atheism, Pantheism, or Fatalism. The outcome of these is as injurious to the community as they are in themselves full of sorrows to the individual. No one can doubt this who watches the course of modern unbelief. From the rejection of a written revelation, and a Personal Deity, it advances to the denial of moral responsibility, and the repudiation of social relations, social duties, social morality; eliminating sin by the simple process of asserting the non-existence of moral evil. It professes by this course to cure the griefs to which humanity is liable; the medicine, however, is no true balm, but rather like that narcotic which for a short time induces oblivion of troubles only to intensify them tenfold when the patient wakes to consciousness again. Even the Greek poet could see that the Supreme Being alone was the giver of peace to the troubled mind:—

οὐκ ἔχω προσεικάσαι,
 πάντ' ἐπισταθμώμενος,
 πλὴν Διὸς, εἰ τὸ μάταν ἀπὸ φροντίδος ἄχθος
 χρῆ βαλεῖν ἐτητύμως.

It has remained for a later age to enunciate the doctrine that the surest expedient against care is to banish Him. But where this expedient is tried, the witness of Him still remains, to increase the care by the feeling of severance from Him: scepticism enhances sorrow by the addition of its own. A true philosophy, a true estimate of the needs of humanity, its tendencies, its latent powers, its patent frailties, points, equally with religion, to a very different course, and a very different result. "Ita ergo," says St. Bernard, "sursum cor, sursum clamor, sursum desideria, sursum conversatio, sursum intentio, et omnis expectatio tua desursum sit: clama in cœlum ut exaudiaris, et Qui in cœlis est Pater mittat auxilium de tribulatione, eripiat a tribulatione, et glorificet in resurrectione."

The CHAIRMAN.—I am sure you will allow me to return thanks to Dr. Thornton for his interesting paper. I may, perhaps, be allowed to make one remark to give you an opinion having reference to the argument bearing upon physiognomy. Some years since I was visiting the studio of the celebrated American sculptor, Hiram Power, whom I found to be as good a talker as a sculptor. I asked him "if he knew that anthropologists say that it is impossible to study the subject of anthropology perfectly without considering the effect of religion; that the physical effect which religion has upon the countenance is a prime factor in the estimate?" He replied, "Well, I have had a good deal of experience among the revivalists of America, and I found this uniformly, that though individuals had been only five or six weeks under the influence of religious enthusiasm, following the movement as mere camp-followers, their countenances were perfectly changed in the time by the fact that they had been under such an influence." Now that, coming from a man like Power, whose profession involved the study of the features, is not without interest to us, and I can quite understand Dr. Thornton's statement that unhappiness is to be found in the physiognomy of the sceptic, just as an expression of happiness will be found, as a rule, in the face of the true Christian, for who can be happy if he is not? (Cheers.)

Mr. H. COLEMAN, LL.D.—I think that the paper which we have heard read to-night contains much that is admirable, but it also contains some weak points. The question which we ought to discuss is not whether scepticism may not be attended by certain sorrows, but whether the mere fact that scepticism may be so attended is an argument against it from a Christian point of view. The Christian dispensation leads us to expect sorrow, and

therefore the mere fact that scepticism is attended by sorrow would in itself not be an argument against it. Scepticism is a disease, and you must go to the cause of it. It is of no use telling a man under these unfavourable conditions that he would be better out of them. He cannot help them. He is involved in sceptical conditions. I should have preferred to see in this paper a bolder and more enlightened treatment of the question. We all know that scepticism exists, and that it is very prevalent, but what can be the practical result or use of saying, "If you accept scepticism, you must accept a system of sorrow." I desire, however, to express a general approbation of the paper, and of the excellent manner in which it has been placed before us, but I really would urge Dr. Thornton to tell us in his reply the cause of scepticism and the best mode of treating it.

Mr. J. RENDALL.—The last speaker seems to have forgotten that the paper which has been read to-night only deals with one-third part of the question.* My exception to it is of a very different character. I was sorry to find some expressions in the paper which are not worthy of so able a man as Dr. Thornton; he does not quite do justice to the position nor to the views of sceptics. On the very first page I find him saying: "The sceptic, in general, has, intentionally or unintentionally, so shaped his arguments as to appear to aim rather at inducing men to quit their profession of Christianity, than at demonstrating the truth of his own principles." On the second page he says of scepticism: "Its history is not ennobling nor even respectable," and so on through several other pages, speaking of "its shiftiness," its being "confused together," et cetera. I was much struck with the contrast afforded to this style of writing by that of Farrar's "Life of Christ," where I find this passage, in reference to scepticism,—Dr. Farrar writing distinctly, be it remembered, as a believer to believers:—"Let me here say at once that I hope to use no single word of anger or denunciation against a scepticism which I know to be in many cases perfectly honest and self-sacrificingly noble." Dr. Thornton, I think, does injustice to his own position, when he will not allow to the sceptic, motives, quite as good as his own, and a sacrifice quite as great, though the sceptic arrives at different conclusions. But the purpose for which I rose was to bring forward a strong illustration of the soundness of the general view contained in the paper. In reading the life and letters of Niebuhr I came across a passage which well illustrates the sorrows of scepticism. Niebuhr was an unbeliever, and one of the most eminent; but, writing to a lady, afterwards his wife, about the education of his son, he says:—"He shall believe in the letter of the Old and New Testaments; and I shall nurture in him from his infancy a firm faith in all that I have lost, or feel uncertain about."—*Life and Letters*,

* The paper is the fourth or concluding portion of the arguments brought forward in the Author's Papers on "The Logic of Scepticism," "The Credulity of Scepticism," and "The Varying Tactics of Scepticism"; read in 1866, 1869, and 1874. (See note, p. 234.)—ED.

vol. ii. p. 101. (Cheers). That is a very strong utterance to proceed from Niebuhr. The father, though he could not himself believe in the Old and New Testaments, still felt such an amount of discomfort about his own position that in educating his child he determined to bring it up in the belief which he himself had ceased to possess. With reference to the question of physiognomy, we must remember that (with most of us) lines will deepen and wrinkles will come with age, also that Froissart charges the English with being serious even in their pleasures, and certainly Dr. Thornton's friends must be exceptions, if nine-tenths of them have happy expressions. I agree that unbelievers, as a rule, carry a painful expression, but my experience leads me to deny that nine-tenths of Christians are happy-looking, at least among Englishmen.

REV. F. N. OXENHAM.—The observation which I specially wish to make arises partly from what fell from the first speaker. The industrious author of the paper has not done one thing which we should have wished: he has not pointed out to us the very essential difference between two sorts of scepticism. It seems to me that if we are really to meet the growing difficulties of scepticism, we must be most careful to distinguish between the doubt which arises from a desire not to believe what is put before a man as truth, and the doubt which arises from a real genuine difficulty, in being convinced that a certain statement does rest on sufficient grounds. One I should call moral, the other intellectual. It seems to me that the scepticism with which we have to deal ought to be regarded as simply intellectual, and Dr. Thornton has told us that he regards it as an intellectual disease. If it really is an honest incapacity in any mind to see that a particular statement rests on a sufficient basis of truth, then all these arguments as to "attempts to make us give up Christianity" are beside the mark. I cannot help thinking, and I say it regretfully, as a clergyman, that we have failed to do much that we might have done in the way of winning over sceptics by assuming, to begin with, that they were morally wrong. If we began by sympathizing with their doubts, and agreeing with them that truth is so precious that we cannot allow an imposture to usurp its place; if we gave them more credit, not for wishing to undermine Christianity, but for feeling genuine difficulties in ascertaining the grounds on which certain statements were originally made, we might do a great deal more for them than we have done. When we impute to them bad motives, and tell them they are not respectable,* the sceptic naturally says, "A person who speaks in that way does not understand my state of mind, and has no sympathy with me." I cannot help thinking that the scepticism which Dr. Thornton has called intellectual is entirely different from that which he described in the earlier pages of his paper. If we had been told at the beginning of this paper that the author regards scepticism as a moral disease, which desires not to believe God's word, and which wishes to explain God's word

* Dr. Thornton said this of the history of scepticism, not of sceptics.—ED.

away, because it checks the sceptic's evil desires, then the paper might be true; but if we are told that scepticism is intellectual, then it seems to me that the paper is irrelevant. It really is of no use to go to a man who is deeply sorry because of his doubts and say, "Give them up, because they make you sorry." He answers: "I would give worlds to know on what I may rest my faith. I am sorry you cannot get rid of my doubts, which want positive truth to upset them. I do not want to be told I am sorry because I rest on shifting ground, for I feel that already." I cannot help thinking that if a paper of this kind goes abroad, it will tend much to confirm the view which I have often met with in my small experience. Men who are really searching for truth say, "You clergymen have no sympathy with us, you throw us overboard at once if we do not agree exactly with all you say, and therefore it is of no use to come to you." I do not mean to say that Dr. Thornton has had this idea in his own mind.

Rev. Prebendary Row.—I feel some regret in criticising this paper, because I must endorse the opinion which has been expressed by the last speaker. I have had much experience of scepticism, and I have always treated sceptics with respect, as though they were searchers after truth. For the last nine months I have been reading a large amount of sceptical philosophy, and I own I cannot endorse the opinions at the opening of this paper, with respect to the works of the very eminent men that I have been reading. Would such comments be applicable to Herbert Spencer's works, or to the works of John Stuart Mill, or to the last production of Herbert Spencer's school, the *Cosmic Philosophy of Mr. Fisk*? Any one who has conversed with men who are not sceptics, but who feel doubts and difficulties, must have felt, as I have felt, the greatest sympathy for them. Now let us go to the first point in this paper; and I would ask, what does Dr. Thornton define scepticism to be? Unless we have a considerable amount of scepticism, we shall certainly fall into gross superstitions. When miracles were recently stated to have occurred in France, I certainly could not believe them, and that is a species of scepticism. The mere term itself is so absolutely vague that I do not see how you can lay hold of it to make any definite utterance on the subject. Take, for example, many of our great writers: you may charge nearly every one of them with a certain amount of scepticism, because a spirit of inquiry exists among them. I suppose Dr. Thornton meant the scepticism of unbelief; but let me have something like a definition. I did not really know what was the end and purport of the paper, and I am still very much in the dark. It may be said that it is to prove that scepticism or unbelief is a very bad thing; but there is much matter in it which has no bearing on that purpose at all. There is one thing on which Dr. Thornton has laid considerable stress, and that is, that, according to his own observation of the physiognomy of sceptics, they look a very sorrowful and wretched set of people. One day lately I was walking through London with more than my usual observation, and scrutinizing the faces of those I met. I subsequently observed to a gentleman I met, "It seems to me that people of our age" (we

were both of the same age) "get to have a great deal of care expressed in their faces." Dr. Thornton may be right, and many sceptics may look unhappy; but I do not think that proves much, for I am sure a large number of Christians do so also. Even if you prove that the sceptic looks sorrowful, it is not much to make a point of; for the Scriptures refer to much that is sorrowful, and, with all reverence be it spoken, they place before us a Person designated the Man of Sorrows. I have been much struck with the altered aspects assumed by scepticism for some years past. It has been in real earnest attacking Christianity, in a manner very different from that of the last century, when it consisted more of gibes. The present attack on Christianity is most determined. I do not know a time when a greater amount of intellect was attacking theism than at present. We have to meet it, not by taking any side-issues, but by trying to grapple with it heartily.

Mr. T. W. MASTERMAN.—I should like to say a few words in favour of the paper when I have heard so many hard words against it. (Mr. Row.—Not "hard" words.) I like the paper very much indeed. We cannot look at any form of scepticism—at any form of doubt—and not see that it must necessarily bring with it sorrow; and I believe the idea in Dr. Thornton's mind is just this; that scepticism of all kinds brings sorrow to those who hold it. (The CHAIRMAN.—Unrelieved sorrow.) Exactly so. There is a great difference between the sorrow of Christians and the sorrow of sceptics. The sceptic has the intense sorrow of finding that he has no outlet and no relief for his doubts; and here is the difference between him and a believer, who, when he has sorrow, as sorrow he must have, knows that there is always a refuge from it—always a relief. The reason why, in my opinion, the sceptic must naturally have sorrow, is that he sees, or fancies he sees, all around him going wrong; he is wrong himself, and he feels that he is without a future, without hope, either for himself or humanity around him. Look at the later examples of modern scepticism—John Stuart Mill, for instance—read his ablest works, and you will find impressed upon them an intense sorrow. It is a most melancholy exhibition to see that great intellect straying from the paths along which it might have walked, into the depths of an everlasting sorrow; and I agree with Dr. Thornton in acknowledging that scepticism must bring with it a deep and great sorrow. Mr. Row has alluded to the lines of thought which are traced in the features, and has told us that no thoughtful man has advanced to a certain period of life without deep lines in his face and an expression of care. Of course there is some truth in that, but the expression of sorrow which Dr. Thornton referred to is something very different from the expression of thoughtful care. A man engaged in deep thought will have the marks of thought in his face, but they need not of necessity be unhappy marks. They may show that a man thinks much and deeply; but talk to that man about something in which he is really interested and the face will alter at once, and brighten with pleasure. All who have a true faith will be able to show generally the marks of their faith even in their countenances.

The CHAIRMAN.—It strikes me that in this, as in other things, the prime factor of the problem is often forgotten, and that is, that there is a power which comes with Christianity which determines all these things. An eminent London clergyman had been for four years unsuccessfully arguing with a person who was doing much harm in his parish, and was said to be an honest infidel—(though I think we may use that phrase too widely, and call them “honest,” when in truth there is something behind which prevents them from accepting the clearest demonstrations). At last, on bringing before his mind this prime and essential factor, a living and true faith in Jesus Christ, he accepted his views ; subsequently saying, “You may tell your friends that there is not now a happier man in all England than I am.”

Dr. THORNTON.—I thank my critics very much for their kind tone, and also for their criticism. I know my paper is not as complete as it should be, but I think its intention has not been quite understood. I would reply to Dr. Coleman : “I quite agree with what you say, but I am not endeavouring, in a paper of eleven pages, to show why and how scepticism is opposed to Christian truth. I have already pointed out in previous papers the weakness of scepticism ; I have now taken up a single point, which is, that scepticism does not satisfy the human intellect in the case of those who profess it. I am not writing a complete treatise against scepticism ; still less do I write against sceptics. You will not find the word ‘sceptics’ above once or twice in my paper ; it is scepticism, not sceptics, that I write against.” I can endorse all that has been said about attacks on sceptics, and I believe that many have been lost to Christianity merely because they have not been properly approached. I have had some intercourse with persons troubled with doubts ; in every instance where I have endeavoured to make Christian views prevail, I have tried the effect of love, and the experiment has always been perfectly successful. I believe that is the way to deal with such persons ; but we must treat scepticism in the abstract in a totally different manner. The fact is that there is a great deal of dishonest scepticism about. I do not mean to say dishonest sceptics, for a man who yields to a scepticism which we must term dishonest is not necessarily a dishonest man. This distinction between scepticism and sceptics may answer a great deal of the criticism of Mr. Row and Mr. Oxenham, for which I thank them all the more because I cordially agree with it. I think it is right, while showing all charity to individuals, to point out the really insidious undermining character of the doctrines which sceptics unhappily profess. I do not base my arguments against unbelief on the fact that it produces or appears to produce sorrow ; it is part only of my argument that it does not seem to satisfy the aspirations of the intellect, and therefore there probably is something completely wrong about it. I must disagree with one or two remarks which have been made. I did not say that nine-tenths of Christians look happy. I said that nine-tenths of sceptics look unhappy, and I adhere to that. However, there is this very great difference between the

sorrow in the face of a Christian and that in the face of a sceptic. The sorrow in the face of a Christian seems to prepare him for something better, that in the face of a sceptic does not. Mr. Row mentioned "the Man of Sorrows," but I think he would scarcely have done so if he had remembered, as I have no doubt he has by this time, that the grief of the Man of Sorrows was not His own, but that of others. (Cheers.) We must always bear in mind that He had no reason of His own to be sorry. I have not pointed out how that incompleteness which causes sorrow may be remedied, because I do not think that this is the place in which it should be done. It is too distinctly religious a question for a scientific institution like ours. That is the reason why I did not give, as I should have liked to do, a longer quotation from St. Bernard, to show the true remedy for sorrow. But I want to be thoroughly understood. The object of my paper is not to abuse those who differ from me; nor is it to point out how the aspirations of men can be thoroughly satisfied. That is the office of the Christian preacher, and not of the writer of a semi-scientific paper; but I wanted to urge that there is an antecedent probability against scepticism, because it does not supply man with that which he hungers and thirsts after.

The meeting was then adjourned.

NOTE BY DR. THORNTON.—By the Editor's kindness I am permitted to add a note to complete my somewhat inadequate reply. I have, I hope, made it plain: (1) that there is a great difference—and one which Lavater would recognize—between the lines of thought, care, penitence, which a Christian's face may exhibit, and the peculiar restless, unsatisfied, unhappy expression of the unbeliever, that testifies to the aching void within; and (2) that Charity is of persons, not of doctrines or acts, so that one may abominate and denounce infidelity, and yet feel most tenderly for the Infidel, and give him credit for the best motives and the utmost honesty. But I omitted to point out clearly the distinction between Philosophical, Historical, and Religious Scepticism. The first declines to assent to a conclusion without knowing the premises, and weighing their correctness and cogency. It is praiseworthy and valuable; for philosophy is of knowledge, not of faith. Our Institute is in this sense extremely sceptical: we doubt all science that opposes revelation. Historical scepticism refuses to accept a statement of fact without examining the evidence and finding it adequate, and is an absolute necessity for those who have to deal with facts. Of this kind is the scepticism which led Mr. Row to reject the alleged French miracles. Religious scepticism is a refusal to believe what Christians do now receive, and have from the first put faith in, as belonging to a higher and Supreme Intellect. This is the scepticism against which we protest, since religion is not of knowledge, but of faith; and yet the Sceptic asks for such proofs as shall lead to knowledge. I have touched on the subject in my remarks on the Cartesian doubt (p. 237), and dealt with it more fully in my paper on the Credulity of Scepticism.

ORDINARY MEETING, FEBRUARY 7, 1876.

The Rev. PREBENDARY CURREY, D.D., IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following elections were announced :—

MEMBERS :—

Rev. R. W. Forrest, M.A., St. Jude's Vicarage, Kensington.

Rev. J. G. Hawes, M.A., R.D., late Fellow of St. Peter's Coll. Camb., Minehead.

ASSOCIATES :—

J. Bush, Esq., Chatham.

D. A. T. Christie, Esq., London.

C. E. B. Young, Esq., London.

Rev. H. Ryder Ware, M.A., C.C. Coll. Camb., London.

Also, the presentation of the following Works to the Library :—

“Proceedings of the Royal Society.” Part 165. *From the Society.*

“Proceedings of the Royal Institution.” Part 63. *From the Institute.*

“Light as a Motive Power.” Lieut. Armit, R.N. *From the Author.*

“Everlasting Punishment.” Rev. F. N. Oxenham, M.A. *Ditto.*

The following Paper was then read by the Author :—

HEATHEN COSMOGONIES COMPARED WITH THE HEBREW. By the Rev. BOURCHIER WREY SAVILE, Shillingford Rectory, Exeter.

1. **I**N attempting to compare the various theories entertained by ancient writers respecting the origin of men and things, with the Hebrew cosmogony, as set forth in Scripture, it may be best to allow the several authorities, from which I shall have occasion to quote, to state, as far as possible in their own words, the belief entertained by their fellow-countrymen on this important subject. But it will be impossible to consider some of the very curious and extravagant theories thus stated without observing, as the late Sir Charles Lyell truly remarked, that they do “not seem to differ essentially in principle from some cosmological notions of men of great genius and science in modern Europe.” *

2. Referring to the “cosmological notions” entertained by the ancient EGYPTIANS, as set forth in that wonderful book, *The Ritual of the Dead*, portions of which are undoubtedly as old as the time of Abraham, and therefore some centuries older than the Books of Moses, we find that they believed in the

* Lyell's *Principles of Geology*, vol. i. p. 11.

supposed intervention of a masculo-feminine principle, to which was assigned the development of the embryo world in the way of incubation. For the doctrine was that when the first chaotic mass had been produced in the form of an *egg*, by a self-dependent and eternal Being, it required the mysterious functions of this masculo-feminine demiurgus to reduce the component elements into organized forms. Thus, *e.g.*, we find such passages as these in the *Ritual*:—"I am the Great God, creating Himself. It is water, or Nu, who is the father of the Gods. Let him explain it. The Sun is the creator of his body, the engendered of the Gods who are the successors of the Sun" (ch. xvii.). Again it is written, "I am the Egg of the Great Cackler Seb. I have watched this great egg which Seb prepared for the earth. I grow, it grows in turn; I live, it lives; I breathe air, it breathes air, in Hades" (ch. liv.).*

3. The Hermetic books, according to Jamblicus, teach as follows:—"Before all things there is one God, who is the Father of Himself, self-begotten, and truly good. He is the fountain of all things, and the root of all primary intelligible existing forms. Out of this one the self-ruling God caused Himself to shine forth. He is the monad from the one; before essence, yet the first principle of essence, for from Him is being and essence; wherefore He is celebrated as the Chief of the Intelligibles. He is the first Intellect, and the first Intelligible. Besides these, other rulers are supposed to exist, such as the demiurgic Intellect, which properly presides over truth and wisdom. There is, also, another certain principle, presiding over all the elements in a state of generation, and over the powers inherent in them, four of which are male and four female; and this principle they attribute to the Sun. Hence the doctrine of the Egyptians inculcates the origin of all things

* The egg of the Cackler, *i.e.* the goose, as the emblem of Seb, is mentioned on an old coffin in the British Museum, of an unknown date. It occurs also on a statue in the Berlin Museum of the age of Thothmes III., the contemporary of Moses, which would fix its date to the sixteenth century B.C. Dr. Birch considers that the earliest appearance of Rituals is in the coffin of Queen Mentuhetp, of that dynasty, and the approximate contemporary of Abraham. The 64th chapter is supposed to be the oldest of all, as it belongs to the epoch of King Menkeres, of the 4th dynasty, *i.e.* the 22nd century B.C. There is much that is very interesting in these Rituals, which contain the esoteric explanation of the faith of the Egyptians, the Crown of Justification, and the doctrine of the Resurrection, though of course, to our ideas, held in a modified form; and it is a matter of surprise that this remarkable book has not been more regarded by Christians at the present day, as proving the measure of light and knowledge to which the ancient Egyptians had attained in their search after truth.

from one, with different gradations to the many, which are again held to be under the supreme government of the One."*

4. Diodorus Siculus, a Greek historian of the first century B.C., describes the current Egyptian cosmogony of his own day as follows:—"The Egyptians suppose that at the original constitution of all things, heaven and earth possessed one uniform appearance, their respective natures being mixed up together. But after this, the material substances separating from each other, the earth took the entire constitution which it now has, and the air acquired the art of perpetual motion. In consequence of the heat acting upon this earth, it gradually received consolidation; and, subsequently, fermentation taking place on the surface, in consequence of the heat, some of the moist matter swelled up into bubbles in many places; and these moist spots became, by means of the heat, impregnated with animal life. At last these embryos, having acquired their full growth, and the membranes which enveloped them having burst, all the various forms were produced. Those which had partaken of the greatest heat soared away to the higher regions and became *birds*; those which retained the earthly constitutions were reckoned *the occupants of earth*; those which had gotten the greater abundance of moist nature fell into the sea and became *FISH*." †

5. The monuments of Egypt afford some indication of the cosmological notions entertained by the Egyptians towards the close of their history. Thus, on a monument of the time of Apries, of the 26th dynasty, the Pharaoh-hophra of Jeremiah (xliv. 30), who reigned B.C. 570, Khnum is said to be the begetter of gods, and the creator of men. In a later monument he is described as the great Potter, father of fathers, of gods and goddesses, the self-existent maker of heaven and earth, the firmament, the waters, and the hills. ‡ And in the mystic chamber of the Temple of Philæ, which belongs to the Ptolemaic epoch, there is to be seen a representation of the god Khnum turning a potter's wheel, moulding the mortal

* Jamblicus, sect. viii. c. 2, § 3.

† Diodorus Siculus, lib. i. c. 7.—Diodorus is said to have taken thirty years in epitomizing all the known libraries of Asia and Europe in order to produce the forty entire books of his own history. But he appears to have made a curious jumble, according to Justin Martyr, respecting the Egyptian lawgivers, mistaking Menes for Moses, and making the following anachronism in the order of the Egyptian lawgivers. Sesonchosis, a king of the 12th dynasty, who reigned circa 2000 B.C., is succeeded by Bocchoris, of the 24th dynasty, who in his turn is succeeded by Amasis, of the 18th dynasty, and the same who is mentioned in Scripture as the new "king over Egypt which knew not Joseph." See Justin's *Hortatory Address to the Greeks*, c. ix.

‡ Rosellini, *M. R.*, clxix.

part of Osiris, the type of mankind, out of a lump of clay, with the following inscription: "Khnum, the Creator, forming on the potter's wheel the divine members of Osiris, now is enthroned in the great hall of life." This inscription reminds us very much of what Isaiah says on the same subject: "Now, O Jehovah, thou art our father; we are the clay, and thou our potter; and we are all the work of thy hand" (lxiv. 8). Inasmuch as the Egyptians were in possession of the Septuagint at the time when this inscription was made, we might suppose the idea had been taken from the Hebrew prophet, only it appears that Khnum was known to the Egyptians in this character some centuries before the Ptolemaic period.

6. Gliddon gives another inscription to the same effect, but unfortunately without mentioning whence it is taken, or the time to which it belongs. It reads as follows:—"May thy soul attain to Khnum, the creator of all mankind." And Gliddon considers that "this alone is a proof of the primitive Egyptian creed of one God the Creator (whose divine attributes were classed in triads), of man's possession of a soul, and of his immortality; of a resurrection, and of the hope of such."*

7. Turning now to the PHŒNICIAN cosmogony as next in chronological order, for Sanconiatho its exponent is supposed to have lived about four centuries after Moses, we find him explaining it in the following way. He says, that the beginning of all things was a dark and a condensed wind, and a turbid chaos as black as Erebus. In course of time this wind became enamoured of chaos, and an intimate union took place which was called Pothos. From this union was generated *Môt*, which some call "Mud," but others, the putrefaction of a watery mixture. And from this sprung all the seed of the creation and the generation of the Universe. And there were certain animals without cessation, from which intelligent animals were produced, and these were called *Zophasemin*, i. e. "the overseers of the heavens"; they were formed into the shape of an *egg*; and from *Môt* came forth the sun and moon, the less and the greater stars. And when the air began to send forth light, by its fiery influence on the sea and earth, winds were produced and clouds, and very great torrents of the heavenly waters. And when they were thus separated, and carried out of their proper places, by the heat of the sun, they all again met in the air, and were dashed against each other, thunder and lightnings being the result. At the sound of the thunder the aforesaid *Zophasemin* (who would be called "astronomers" nowadays) were aroused and startled by the noise, and appeared on earth and in the sea, *male* and *female*. These things were

* Gliddon's *Ancient Egypt*, pp. 28, 29.

found written in the Cosmogony of Taautus, and were drawn from his observations and natural acuteness, or, what would be termed in our age, perhaps, the depths of his moral consciousness, by which he has penetrated all science and enlightened the world.*

8. Although some have pronounced Sanconiatho to be a myth who only existed in the imagination of Philo Byblius, a writer of the first century, there are reasonable grounds for believing him to be a real person, who lived about a century after the Trojan War.† For Porphyry, who was no friend to Christianity, and who flourished two centuries after Philo, appears to describe Sanconiatho as having related Jewish history with truthfulness, saying that he received his accounts from Jerubbaal, the same as Gideon (Judges vii. 1), and that he dedicated his work to Abibulus, king of Berytus. Canon Titcomb, in an admirable paper on the *Ethnic Testimonies to the Pentateuch*, read before this Institute, May 1, 1871, considers in the fragments of Sanconiatho "we have an interesting testimony to the Mosaic cosmogony." I am hardly prepared to go so far as this; but I think we may accept his teaching of the cosmological notions of the Phœnicians in very ancient times.‡

9. Although we should be inclined to take the Chaldæan cosmogony as interpreted by Zoroaster next in order, yet, as Hyde, in his *Historia Religionis Veterum Persarum*, considers the *Boun-dehesch*, or "cosmogony of the PERSIANS," of a date much earlier than the era of Zoroaster—*i.e.* the sixth century B.C., we will let it have the precedence it claims, and learn what the ancient Persians believed on this subject, which is stated as follows:—

10. The Deity Ormisda created all things at six different intervals. First, he formed the heavens; secondly, the waters;

* Eusebius, *Præp. Evan.*, lib. i. c. x. † *Id. ib.*

‡ *Journal of the Transactions of the Victoria Institute*, VI. p. 248. Canon Titcomb writes that Sanconiatho mentions "the Supreme God of the Phœnicians was *Elion*, which is the very name Moses gives in Genesis (xiv. 18) as that by which Melchisedec served Jehovah. This testimony is very remarkable." I do not understand Sanconiatho in this way. It is true that he says from Chaos sprang *Môt*, which some call *ἰλδς* or "Mud"; and also from the marriage of "Heaven" with his sister "Earth" sprang four sons, the first-mentioned being *ἰλδς*, "who is called Cronus"; but I do not see that this *Ilus* or Cronus, who was deified after death, was necessarily the Supreme God of the Phœnicians, or the same as the *El Elion* of Genesis xiv. 18, 19, which Moses terms "the most High God"; although it is true that Sanconiatho says "the auxiliaries of *Ilus*, who is Cronus, were called *Eloëim*." If this be the same person who is described by Berosus under the same name of "Cronus," it would point rather to the deified Noah, than to the Supreme Jehovah.

at the third period the earth; next in order were produced the trees and vegetables; in the fifth place were formed the birds and fishes and wild inhabitants of the woods; and in the last place he created man. This being was called "*the Man and Man-Bull*," and was not produced by the union of male and female. The man part was called *Kaiomorts*, and the man-bull part *Aboudad*. *Kaiomorts* was pure and thinking; *Aboudad* mortal and material. *Aboudad* was the author of all generations. After the creation, for some time there was a season of great happiness. The man resided in a peculiar place of high elevation, where the Creator placed him. At length, *Ahriman*, an evil spirit, corrupted the world. He rose from the regions of utter darkness, and ascended to the realms of pure light—i.e. the sun, whence he leapt upon the earth in the form of a serpent, and introduced a set of wicked beings called *Karfesters*. He bit *Aboudad*, who was immediately affected by his poison, fell sick, and died at the age of thirty years. Before *Aboudad* appeared, *Ormisda* had prepared a salutary fountain called *Binak*, which communicated its virtues to all who drank of it. Upon *Kaiomorts* appearing, *Ormisda* created a water called *Khai*, and brought it to him; from the effects of this water *Kaiomorts* had the body of a young man of fifteen years old, shining with light. *Ahriman*, in addition to that which he contrived against man, formed the design of destroying the whole universe. The heavenly angels fought with *Ahriman* and his angels for ninety days and ninety nights. They overcame them, and cast them into hell. From the midst of hell *Ahriman* went upon earth, and put everything in the world into confusion. And this enemy of all good insinuates himself everywhere, and is found everywhere, seeking what mischief he can do above or below.

11. The above analysis of the cosmological notions entertained by the ancient Persians is taken from a work entitled *Hebrew Characters Derived from Hieroglyphics*, by Dr. John Lamb, Master of Corpus Christi College, Cambridge; and it contains sufficient internal evidence that the founders of this system must have had either some knowledge of the Mosaic writings, or else some national traditions current amongst their race from the time of the dispersion to the same effect.

12. A few extracts from the Chaldæan Oracles of Zoroaster, as given in Cory's *Ancient Fragments*, will enable us to judge of the ideas which prevailed in the region of the Euphrates about the time of the return of the Jews from the Babylonish captivity, concerning God, mind, matter, and monad, &c.

13. God is He that has the head of a hawk. He is the first, indestructible, eternal, unbegotten, indivisible, dissimilar; the dispenser of all good; incorruptible; the best of the good, the

wisest of the wise; the Father of equity and justice, self-taught, physical, and perfect and wise, and the only inventor of the sacred philosophy. The Theurgists assert that He is a circulating and eternal God, infinite through his power, and of a spiral form.

14. The Chaldæans call the God *Iao* in the Phœnician tongue, instead of the intelligible light; and He is often called *Sabaoth*, signifying that he is above the seven poles, that is, the Demiurgus. Containing all things in the one summit of his own subsistence, He himself subsists wholly beyond.

15. The mind of the Eternal Father said that all things should be cut into three, governing all things by mind. All things are governed and subsist in these three. For in the whole world shineth a *Triad*, over which a *Monad* rules.

16. Of the *soul* it is thus said:—Having mingled the vital spark from two according substances, mind and the Divine Spirit, to these were added as a third, Holy Love, the venerable charioteer uniting all things. For the Father of gods and men placed the mind in soul, but in a body He placed you. The soul does in a manner clasp God to herself; for, having nothing mortal, she is wholly inebriated from God, and glories in the harmony under which the mortal body exists. The soul perpetually runs and passes through all things in a certain space of time, which being performed, it is presently compelled to run back again through all things, unfolding the same web of generation in the world. Let the immortal depth of your soul lead you; but earnestly extend your eyes upward.

17. Of *matter*, Zoroaster is thus supposed to have taught. We learn that matter pervades the whole world, as the gods also assert. The Maker, self-operating, framed the world, and there was another mass of fire: all these things He produced self-operating. He has made the whole world of fire, and water, and earth, and all-nourishing ether. For the Father congregated the seven firmaments of the world, circumscribing the heaven with a convex figure.

18. The CHALDÆAN Cosmogony, as explained by Berosus, a priest of Babylon, and the contemporary of Alexander the Great, appears to be of a very different order from that taught by Zoroaster, and received by the Chaldæans* in the earlier

* Justin Martyr relates a curious story respecting the Chaldæans and Hebrews in his *Hortatory Address to the Greeks*. He says: "Since it has been sufficiently proved that the opinions of your philosophers are full of all ignorance and deceit, I think it right to mention what I once heard concerning your oracles. When one inquired at the shrine, What religious men had ever lived, you say that the Oracle answered thus: "Only the *Chaldæans* have obtained wisdom, and the *Hebrews*, who worship God Himself, the self-begotten King" (c. xi.).

times of their nation. The account which Berosus gives is as follows:—Formerly there existed nothing but darkness and an abyss of waters, wherein resided most hideous beings, the produce of a twofold principle. Then appeared men, some of whom had two wings; others four, with two faces. They had one body, but two heads; one that of a man, the other that of a woman.* Human beings existed, some with legs and horns of goats, others with horses' hind-quarters, &c. There were creatures in which were combined the limbs of every species of animals, of all which were preserved delineations in the temple of Belus at Babylon. The person who presided over them was a woman, named *Omoroca*, which in the Chaldæan tongue signifies *Thalath*, but in Greek *Thalassa*—i.e. “the sea,” and which might equally be interpreted “the moon.” All things being thus, Belus, who is Jupiter, came and cut the woman in sunder, and of one half of her he formed *the Earth*, and of the other half *the Heavens*. All this, Berosus teaches, was an allegorical description of nature. For the whole universe consisting of moisture, and animals being continually generated therein, the deity above-mentioned took off his own head; upon which the other gods mixed the blood, as it gushed out, with the earth; and *from thence were formed men*. On this account it is that they are rational, and partake of divine knowledge. Thus Belus divided the darkness, and separated the heavens from the earth, and reduced the universe to order. But the animals, not being able to bear the prevalence of light, died. Belus, therefore, seeing a vast space unoccupied, though by nature fruitful, commanded one of the gods to take off his head, and to mix the blood with the earth, and from thence to form the existing race of animals and men.†

19. Continuing our researches in Asia previous to investigating the Grecian mind on this subject, we find the cosmological notions entertained by the HINDOOS to be represented in their Shasters on this wise:—“All the germs of the world which subsequently came into existence were condensed in the shape of an egg, of which *Brahm* took possession in the form of *Brahma*. One thousand jugs, which equal three hundred million years, elapsed before the egg was hatched.

* In the Royal Museum at Naples are sculptures of Grecian art, representing men as described by Berosus, showing how the theory of the Chaldeans was accepted by the learned Greeks. There are certain figures represented in the sculptures, each with two heads; one evidently that of a male, the other of a female.—*Roccolta de' Monum. del R. Mus. Borbonico*. Napoli, 1842.

† Eusebius, *Chronicon*. v. 8.

During that period it floated like a bubble upon the mighty deep. At length it broke, and Brahma sprung to light, having a thousand heads, with an equal number of eyes and arms, to enable him to undertake *the work of creation*. Similarly with this incarnation, another monster appeared from the same egg, whose hairs were forest trees, his head the clouds, his beard the lightning, his breath the atmosphere, his voice the thunder, his eyes the sun and moon, his nails the rocks, and his bones the mountains of *the earth*. The egg being thus hatched, *Brahm*, as Creator, retired from the scene, and relapsed into his former state of somnolent blessedness. *The earth* is represented as a flat plain of circular form, measuring four hundred million miles in circumference, and resting upon an enormous snake with one hundred heads, which is itself supported by a gigantic tortoise. *Brahma* is said to die in course of time, and on his death all the worlds will suffer deluge; all the Audons will be broken up; and the Paradise of Vishnu will alone remain. At that time Vishnu, taking a leaf of the tree *Allemaron*, will place himself under the leaf in the figure of a very little child, and thus float on the sea of milk, sucking the toe of his right foot. He will remain in this posture until Brahma comes forth from his navel anew in a tamarind flower. It is thus that the ages and worlds succeed each other, and are perpetually renewed.*

20. A far superior idea of true cosmogony is found in the *Institutes of Menù*, to which Sir William Jones ascribes an antiquity of at least 880 B.C., and which seems to show that the Hindoos must have borrowed some of their notions from the Mosaic writings. Thus, in the first chapter of that work God is represented as first creating the *waters*, which are called *Nara*, because they were produced by *Nara*, or "the Spirit of God"; and because they were His first *ayana*, or place of motion, He is called *Narayena*,† or, "moving on the waters." Afterwards, the alternate destruction and renovation of the world is

* See Moor's *Hindoo Pantheon*, p. 100, &c.

† The following hymn has come into the author's possession, he cannot recollect how, when, or where; but he believes it to be a translation from the Sanskrit in honour of *Narayena*, the Holy Spirit according to Hindoo theology. He has only space for a portion of the hymn, which begins thus:—

Spirit of Spirits, who through every part
Of space expanded and of endless time,
Beyond the stretch of labouring thought sublime,
Bad'st uproar into beauteous order start,
Before Heaven was, Thou art.

thus described :—The Being whose powers are incomprehensible having created me (Menù) and this universe, again became absorbed in the Supreme Spirit, exchanging the time of work for the hour of rest. When that power awakes, then has this world its full expansion ; but when He slumbers with a tranquil spirit, then the whole system fades away. Thus that immutable power, by waking and reposing alternately, revivifies and destroys, in eternal succession, this whole assemblage of locomotive and immovable creatures.*

21. Passing from India to CHINA, some of the cosmological legends of the latter resemble, in some respects, those current amongst the Hindoos. Thus it is said that the first man was called *Puonen*, and that he was born of Chaos out of an egg. From the *shell* of this egg, in the deep gloom of night, were formed the heavens, and from the *white* of it was made the atmosphere, and from the *yolk* the earth. In point of order, the heavens were first created ; next the foundations of the earth were laid ; then the atmosphere was diffused around the habitable globe ; and, last of all, man was called into existence. Further light is thrown upon the cosmogony of the Chinese in their book *Y-king*, supposed to have been written B.C. 500. The book teaches that what they call “ the great Term,” is the great *Unity* and the great *Y* ; that *Y* has neither body nor figure ; and that all which have body and figure were made by that which has neither body nor figure. It asserts also that the great Term, or Unity, comprehends “ *Three*,” and describes this comprehension to be of such a nature that the one is three, and that the three are one. *Iao* is Life ; the first has produced the second ; the two have produced the third ; and the three have made all things. He, whom the Spirit perceiveth, and whom the egg cannot see, is called *Y*, whose character is explained by *Hin-chin* as follows :—“ At the first beginning Reason subsisted in the Unity ; that is it which made and divided the heaven and the earth, which changed and perfected all things.”†

My Soul absorbed one only Being knows,
 Of all perceptions one abundant source,
 Whence every object every moment flows ;
 Suns here derive their force ;
 Hence planets learn their course ;
 But Suns and fading worlds I view no more—
 God only I perceive, God only I adore !

* *The Institutes of Hindoo Law, or the Ordinances of Menù*, from the Sanskrit, c. i.

† *Mémoires chinois*, apud Bryant, in *Phil. Jud.*, pp. 285—287.

22. Returning now to Europe, let us consider what was the teaching of the two great nations of antiquity—the Greeks and Latins—on the subject of Cosmogony; or rather, as the former were the sole founders of the philosophical speculations on this subject, it will be sufficient if we direct our attention almost exclusively to the cosmological notions put forward by the Greeks, though these are so varied that it is difficult to compress within a reasonable space the various extraordinary and, I must add, extravagant theories propounded by these eminent philosophers of antiquity. Two Christian writers, both belonging to the second century, have alike called attention to the remarkable differences existing amongst them; and I think it may be well to give a brief sketch of what they have adduced as an argument against receiving the theories propounded by men who, though doubtless what would nowadays be called “very learned,” can scarcely be said to know their own mind on this important point.

23. Justin Martyr, in his *Hortatory Address to the Greeks*, says that Thales of Miletus, who took the lead in the study of natural philosophy, declared that *water* was the first principle of all things; Anaximander, *the Infinite*; Anaximenes, *the air*; Heraclitus and Hippasus, *fire*; Anaxagoras, *the homogeneous parts of nature*; Archelaus, an Athenian, that *the infinite air*, with its density and rarity, is the first principle of all things.* “All these,” says Justin, “forming a succession from Thales, followed the philosophy called by themselves *physical*.”

24. Then, in regular succession from another starting-point,

* Although Buddhism has been described by an acknowledged authority as “Monastic asceticism in morals, and philosophical scepticism in religion,” there is no doubt that the Buddhists recognized a supreme deity in *Vajra Satwa*, whom they termed “THE SELF-EXISTENT.” There is a curious account amongst the Buddhist traditions concerning Cosmogony, not unlike that of the Grecian philosophers. Thus the Swābhāvika doctrine is expressed as follows:—“All things come from Swabhāva in this order with their *vija mantras*: From the *vija* of the letter Y, *air*; from that of the letter R, *fire*; from that of the letter V or B, *water*; from that of the letter L, *earth*; and from that of the letter S, *Mount Sumēru*. On the top of Sumēru is a lotus of precious stones, and above the lotus a moon-crescent, upon which sits, supremely exalted, *Vajra Satwa*. And as all things, together with *Vajra Satwa*, proceed from Swabhāva, he is therefore called the SELF-EXISTENT.” (See Hodgson’s *Quotations in proof of his sketch of Buddhism*, p. 296.) Possibly some modern advocates of Buddhism may attempt to explain that all these things are poetic vagaries, as Empedocles endeavoured to do with reference to the gods of the Greeks, asserting that “Zeus is *fire*, Hera the *earth*, Aidoneus *air*, Nestis *water*; and that these are only elements—none of them are to be considered gods; for their constitution and origin are separated into parts from matter by God.” (See Athenagoras’s *Plea for the Christians*, c. xxii.)

Pythagoras calls *numbers*, with their proportions and harmonies, the first principles; Epicurus, bodies perceptible by reason, admitting no vacuity, unbegotten, indestructible, which can neither be broken, nor admit of any formation of their parts, nor alteration, and are therefore perceptible by reason. All this, divested of scientific entanglements, appears to mean the *atomic philosophy*, which is coming into vogue again with the learned of the present day. Empedocles maintained that there were four elements—fire, air, water, and earth, and two elementary powers—love and hate, of which the former is a power of union, the latter of separation. Justin makes the following sensible remark:—"See the confusion of those who are considered to have been wise men, and the teachers of religion; all of them employing persuasive arguments for the establishment of their own errors, and attempting to prove their own peculiar dogma the most valuable. How can the Greeks fancy they can learn true religion from these philosophers, who are neither able so to convince themselves as to prevent sectarian wrangling with one another, and not to appear definitely opposed to one another's opinions."

25. On the differences between Plato and Aristotle, Justin observes that the former says, "with the air of one that hath descended from above, and has accurately ascertained all that is in Heaven, that *the Most High God exists in a fiery substance*," which opinion the latter clearly and manifestly overthrows, declaring that "God does not exist in a fiery substance; but inventing, as a fifth substance, some kind of ethereal and unchangeable body, says that God exists in that."

26. Again, while Plato says there are three first principles of all things—*God, Matter, and Form*, Aristotle omits all mention of the last, and says there are only two. So, while Plato says that the Highest God and the ideas exist in the first place of the highest heavens, Aristotle declares that, next to the Supreme Deity, there are no ideas, but only certain gods, who can be perceived by the mind. Likewise, respecting the soul, while Plato says it consists of three parts, including the faculties of reason, affection, and appetite, Aristotle declares the soul is not so comprehensive, but only includes *reason*. Plato loudly maintains that the soul is immortal and always in motion; Aristotle, on the other hand, considers it mortal and immovable, since it must itself precede all motion.*

27. Hermias, a Christian philosopher of the second century,

* Justin's *Address to the Greeks*, c. v.—vi.

interprets the doctrines held by the Greeks respecting the soul in a very similar way. For some of them taught that the soul is *fire*, like Democritus; *air*, like the Stoics: some say it is *the mind*; others, *motion*; some, an *exhalation*; others, an *influence flowing from the stars*: some say *number in motion*, as Pythagoras; others, *generative water*, as Hippo: some say, *an element*; others, *breath*: some say, *harmony*, as Dinarchus; and others, *blood*, as Critias. Thus the ancients say contrary things, as Hermias truly observes, adding, "How many sophists are there who carry on strife rather than seek the truth."

28. Very amusing is the way in which he further brings out the contradictory teaching of the Gentile philosophers, which appears to resemble in more ways than one the singular dogmas propounded by many amongst ourselves in the present day. Thus, while one calls *pleasure the good* of the soul; another terms the same *its evil*; while a third steps in and declares it to be a *middle state* between good and evil. Hence Hermias says of the variety of opinions on this subject:—"I confess I am harassed by the ebbing and flowing of the subject. At one time I am *immortal*, and rejoice; at another time I become *mortal*, and weep. Anew, I am dissolved into *atoms*. I become *water*, and then *air*, and then *fire*; and after a little, neither air, nor fire. At one time I am a *beast*, at another a *fish*. Thus, I have dolphins for my brothers; but, when I look on myself, I am frightened at my body, and I know not how I shall call it, man or dog, or wolf, or bull, or bird, or snake, or serpent, or chimæra; for I am changed by the philosophers into all the beasts of the land, of the sea, having wings, of many forms, wild or tame, dumb or vocal, brute or reasoning; I swim, I fly, I rise aloft, I crawl, I run, I sit. But here comes Empedocles, and he makes me *the stump of a tree*."*

29. Hermias, after going over much the same ground which we have seen in Justin's account of the Grecian philosophy, playfully describes the Pythagorean doctrines in the following lively way:—"Lo, from the old school Pythagoras and his disciples, grave and silent men, mention amongst other doctrines this great and ineffable one. HE HATH SAID, the principle of all things is unity, but from its forms and numbers are produced the elements, and the number and form and measure of each of these is thus somehow declared. *Fire* is completed out of twenty-four right-angled triangles, being contained by four equilateral ones. Each equilateral one is composed of six triangles; whence also they liken it to a pyramid. But *air* is

* Hermias's *Derision of Gentile Philosophers*, §§. 1, 2.

completed by forty-eight triangles, being contained by eight equilateral ones. But it is likened to an octahedron, which is contained by eight equilateral triangles, each of which is divided into six right-angled ones, so that they are forty-eight in all. But *water* being contained by one hundred and twenty, is likened also to a figure of twenty sides, which consists of twenty-six equal and equilateral triangles. The *air* is composed of twelve equilateral pentagons, and is similar to a figure having twelve sides. Earth consists of forty-eight triangles, and is like a cube; for the cube is contained by six squares, each of which extends to four triangles; so that all together are twenty-four. Thus Pythagoras measures the world. But Epicurus says to me, 'You have only measured one world; there are an endless number of worlds.' Well might Hermias be frightened at the prospect before him. So he hastens his brief treatise to a conclusion with the following sensible reflection:—"All things appear to be mixed up with the darkness of error, unprofitable fancies, and most lamentable ignorance; utterly useless, unless, indeed, I intend to number the very *atoms* also out of which such great worlds are made. Thus, I have analyzed some of the doctrines of these Gentile philosophers, and have pointed out that the differences amongst them are unlimited; for their end is useless, not being confirmed by one clear fact, nor supported by one sound argument."*

30. Justin has a singular passage on the subject of the Greeks having learnt some things from Scripture, which I cannot forbear quoting. "I think," he says, "when you read even carelessly the history of Diodorus, you cannot fail to see that Orpheus,† Homer, Solon, Pythagoras, and Plato, when they had been in Egypt, and had taken advantage of the history of Moses, afterwards published doctrines concerning the gods quite contrary to those which they had formerly promulgated in error."‡

31. Let us see how this is borne out by the "Orphic Frag-

* Hermias's *Derision*, &c., §§ 8, 9, 10.

† It is curious to see how Homer appears to refer to the Orphic cosmogony, which, according to Orpheus, is thus explained. *Water* was the beginning of all things; from *water mud* was formed, and from both was produced *an animal*, a dragon with the head of a lion growing on it; and between the two heads there was the face of a god named Heracles and Kronos. This Heracles generated an egg of enormous size, which burst in two on becoming full, the upper half becoming *Heaven*, and the lower part *Earth*. The goddess Earth had a body, and by marrying Heaven gave birth to children both male and female. (See Athenagoras's *Plea for the Christians*, ch. xviii.)

‡ Justin's *Address*, c. xiv.

ments" * which have been handed down to us. Aristotle gives the following as the conception of Orpheus respecting the Supreme Being:—

Jove is the First. Jove the Thunderer is the last.

Jove is the head. Jove is the middle. By him were all things made.

Jove is male. Immortal Jove is female.

Jove is the foundation of the earth, and of the starry heavens.

Jove is the king. He is the author of universal life.

All things are united in the vast body of Jove.†

32. Proclus quotes another fragment, which seems to contain a mixture of the mundane egg theory and a conception of Deity somewhat resembling the four-faced figure described by the Prophet Ezekiel, as he writes:—"Orpheus has the following theological speculation in allusion to Phanes. The first God bears within himself the heads of these animals, many and single—an ox, a serpent, and a lion; and these sprang from the primeval egg, in which the animal is seminally contained."

* It is impossible to assign any date to the extant writings ascribed to Orpheus, such as the *Theogony*, the series of *Hymns* attributed to him, the treatise termed *Lithira*, and the epic poem *Argonautica*. By some he is supposed to have lived before the Trojan war; and Clement, Bishop of Alexandria, in the second century, asserts that many fragments of his works are to be found interwoven with the Homeric poems. Some fragments of the hymns ascribed to him are thought to indicate an acquaintance with the doctrine of the Trinity under the names of Phanes, Uranus, and Cronus; but this is rather doubtful, as they are found for the most part in writers of a very late period, and there is reason to question their genuineness.

† It is an undoubted fact that the great dramatists of the Greeks, who might be supposed to indulge in poetical license more than the philosophers, have expressed themselves respecting the Godhead far more in accordance with Revelation than the other learned writers of their nation. Take for example the nature of the Creator as so finely expressed by Sophocles in the following lines:—

There is one God, in truth there is but One,
Who made the heavens and the broad earth beneath,
The glancing waves of ocean, and the winds;
But many of us mortals err in heart,
And set up for a solace in our woes,
Images of the gods in stone and brass,
Or figures carved in gold or ivory;
And, furnishing for these, our handiworks,
Both sacrifice and rite magnificent,
We think that thus we do a pious work.

Sophoc. Fragm.

Even in the present day, these words of the heathen poet are not without their application, in the case of some who appear to underrate the claims of Christian philosophy.

33. Concerning the formation of man, both John Malala and Suidas relate the following:—"Orpheus has asserted that 'man was formed by God out of the earth, and endued with a reasonable soul,' in the same way as Moses has revealed."

34. Aristophanes, in his comedy of *The Birds*, thus records the Cosmogony of Orpheus, and, though undoubtedly satirical, it must afford some satisfaction to certain speculators in the present day respecting the origin of men and things.

First was Chaos and Night, and black Erebus and vast Tartarus ;
 And there was neither Earth, nor Air, nor Heaven : but in the boundless
 bosom of Erebus
 Night, with her black wings, first produced an aërial egg,
 From which at the completed time sprang forth all-delightful Love,
 Glittering with golden wings upon his back, like the swift whirlwinds ;
 But embracing the dark-winged Chaos in the vast Tartarus,
 He begat our race THE BIRDS, and first brought us to light.
 The race of the Immortals was not, till Love mingled all things together,
 But when the elements were mixed one with another, Heaven was produced
 and Ocean,
 And Earth, and the imperishable race of all the blessed gods !

35. The cosmogony of the Greeks, as found in the Pythagorean* Fragments, is thus explained by Timæus the Locrian:—"The causes of all things are two—*Intellect* and *Necessity*. Of these the first is of the nature of good, and is called God,—the principle of such things as are most excellent. Before Heaven was made, there existed in reality *Idea* and *Matter*, and *God the Creator of the better nature* ; and since order is more worthy than disorder, God in His goodness, seeing that *Matter* was continually changing, resolved to reduce it to order. Therefore He made this world out of all the *Matter*, and constituted it the boundary of Nature, comprising all things within itself, one only-begotten, perfect with a soul and intellect ; for such is

* What are called the "Pythagorean Fragments" are not the writings of Pythagoras himself, but the doctrines believed to have been held by him, as reported by Timæus the Locrian, Plato, and others. Although there is an extant work written in the Doric dialect bearing the name of Timæus, who is said to have been a teacher of Plato, its genuineness is doubtful, and is in all probability nothing more than an abridgment of Plato's Dialogue in the *Timæus*. There is no doubt, however, that the Greek philosophers had far better conceptions of Deity and matter than what certain dogmas to be found in their writings seem to convey, or than what many sceptics of the present age appear to have. Thus Athenagoras, a Christian philosopher of the second century, points out that "Philolaus, when he says all things are included in God as in a stronghold, teaches that *He is one*, and that *He is superior to matter*. And Plato says, 'To find out the Maker and Father of this universe is difficult, and when found it is impossible to declare Him to all,' *conceiving of one uncreated and Eternal God.*" (*Plea for the Christians*, ch. vi.)

superior to one without either. He gave it also a spherical body, for such of all other forms is the most perfect. Since, therefore, it was His pleasure to render His production most perfect, *He constituted it a god*; begotten indeed, but indestructible by any other cause than by the God who made it, in case it should be His pleasure to dissolve it.

36. Although it is doubtful whether Pythagoras ever wrote any account of his doctrines, it is tolerably certain that Philolaus, his distinguished disciple, who flourished in the time of Socrates, and therefore within a century of his master, has left sufficient in his work on the Pythagorean philosophy to enable us to discover that he undertook, by means of a single primordial principle, the vague problem of the origin and constitution of the universe as a whole; and likewise that he held and taught very distinctly the doctrine of transmigration of souls, which has been set forth so fully in the *Timæus* of Plato, as the chief motive of good believed by the learned Greeks.

37. This doctrine was viewed apparently in the light of a process of purification. Souls under the dominion of sensuality passed into the bodies of animals, or, if incurable, were thrust down to Tartarus, in order to undergo expiation, or to meet with condign punishment. The pure were exalted to higher modes of life, and at last attained to incorporeal existence. In reference to the fruits of such a creed, it is interesting to see that wherever we have notices of distinguished Pythagoreans, we usually meet with characters of uprightness and self-restraint. Pythagoras himself is said to have once been Euphorbus, one of the bravest of the Trojans, who was slain by Menelaus; and that in proof of his assertion he took down at first sight the shield of Euphorbus from the temple of Hera or Juno, in which it had been placed by the victor six centuries before.*

38. Plato's embodiment of the *transmutation theory*, which appears to resemble some of the extraordinary theories propounded in modern times, is to be found chiefly in the *Phædo* and the *Timæus*. In the latter work he describes how wicked men in the first generation were changed into women for their punishment during the second, and thence passed into the tribe of birds, with feathers in place of hair, which were, as he says, "fashioned from men not actually vicious, but over curious concerning things on high." The race of wild animals with feet were made "from men who had made no use of philo-

*—habentque

Tartara Panthoïden, iterum Orco

Demissum; quamvis, clypeo Trojana refixo

Tempora testatus.

Horace, *Carm.* i. 28.

sophy"; and because they disliked intellectual pursuits, "their legs and heads became fixed earthwards, as most suited to their nature;—hence arose the race of *quadrupeds* and *centipedes*." The lowest tribe of *fishes* and *oysters* are represented as sprung from the greatest dunces among men: and hence, argues the Grecian sage, "after this manner, both formerly and now, animals migrate into each other, experiencing their changes through either the loss or acquisition of intellect or folly."*

39. It is curious to observe how the cosmological speculations of the present day have reversed the philosophy of the mightiest intellects of ancient times. Whereas Pythagoras and Plato contend that *fishes* and *oysters* have sprung from the greatest dunces among men, we find these very animals named by our modern philosophers as the lineal ancestors of mankind. From Mr. Darwin we learn that the first of our prehistoric ancestors were Ascidian tadpoles, who, he says, were "the parents of a group of *fishes* as lowly organized as the lancelet; and from such fish" have gradually been evolved "the new and the old world monkeys; and from the latter, at a remote period, *man*, the wonder and glory of the universe, proceeded."† Professor Andrew Jackson Davis, who may be regarded as the Darwin of the United States, very positively asserts that "Man was originally an *oyster* or clam, from which he has progressed to his present condition in the following way. The oyster produced a tadpole, which produced a quadruped, which produced a baboon, which produced an orang-outang, which produced a negro, who produced a white man."‡

40. Plato, however, has promulgated another theory respecting the original condition of mankind, at which it may be well to glance, as it will put us in possession of the singular extravagances which the ancient philosophers permitted themselves to broach in their various theories relating to creation. It is true, as Plato places the following ideas in the mouth of Aristophanes, to whose comedy on the *Birds* I have already alluded, we may suppose that he was caricaturing some fond theory of

* Plato's *Timæus*, § 73. † Darwin's *Descent of Man*, i. 212.

‡ *Principles of Nature*, by A. J. Davis, p. 122. It is satisfactory, however, to believe that the tide is turning respecting the Darwinian creed. Dr. John Arnold, in the Preface to his *Genesis and Science*, observes that "the ignominious defeat of the able materialistic developist, Carl Vogt, at the recent Stuttgart conference of German naturalists by an immense majority, is certainly a sign that the reaction has fairly commenced, and that *in less than ten years* Darwinism, which falsely ascribes to nature what really belongs to culture, will be only remembered as one of the delusions of the past."

his day; but whether it was intended for satire or otherwise, it is clear that some of the *savans* of that time believed it, just as much as certain amongst ourselves believe the parentage of mankind is to be found in an Ascidian tadpole, or as St. George Mivart, an acknowledged authority, describes it, as a "sea squirt."

41. Plato then teaches as follows on this interesting subject:—In ancient times there was no such thing known as distinction of sexes. It was then one man-woman; perfect in form, faculty, and in spirit. The exact shape of this being was a *round ball of flesh* with four hands, four feet, two faces, and one brain. They walked, as now, upright, withersoever they pleased. When they ran, they did so in the manner of tumblers, who, after turning their legs upward in a circle, place them accurately in an upright position; so they supported their legs on their eight limbs, and afterwards turned themselves quickly over in a circle.* Now these beings, which may be described as three in number, were descended, the *male* from the sun, the *female* from the earth, and that which partook of *both* from the moon. The bodies thus were round, and the manner of their running was circular, through their being like their parents.† They were so terrible in force and strength, that, as Homer says of Epiphialtus and Otus, they attempted to scale the heavens and attack the gods. Upon which Jupiter and the other gods consulted what they had best do in their difficulty. At length Jupiter, on reflection, said, I have thought upon a plan by which men on becoming weaker may be stopped in their present course. For now I will divide each of them in two; and they will, at the same time, become weaker, and also more useful to us, through their becoming more in

* It is a curious fact that the arms of the Isle of Man represent three legs of a man turning round, just after the fashion so graphically described by Plato in the text!

† This explanation seems to support the theory that Pythagoras and his followers had some idea of the globular shape of the earth, about 2,000 years before the time of Copernicus. Hence Philolaus of Croton taught the progressive motion of the earth through space; and Aristarchus of Samos and Seleucus of Babylon are both supposed to have taught, not only that the earth rotated on its axis, but also moved round the sun. In truth a passage of Plato in the *Timæus*, when read by the light of Aristotle's comment thereon, would seem to show that they both taught the same. The former says "God made the earth to be the nurse of mankind, and by her rotation round the *cosmical pole*, the guardian and creator of day and night." On which the latter comments thus: "All those who do not make the earth the centre of the system, *make her rotate round the centre*; and some even of those who place her at the centre say she rotates round the cosmical axis, as we read in the *Timæus*.—Aristotle, *De Cælo*, ii. § 13.

number, and they shall walk upright on two legs ; but if they refuse to keep quiet for the future, I will again divide them, each into two, so that they shall go *hopping on one leg alone*. Thus saying, Jupiter cut men into two parts, as people cut medlars when about to pickle them, or as they cut eggs with hairs. . . . Now when nature had been thus bisected, each half perceived with a longing desire its other self ; so throwing their arms around each other and becoming entwined, they had a great desire to grow together, but they died through famine and idleness. And when one of these halves died, and the other was left, the survivor sought another moiety ; [which in the gentler sex is now termed by the chivalry of the day man's "better half."] From this period has been implanted by nature in mankind a mutual love, which is the bringer together of their ancient nature, which endeavours to make one out of two, and to heal the nature of man. Such, then, was man's original nature. We were once whole. To the desire and pursuit of this whole has the name of LOVE been given. We were originally one, but for our sins we have been cut in two. There is, therefore, reason to fear, unless we behave properly towards the gods, we shall be again cleft in twain, and go about with our noses split in twain, like those who are modelled on pillars in profile, and become, as it were, pebbles cut through and cut smooth. It is meet, therefore, that every man should behave piously towards the gods, that we may, on the one hand, avoid the ills we know not of, and, on the other, find the good we desire to obtain.*

42. We must not omit all notice of the *atomic philosophy* as enunciated by Leucippus, its founder, and more fully developed by his distinguished disciple Democritus. In order to explain his cosmological ideas, the latter maintained that there were in infinite space an infinite number of atoms or elementary particles, homogeneous in quality but heterogeneous in form. These atoms were said to combine with one another, and that all things arise from the infinite variety of the form, order, and position of the atoms in forming combinations, which he terms "chance," in opposition to the *νοῦς* or "mind" of Anaxagoras.

43. Professor Tyndall, in his address to the British Association of 1874, has explained the philosophy of Democritus in this wise. "1. From nothing comes nothing. Nothing that exists can be destroyed. All changes are due to the combination and separation of molecules. 2. Nothing happens by chance. Every occurrence has its cause, from which it follows

* Plato's *Symposium* or *Banquet*, § 16.

by necessity. 3. The only existing things are the atoms and empty space, all else is mere opinion." Then, after specifying more minutely the action of the atoms in their combinations, Tyndall remarks, on the authority of Lange, that "the great enigma, *i.e.* 'the exquisite adaptation of one part of an organism to another part, and to the conditions of life,' more especially the construction of the human body, Democritus made no attempt to solve." And then he adds, what appears difficult to understand, "Thus, more than two thousand years ago, the doctrine of 'survival of the fittest,' which, in our day, not on the basis of vague conjecture, but of *positive knowledge*, has been raised to such extraordinary significance, had received at all events partial enunciation." *

44. Tyndall might have added, in place of regarding this theory as a precursor of Darwinism, that Democritus' theory of "from nothing comes nothing," which probably gave rise to the well-known proverb, *ex nihilo nihil fit*, only forestalled the curious speculation propounded by Professor Oken, of Zurich, who explained his cosmological ideas at the commencement of the present century in the following way:—"The highest mathematical idea, or the fundamental principle of all mathematics, is that zero = 0. Zero is itself nothing. Mathematics are based upon nothing, and, consequently, arise out of nothing. The eternal is the nothing of nature. *There exists nothing but nothing*; nothing but the Eternal. Man is God wholly manifested. God has become man. Zero has become +. For God to become real, He must appear under

* Address delivered before the British Association at Belfast, by John Tyndall, F.R.S., President, pp. 4, 5. It is a curious fact that so distinguished a man as Professor Tyndall should have made such a lapse as he has done in discoursing on the Atomic philosophy. He represents Empedocles as "noticing a gap in the doctrine of Democritus"; whereas the former was at the height of his fame B.C. 444, when Democritus was a lad of sixteen, and who only became a philosopher after his extensive travels in Egypt, Chaldæa, and other countries, many years later, dying B.C. 357. Professor Tyndall's view of "matter" appears to resemble very closely that of the *Stoics* as represented by Athenagoras. (See his *Plea for the Christians*, ch. xxii.) Professor Tyndall's boast concerning what he terms "the impregnable position of science," that "all religious theories, schemes, and systems, which embrace notions of cosmogony, or which otherwise reach into the domain of science, must, in so far as they do this, submit to the control of science, and relinquish all thought of controlling it" (*Belfast Address*, p. 61)—has been singularly contradicted by experimental results. When we recollect the innumerable variations of what some men call "science," and others more correctly "pseudo-science," and compare them with the unvarying testimony of the Bible, we may console ourselves with this well-established axiom—*that not a single fact of science fully ascertained has ever yet been proved to be in opposition to a single statement of Scripture rightly understood.*

the form of the sphere. God is a rotating globe. The world is God rotating. Everything that is, is immaterial. Self-consciousness is a living ellipse. Physico-philosophy has to portray the first period of the world's development *out of nothing*; how the elements and heavenly bodies originated, in what method, by self-evolution into higher and manifold forms, they separated into minerals, became finally organic, and *in man attained to self-consciousness*. There are two kinds of generation in the world, the creation proper, and the propagation that is consequent thereon; consequently, no organism has been created of larger size than an infusorial point. No organism is, nor ever has been created, which is not microscopic. Whatever is larger, has not been created but developed. As the human body has been formed by the extreme separation of the mucous mass, so must the human mind be a separation, a memberment of infusorial sensation!"

45. I venture to think, by comparing the principles of Democritus, as explained by Professor Tyndall, with those of his brother-professor Oken, of Zurich, we shall find a confirmation of the truth of Lyell's saying, to which I have before adverted, that such notions, whether of the first chaotic mass having been produced in the form of an egg, or by the fortuitous concourse of atoms, "do not seem to differ essentially in principle from some cosmological notions of men of great genius and science in modern Europe."*

46. I had purposed adducing the ideas entertained by other nations respecting Cosmogony; such as the Tyrrhenians, Etruscans, Scandinavians, Saxons, Saracens, North American Indians, Mexicans, Azteks, Polynesians, &c., in addition to those

* I observe that in the *Fortnightly Review*, of November, 1875, Professor Tyndall, in his article on *Materialism and its Opponents*, applies the term of "squatter" to those who differ from him, which he defines as "one who settles on new land without a title," remarking that this is the "position of the older theologians in regard to cosmogony and anthropology"; and he claims the right to "attempt to remove them from ground which they have no right to hold." The great question between those who accept Tyndall's theology and that which is derived from Revelation may be thus defined: The Professor says, "MATTER I define as the mysterious thing by which all this is accomplished." The Bible virtually replies that it is MIND, the infinite and eternal Mind, which has created and maintains the Universe. The question then is not so much as to how worlds were formed, but rather by what agency. Professor Tyndall asks us to believe that by inherent forces organisms proceed from inorganic matter, and that "the animal world is so to say a *distillation*, through the vegetable world from *inorganic matter*." By this dogma, which the Professor will never be able to prove, the "older theologians" will naturally be reminded of Jehovah's answer to Job,— "Who is this that darkeneth counsel by words without knowledge?" And in this way we must leave the question of MATTER or MIND.

already mentioned, but want of space requires me to relegate them, either to an Appendix, or to omit them altogether.*

47. I therefore gladly turn to consider what is really the Cosmogony set forth in the Hebrew Scriptures, and what the Jews themselves believed on the subjects therein mentioned. It is necessary to be extremely careful in the examination of this question, for I think it is this want of care on the part of critics which has caused so much misunderstanding as to what the Bible really teaches on the subject of Cosmogony. I allude especially to the unfriendly criticisms of Bishop Colenso and Professor Huxley. I remember, when the former published the first part of his work on the Pentateuch, that Dr. Hermann Adler, son of the Chief Rabbi in London, published a letter in the *Athenæum* of December 6, 1862, asking, "Who but a smatterer in Hebrew would pervert the plain language of the text in the way Bishop Colenso has done?" And also, that the Rev. A. Levie, an English clergyman of the seed of Abraham, in a letter to the *Record*, stated, "there can be no doubt of the fact that unbelieving Jews are scoffing at the recent whimsical display of ignorance and audacity on the part of an English bishop."

48. In a similar spirit Professor Huxley appears to have addressed the assembled clergy at Sion College on November 21, 1867. "You tell your congregations," said he, "that the world was made 6,000 years ago in the period of six days;† and teach that men of science, like myself, who deny this,

*It should not, however, be forgotten that in all these cosmological traditions, as supposed to be held by various nations, there is some degree of doubt as to how far the accounts handed down to us fairly represent the traditions so held; e.g., Two writers in the present day might give very different accounts of the meaning of the various terms employed in Genesis to denote the Mosaic Cosmogony, as indeed, the papers read on this subject before the Institute bear ample evidence to this fact.

† Mr. Warrington, in a paper read before the Victoria Institute, June 4, 1866, says: "Genesis teaches that the whole work of creation, in respect both to heaven and earth, was performed in the short space of six days."—*Transactions*, vol. i. 88. I confess I have read these words with great surprise; and still more to find that in the discussion which ensued no one called attention to this grave mistake, as to the meaning of what Moses really wrote. Professor Huxley, however, is not always so destructive of cosmological theories as he appears to be when speaking of the Biblical Cosmogony. In his *Lay Sermons*, while advocating most earnestly his own idiosyncrasy respecting PROTOPLASM, he appears to defend warmly the materialistic theory of Kant, saying, "In his *Natural History* Kant expounds a complete cosmogony, or theory of the causes which led to the development of the universe, from diffused atoms of matter endowed with simple attractive and repulsive forces, saying, 'Give me matter, and I will build the world.'" (p. 267).

are liable to pains and penalties, as men who are guilty of breaking great moral laws." The only suitable reply to this astonishing statement might be couched in the language of a Parisian wit, who is said to have criticised a work on natural history published by the French Academy, in which a crab was described as "a red fish which walked backwards," with these gentle words, "Admirable! Messieurs; your definition would be perfect, save that a crab is *not* a fish, its colour is *not* red, and it does *not* walk backwards." Even so, I think we may answer the learned professor by saying, that the clergy do *not* affirm that the world was created 6,000 years ago, for the Bible distinctly says it was created "in the beginning"; neither do they affirm that it was created "in the period of six days"; but that it was fitted up for the habitation of man within six periods (whatever the term "day" may mean) they don't deny, for Scripture says it was so; and true science has not yet proved anything to the contrary. But as for teaching that men of science, like Professor Huxley, are guilty of "breaking great moral laws" for denying the cosmogony of Scripture, as our accuser declares, it is one of the wildest hallucinations that ever entered the professorial brain. It may have been so with the clergy of the Church of Rome in the dark ages, but to accuse the clergy of the Church of England* in the middle of the 19th century of such bigotry is unworthy of the profession to which he claims to belong. Such an accusation seems almost to deserve the reproof of the late Hugh Miller, who remarked that "never was there a fancy so wild and extravagant but there have been men bold enough to dignify it with the name of philosophy, and ingenious enough to find reasons for the propriety of the name."

49. In considering the subject of the Hebrew cosmogony as laid down in Scripture, it may be well to bear in mind these two points: 1st. That we should make every effort to ascertain the exact meaning of the words employed by Moses in his description of the world's creation. 2nd. That we should accept the explanation given by the ancient Jews themselves in preference to that of Gentile critics in the present day. I do not mean of such critics as Bishop Colenso, or Professor Huxley, or Mr. Goodwin,† one of the writers of *Essays and*

* I recollect hearing the late Lord Brougham in the House of Lords, about twenty years ago, describe the Church of England as the most liberal and tolerant Church that had ever existed. I have noticed in my "Reply" the case of a clergyman, who, at the beginning of the last century, explained the Mosaic cosmogony in the way that Professor Huxley represents the clergy of the Church of England doing in the present day.

† Mr. Goodwin concludes that the Hebrew word רָקִיעַ *rakia* was not interpreted as "expanse" until by a happy afterthought theologians attempted

Reviews, whose disqualification for the task they have assumed must be manifest to all men; but of eminent scholars like Gesenius, Ewald, and others, who, however high their attainments as Hebraists, are not sufficient to warrant our ranking them above the acknowledged authority of the Rabbinical teachers and learned Jews themselves.

50. This may be illustrated by our understanding of a term which has been the subject of much criticism in the present day. It has been generally understood by Christian commentators of the first sentence in Scripture, "In the beginning God created," &c., that from the peculiar construction of the Hebrew—a plural nominative governing a singular verb—we have a clear intimation of the doctrine of the Trinity. Modern criticism has been careful to deny this; and yet, if we refer to the learned Jews, who lived before the fuller revelation of Gospel light, we have a distinct intimation that such was the case. Take, for example, the teaching of *Zohar*, a work of the highest authority amongst the Jews, composed by *Simeon bar Juchai* in the century preceding the Christian era, which thus speaks on the doctrine of the Trinity: "THERE ARE THREE LIGHTS IN GOD; the ancient light, or *Kadmon*; the pure light, or *Zach*; the purified light, or *Mezuchzach*; and THESE THREE MAKE BUT ONE GOD." Many other passages of a similar nature might be adduced from the writings of learned Jews, showing the difference between their teaching and the results of modern criticism respecting the Trinity.

51. Further, as regards the Hebrew cosmogony, we cannot forget that it claims to be a revelation of the Divine Will, and as such it is impossible that there can be any conflict between what are really and truly the works and the word of

to reconcile science and Scripture. Had he read more on this subject, he would have known that ages before the science of geology existed one of the earliest translations of the Bible was that by Paginus, a Dominican monk, born A.D. 1470, the profoundest Hebrew scholar of his age. And he, with Montanus Benedictus, who was appointed to revise this translation in the middle of the following century, renders the Hebrew *rakia* by the Latin *expansionem*. So Bishop Colenso, in his attempt to decry our English version of the Bible, which speaks of the priest "carrying forth the whole bullock without the camp," &c. (Leviticus iv. 12), appears to be unaware that the Hebrew verb *hotzia* is of the Hiphhil form, and has a *causative* signification, meaning that "the priest shall *cause* to carry forth," or "have carried out," as Buxtorf, Gesenius, and all Hebraists teach. The English phrase "I have carried my hay," exactly expresses the meaning of what Moses wrote. If either of these opponents of Scripture had studied such a work as Origen's Answer to Celsus' sceptical objections to the Mosaic cosmogony (see especially lib. vi. c. 60, et seq.), I do not think they would have committed themselves in the way they have done.

God. Hence the force of this just axiom, that not a single fact of science fully ascertained has ever yet been proved to be in opposition to a single statement of Scripture rightly understood. At the same time it must be acknowledged how differently this is understood by various classes at the present time. There are those who believe without investigation, because they conscientiously believe the Bible to be the revealed will of God; there are others who believe after the strictest investigation; there are those who, after investigation, deny God *in toto*, like the German Büchner, or the English Bradlaugh; there are those who stand midway between Atheists and Theists, like Professor Tyndall, and content themselves with a sort of ideal Deity of their own composition; while others, like Herbert Spencer, are unable to make up their minds as to the existence of a God or not, consoling themselves with such reasoning as this: "I do not affirm there is no God. I am simply between the two statements. Some say there is a God; some say there is not; I only say *I am not aware of it.*" *

52. I think, therefore, it may be safely affirmed without presumption that, in order to understand the cosmogony as sketched out, rather than dogmatically laid down, in Scripture, there must be before all a sincere belief in revelation, together with a competent amount of Biblical scholarship, and some knowledge of the elements of modern science. The chief objectors to the Hebrew cosmogony in our own day may know much of the last, less of the middle, and apparently nothing whatever of the first. As a rule, they present a striking contrast to that master mind in all genuine science, Sir Isaac Newton, whose humility and genius were alike conspicuous in his memorable avowal, which they would do well to imitate:—"I am but as a

* See *Transactions of the Victoria Institute*, vol. vii. p. 160. What a contrast to the well-known teaching of one of England's greatest philosophers. "Undoubtedly," wrote Bacon, "a superficial tincture of philosophy may incline the mind to atheism, yet a farther knowledge brings it back to religion. For on the threshold of philosophy, where second causes appear to absorb the attention, some oblivion of the highest cause may ensue; but when the mind goes deeper, and sees the dependence of causes and the works of Providence, it will easily perceive, according to the mythology of the poets, that the upper link of Nature's chain is fastened to Jupiter's throne. Let none weakly imagine that man can search too far, or be too well studied in the book of God's word and works,—divinity and philosophy; but rather let them endeavour an endless progression in both, only applying all to charity and not to pride—to use, not ostentation, without confounding the two different streams of philosophy and revelation together." (*Advancement of Learning*, book i. p. 32.) See "Reply" respecting the real opinions of Herbert Spencer and Professor Tyndall.

child standing on the sea-shore of the ocean of truth, and playing with a little pebble which the waters have washed to my feet.”

53. We come now to the question at issue among ourselves. What does the Bible really teach, and what did the Jewish people, for whom it was written, really believe respecting the Mosaic record of creation? Adopting a more literal rendering than is to be found in our admirable Authorized Version, and combining with it a few other passages besides the Mosaic account, in order to elucidate more fully the correct teaching of Scripture, I believe the following will be found to convey a fair representation of all the information contained in the Bible respecting the Hebrew cosmogony.

54. In the beginning was the Word (ὁ λόγος), and the Word was with God, and the Word was God (John i. 1). In the beginning, before the earth existed (Proverbs viii. 23), God the Eloheem, *i.e.* the Trinity, called into existence, by a sovereign act of creative power, the Essence of the Heavens and the Essence of the Earth (Genesis i. 1).^{*} Moreover, the Creator hung the earth upon nothing, as a ball in the air, poised with its own weight, and kept in this manner by the power of gravity (Job xxvi. 7). Now God did not create the earth empty (Isaiah xlv. 18); but the earth became empty and desolate; and there was darkness upon the surface of the deep. And the Spirit of God brooded upon the face of the waters (Genesis i. 2).

FIRST YOM.

55. And God said, Let there be light, and there was light. And God saw the essence of light that it was good; and God made a division between the light and between the darkness. And God called the light YOM (day), and the darkness He called Night. And there was evening, and there was morning, one peculiar YOM (Genesis i. 3—5).

SECOND YOM.

56. And God said, Let there be an atmosphere or expanse in the midst of the waters, and let it divide between the waters.

^{*} The following is a comparison between the ancient Hebrew characters, such as we may suppose Moses used on the occasion, and the modern Hebrew characters :—

7 L K Y

Ancient.

ד ה כ י

Modern.

And God prepared the atmosphere, and a space between the waters which were above the atmosphere, and it was so. And God called the expanse "SKY," and there was evening and there was morning, a second YOM (Genesis i. 6—8).

THIRD YOM.

57. And God said, Let the waters under the sky be gathered to one place, and let the dry ground appear, and it was so. And God called the dry ground "EARTH," and the assembling of the waters He called "SEAS," and God saw that it was good. And God said, Let the Earth sprout forth the green grass, the green herb bearing seed, and the fruit-trees bearing fruit according to its kind, whose seed is in itself, and it was so. And the earth brought forth the green grass and the green herb bearing seed according to its kind, and God saw that it was good. And there was evening, and there was morning, a third YOM (Genesis i. 9—13).

FOURTH YOM.

58. And God said, Let there be light-bearers in the expanse of the heavens to separate between the YOM and between the Night; and let them be for signs and for the seasons, and for days and for years. And let them be for light-bearers in the expanse of the heavens to afford light on the earth, and it was so. And God appointed the two great light-bearers—the chief light-bearer for ruling the day, and the lesser light-bearer for ruling the night, and the stars likewise. And God so arranged them in the expanse that they should give light upon the earth, and rule over the YOM and the Night, and divide between the light and between the darkness; and God saw that it was good. And there was evening and there was morning, a fourth YOM (Genesis i. 14—19).

FIFTH YOM.

59. And God said, Let the waters swarm with animal life; and let birds fly above the earth in the open sky. And God called into existence the long-stretched * monsters of the deep,

* תנינים means properly sea monsters, huge whales, serpents, crocodiles, &c., from an unused verb תנן signifying "to extend," as in the Sanscrit and other Indo-Germanic languages. Hence, says Gesenius, it refers to the vast fishes of the deep, so called from their enormous length; as whales, by far the greatest monsters of creation, have been known to extend to over 100 feet in length.

and all animals endued with life with which the waters swarm, according to their kinds; and the birds of the air after their kind; and God saw that it was good. And God blessed them, saying, Be fruitful and multiply, and fill the waters in the seas, and let the birds multiply on the earth. And there was evening and there was morning, a fifth YOM (Genesis i. 20—23).

SIXTH YOM.

60. And God said, Let the earth bring forth all animals after their kind, domestic cattle, and reptiles and wild beasts after their kind; and it was so. And God made the wild beasts of the earth after their kind, and domestic cattle after their kind, and all reptiles of the earth after their kind; and God saw that it was good. And God* said, Let us make man in our image (= outline) after our likeness (= filling up the outline); and let them have dominion over the fish of the sea, and the birds of the air, and over the domestic cattle, and over all the earth, and over every creeping thing that creepeth upon the earth. So God called man into existence after His own image; male and female created He them. And there was evening and there was morning, a sixth YOM (Genesis i. 24—27).

SEVENTH YOM.

61. At the beginning of the seventh YOM God finished His work; and He rested then from all the work which He had done. And God sanctified the seventh YOM, because that in it He rested from the work which He intended to perform† (Genesis ii. 2, 3).

62. Before entering upon an investigation of the Mosaic record respecting Creation, I would adduce the testimony of a noted French writer in the present day as a fair specimen of the

* As some critics, like Bishop Colenso, have assumed that because the name "Jehovah" is not found in the first chapter of Genesis, as it is in the second, therefore it is a proof that they must have been written by two different hands. But this rather proves ignorance of the Hebrew language on the part of the critic. For when it is written "God said" (*yo-mer*) we understand Jehovah to be the speaker. If Moses, instead of writing "God said, let us make man, and God blessed the seventh day," had written "The Lord said, and the Lord blessed," &c., the Jews would have understood that some one commissioned to speak and to bless had done so in the Lord's name. And this is the reason why the word Lord or Jehovah is not found in the narrative of the Mosaic cosmogony.

† The literal rendering of this last phrase is "which God created to make." So the *Targum* of Onkelos and the Syriac version render it. The Vulgate translates it, "which God created that He might make it."

way in which a class of writers, to whom I have before alluded, are in the habit of speaking of the Hebrew cosmogony. "No one," says M. About, as reported in the *Christianisme au XIX^{me} Siècle*, "any longer defends the cosmogony of Moses; one hardly dares to teach children from the catechism about the *creation of light before the birth of the sun*, the formation of the world in seven [? six] days; or the legend of Adam moulded like a marble statue, and of Eve formed out of a rib of her husband."

63. It would be difficult to give clearer proof of the most crass ignorance than this specimen of French philosophy in the middle of the nineteenth century.* The Mosaic cosmogony has been defended by illustrious Frenchmen, such as Cuvier, Brongniart, Prevost, and other philosophers of the present day, of whom M. About must have heard. The existence of light *independent* of the sun (not as M. About terms it, "*before the birth of the sun*") is one of the brilliant discoveries of modern science; the objection originally came from Voltaire, at whom the merest tyro in science may well smile, just as men will hereafter smile at him who now reproduces his sceptical sneer. The formation of the world as it now appears to us in six (not seven, as M. About curiously says) *yoms* or periods has been believed in and expounded by Descartes, Bacon, Newton, Leibnitz, Euler, and others, all of whom are still authorities in modern science. Thus much in answer to M. About.

64. But to return to the consideration of what the Bible really teaches respecting the formation of the world. We may

* M. About's knowledge of the Hebrew cosmogony appears to be on a par with that of Mr. Goodwin's, whose infidelity is but thinly concealed in the unsupported accusations which he brings against those who believe in the Divine record. Ignorance the most profound, joined to dogmatism the most presumptuous, is a marked characteristic of the sceptic's creed; of which we have a fair specimen in Mr. Goodwin's statement that "the plain meaning of the Hebrew record is unscrupulously tampered with, and in general the pith of the whole process lies in divesting the text of all meaning whatever!!! Physical science goes on unconcernedly pursuing its own paths. Theology maintains but a shivering existence, shouldered and jostled by the sturdy growths of modern thought, and bemoaning itself for the hostility which it encounters"!!! (*Essays and Reviews*, p. 211.) As the above statement does not appear to be redeemed by a single particle of truth, we can afford to pass it by in remembrance of the advice given by the wise King of Israel, "Answer not a fool according to his folly, lest thou also be like unto him." The literary world seems to be of a similar opinion, for probably no book of such lofty pretensions has ever had so great a fall as that of the notorious *Essays and Reviews*. As a specimen of Mr. Goodwin's knowledge of geology, he talks about "the *first* records of organisms presenting themselves in the so-called Silurian system" (p. 214), whereas the merest tyro knows that the Laurentian beds of Canada, which *underlie* the Silurian system, contain sure proof of organic life.

confidently assume from those passages which have been already adduced respecting the Hebrew cosmogony, the truth of the following propositions:—1st. That a self-existent Creator in the beginning called the earth into existence; and that this earth is poised in the air, balanced by its own weight. 2nd. That He did not create it “empty,” or, as a heathen philosopher would term it, in a chaotic state. 3rd. That it subsequently became “empty.”* 4th. That light exists independent of that which the earth receives from the sun. 5th. That during a certain period, termed six Yoms, the Creator prepared the earth for the use of man. 6th. That man is an entirely separate act of creation on the part of the Divine Being. 7th. That after this had been accomplished, God rested from the creative work which He had done.

65. Thus we have in the cosmological record of the Hebrews a clear, and as far as it goes, a scientific statement of the origin of the universe, not yet superseded by the theories of the speculative philosophy, nor contradicted by the discoveries of modern science; but sufficient to prove that it was made known to the writer as a revelation from on high. Had the objectors to this revelation been better acquainted with the language in which it was written, they would not have committed themselves to such marvellous mistakes as, *e.g.*, of asserting that Moses taught the earth was created only 6,000 years ago; that it was immovably fixed in its position; that he makes the birds fly through a solid vault; that the term Yom must mean a period of twenty-four hours, and can mean nothing else; that the

* This appears to have been the view of Dr. Buckland, as he says in his *Bridgewater Treatise*: “The word *beginning* as applied by Moses expresses an *undefined period of time*, which was antecedent to the last great change that affected the surface of the earth, and to the creation of its present animal and vegetable inhabitants, during which period a long series of operations may have been going on; which, as they are wholly unconnected with the history of the human race, are passed over in silence by the sacred historian, whose only concern was barely to state that the matter of the universe is not eternal and self-existent, but was originally created by the power of the Almighty..... The first verse of *Genesis* seems explicitly to assert the creation of the universe, the heaven, including the sidereal systems, and the earth more especially specifying our own planet as the subsequent scene of the operations of the six days about to be described..... Millions of millions of years may have occupied the indefinite interval, between the beginning in which God created the heaven and the earth, and the evening or commencement of the first day of the Mosaic narrative..... We have in verse 2, a distinct mention of earth and waters, as already existing, and involved in darkness; their condition also is described as a state of confusion and emptiness (*tohu bohu*), words which are usually interpreted by the vague and indefinite Greek term chaos, and which may be geologically considered as designating the wreck and ruins of a former world.”

author of this cosmogony was no better than a mere Hebrew Descartes, possibly somewhat in advance of the intellects of his age. It would be well for such objectors if they could receive what Ewald has said in his comment on Genesis i. 1—ii. 4, that “the aim of the first connected narrative is to exhibit God as the Creator of the universe. The author then passes over from the perfected picture of the created universe to that which must have been to him, as to all writers of history, the most worthy of note—to the history of man. Yet he closes the first picture with the words—‘These are the generations of the heavens and the earth.’”*

66. In comparing the Hebrew cosmogony with the discoveries of true † science, it may be well to consider them under these several heads:—1st. The creation of the universe. 2nd. The existence of light. 3rd. The duration of the term translated “days.” 4th. The formation of man.

67. First, as regards the creation of the universe. It has been contended by some that the Mosaic cosmogony represents a distinction in point of time between the creation of the heavens and of the earth; as if the stellar worlds of light (those unanswerable proofs of a Divine Architect, to use the argument of Napoleon I.) which are hung around us on all sides of the universe were made at one time, and earth with its ruler, man, was made at another time. But such is *not* the teaching of the Word of God. Nothing can be plainer than the declaration that the heavens, containing the whole stellar system, and that the earth, a small planet in the solar system, were called into existence simultaneously. “In the beginning God created the heavens and the earth.” In these few simple words, if our finite minds are only able to fathom their full meaning, are contained all the depths of philosophy which the wit and wisdom of man have enabled him to discover; he can add nothing thereto; he can take nothing therefrom; and it should be his unceasing endeavour to understand what they teach, in order that the wit of man may not contradict the wisdom of God.

* Ewald's *Composition per Genesis*, p. 192.

† I am obliged to use the word “true”; for much that passes in the present day under the name of “science” is anything but true, and must be distinguished by the term “pseudo-science.” The differences between those who claim for themselves the name of *Savans*, especially on the subject of *geology*, are so numerous and so great, that they may be fitly compared to the little difference between John Stuart Mill and the author of *Ecce Homo*, respecting “Christian morality,” of which the former, in his *Essay on Liberty*, p. 29, says, “in its precepts ‘*thou shalt not*’ predominates over ‘*thou shalt*’”; Whereas the latter declares respecting the same, “The old legal formula began ‘*thou shalt not*,’ the new begins ‘*thou shalt*’” (p. 175).

68. It is unnecessary to enter at any length upon Hebrew criticism in our proposed reading of the first verse of the Bible. It has been so fully and well done in *Aids of Faith*, by the late Dr. McCaul, who was confessedly one of the first Hebrew scholars of the day, that, with the exception of one single point, which I shall presently mention, he has left nothing to be desired in confirmation of the truth of these words respecting the creation of the heavens and earth. It will be sufficient to notice that Moses, in using the term "*In the beginning*,"* expresses *Duration or Time*, previous to Creation; that the Hebrew word ברא *hara*, although not necessarily meaning *creation out of nothing*, is always used in Scripture to denote the work of God and not of man; and here, as elsewhere, something *new*, which did not exist before. Hence the learned Gesenius says, in reply to those who contend that this word implies the eternity of matter,—“It is abundantly plain that the use of this verb in *Kal* is altogether different from its primary signification, and that it is more used of *new production* (*Genesis* ii. 3) than of the conformation and elaboration of matter. But that in *Genesis* i. 1, the first creation of the world out of nothing is proved by the connection of things in the whole chapter. Thus, also, the Rabbis (see *Aben Ezra in loco*) say, ‘that creation is a production of something from nothing.’” †

69. Hence it will be seen in the translation I have adopted as more exactly conveying the literal sense of the original, the term, “the *essence* of the heavens,” and “the *essence* of the earth,” which is rendered by את *eth* in the Hebrew, is understood to signify “essence,” or “substance,” by the Jews themselves. ‡ In this brief record of the Divine act and will we have all that the comparatively infant science has been enabled to discover after a virtual search of 6,000 years of the condition

* Lightfoot relates a curious story concerning the word בראשית recorded in both of the Talmuds—of the seventy elders, employed by Ptolemy Philadelphus to translate the Hebrew Scriptures, that they wrote the first sentence of the Pentateuch “God created in the beginning,” not as in the Hebrew, “In the beginning God created”; fearing lest the king should say, “BERESHEH is God, and that there were two powers, and that the first created the latter.” (*Exercitations upon 1 Cor.* viii.)

† Gesenius’s *Thesaurus*, in loco.

‡ Both *Aben Ezra* and *Kimchi* affirm that the particle את signifies “substance” (*Sepher Shorash*, rad. את). And *Maimonides* observes that it is the same as “with”; and then the sense would be, “God created with the heavens whatsoever are in the heavens, and with the earth whatsoever are in the earth, i.e. the substance of all things in them both.” (*Moreh Nevochim*, par. 2, ch. 30.)

of the earth during the geological periods, previously to the preparation of earth for the use and habitation of man.

70. Dr. McCaul, in his valuable essay on the *Mosaic Record of Creation*, had mentioned as an instance of the scientific accuracy of the Mosaic account, that, "before the human period there was no difference of climate, and that there was, apparently, one uniform high temperature over the whole earth; and, consequently, that the flora and fauna of warm climates are found in latitudes where they could not now exist" (*Aids to Faith*, p. 219). Now, although some have sneered at this statement, it is undoubtedly true that, until lately, the scientific world supposed that the flora of the carboniferous era, which extends as far north as Baffin's Bay,* indicated an almost tropical temperature; but, as in a multitude of other instances, † science has now adopted a different view on this subject, and, though it does not affect any statement of Moses in the slightest degree, we may readily accept the opinion of the late Sir Charles Lyell, who says,—and I beg you to note his words, "*It seems to have become a more and more received opinion that the coal plants do not on the whole indicate a climate resembling that now enjoyed in the equatorial zone. A great preponderance of ferns and lycopodiums indicates moisture, equability of temperature, and freedom from frost rather than intense heat*" (*Elementary Geology*, p. 399). A remarkable work, published last year, entitled, *Climate and Time in their Geological Relations: a Theory of Secular Changes of the Earth's Climate*, by James Croll, of H. M. Geological Survey of Scotland, has fully discussed this subject in all its bearings; and the learned author has, I venture to think, shown some reasons for believing:—1st. That the old internal heat theory must be abandoned, in consequence of Sir W. Thomson's conclusion that the general climate could not have been sensibly affected by intense heat at any time more than 10,000 years after the solidification of the earth's crust, though there is evidence that its climate was much hotter during

* The author of *Vestiges of the Natural History of Creation*, says, "In the coal of Baffin's Bay, of Newcastle, and of the torrid zone, alike, are the fossil ferns arborescent, showing that, in that era, the present tropical era, or one even higher, existed in very high latitudes."

† In Mr. Croll's work on *Climate and Time*, I have counted over thirty instances, which he mentions, wherein *savans* materially differ from each other in their interpretations of various points connected with the earth's climate; e.g. to mention one, Humboldt estimates that it would require 7,200 years to form a bed of coal a yard thick; Dr. Heer, of Zurich, contends that only 1,400 years would be required to effect this! (p. 429).

Palæozoic ages than now. 2nd. That the ocean currents are the chief agents employed in the distribution of heat over the globe. 3rd. That while, during portions of the Glacial period, England and much lower latitudes had an Arctic condition of climate, yet, during other portions termed "Interglacial," a warm condition extended to Greenland and the Arctic regions generally, which then were not only free from ice, but covered with a rich and luxurious vegetation. 4th. That this condition of things is accounted for on the theory of a great increase in the eccentricity of the earth's orbit, which brings into operation a series of physical agencies, the direct tendency of which is to lead to a glacial condition of things on the hemisphere whose winters occur in aphelion, and a warm and equable condition of climate (interglacial) on the opposite hemisphere, whose winters, of course, occur in perihelion. The precession of the equinoxes reverses the condition of each hemisphere alternately, about every 10,000 years as long as the eccentricity continues at a high value, which eccentricity about 850,000 years ago Mr. Croll computes at 0.0747.*

71. Hence we may reasonably conclude that what has hitherto been a somewhat perplexing knot for our geologists, naturalists, and botanists to untie, may now be accounted for by the hypothesis of Mr. Croll as given above. All these things, and various other matters, which have been so fully, ably, and temperately discussed by Mr. Croll in his work on *Climate and Time*, may serve to explain the problem of a past flora and fauna existing in latitudes where at present they are unknown.

72. The older and more perfect science of Astronomy confirms the view derived from Geology, so far as it bears upon the meaning of the antiquity of the heavens and earth, which may have been created myriads of millions of years just as readily as thousands of years ago, so far as the words of Scripture are concerned. But that it could not mean merely 6,000 years ago, the limit of man's antiquity on earth accord-

* "How totally different," says Mr. Croll, "must have been the condition of the earth's climate at that period, from what it is at present! Taking the mean distance of the sun to be 91,400,000 miles, his present distance at mid-winter is 89,864,480 miles: but at the period in question, when the winter solstice was in perihelion, his distance at mid-winter would be no less than 98,224,289 miles. But this is not all; our winters are at present shorter than our summers by 7.8 days, but at that period they would be longer than the summers by 34.7 days. At present the difference between the perihelion and aphelion distance of the sun amounts to only 3,069,580 miles, but at the period under consideration it would amount to no less than 13,648,579 miles!" (*Climate and Time*, p. 359.)

ing to revelation, may be seen in this. Science has enabled man to discover the speed at which light travels through space,* and by this means to have some faint conception, not only of the magnitude of creation, of the greatness of the Creator, and of the insignificance of the created, but also of the time which must have elapsed since the heavens and the earth were called into existence by the will and power of God. Assuming light to travel at its well-ascertained speed of 192,000 miles each second of time, it passes from the moon to the earth in rather more than one second; from the sun to the earth in about eight minutes; but to Neptune, the most distant planet yet discovered in the solar system, upwards of four hours are consumed in its flight. A parallax has been found for each of the nine fixed stars, or suns to other systems, which form what astronomers term "stars of the first magnitude," and the result is seen in the computation that light proceeding at the same speed requires *three years* to pass from a *Centauri*, the nearest of the fixed stars, to our system; while from Capella, the farthest fixed star of the first magnitude, a period of seventy years would be required. But even this is as nothing compared with what science has further determined respecting the magnitude of the Universe, and the consequent distance of some of the stellar orbs from our system, when the heavens and the earth were originally called into existence by their Omnipotent Creator.

73. It is nearly a century ago that a foreign musician, at that time in the comparatively humble position of organist at the Octagon Chapel, Bath, who was subsequently known as the celebrated Sir William Herschel, and father of another eminent astronomer in the person of Sir John Herschel, conceived the grand idea of gauging the universe with the assistance of his newly-formed telescope, which then excited the wonder of the age. It would require too much time to detail the means employed by this illustrious discoverer; it will be sufficient to name some of the results, which may be expressed in

* Roemer, the Danish astronomer, by means of Jupiter's satellites, was the first to discover the estimated speed of light; the accuracy of which has been confirmed by Professor Wheatstone's test of a rotating mirror, in which artificial light is made to pass over a distance of 30,000 feet to the same point from which it emanated. Herr Bessel, of Germany, was the first to give Roemer's discovery a practical value, by finding a parallax for a fixed star marked in the maps as "61 cygni," which proved its distance from us to be such as to require light, travelling at the rate of 192,000 miles each moment of time, a period of nine years to reach our system. A grand achievement in the progress of science, which Sir John Herschel has justly termed "the greatest and most glorious triumph that practical astronomy has ever witnessed."

a few words. A star of the 6th magnitude would require a period of 2,656 years for its light to reach our system ; so that the star thus seen by the telescope is not necessarily as it now appears, but as it existed 2,656 years ago ; so that, supposing such a thing possible, if a telegraphic message had been sent off by light as the agent, and therefore travelling at nearly twenty times the rate of our electric telegraph, to a star of the 6th magnitude, at the date of the building of Rome, B.C. 753, it would have required twenty-eight years more of travel before it could have reached its destination.

74. Stars situated in the more remote edges of the Milky Way require a period of 20,000 years for the transit of their light, *according to the original calculations of Herschel*, though these are now questioned ; and the splendid nebula in Orion,* a portion of which has been proved by the spectroscope to be of a strictly nebulous or gaseous matter, and which was unresolvable until the power of Lord Rosse's gigantic telescope was brought to bear upon its beams, would absorb 60,000 years for the transit of its light to our system. And to proceed one step further, if, as Professor Nichol has finely contended, "*we take the guidance of analogy*, it may be asserted without hesitation, although not apart from a feeling next to overwhelming, relating to the awful realities within which our frail lives are passing—that if any of those Milky nebulae *first seen* by the six-foot mirror of Lord Rosse's telescope, and left irresolvable until art shall achieve some new and mighty advance—if any of these are like the grand object in Orion, they may be so far off in space that light does not reach us from them in less than *thirty millions of years!*"

75. Thus far the science of astronomy confirms the teaching of Scripture relative to the antiquity of the heavens and the earth. And, so far from the next statement of Moses being in opposition to the discoveries of the younger and inferior science of geology,† it must be regarded as in complete accord with what geologists have at length found out; for, after the declara-

* See "Reply," for remarks on the nebulae in Orion.

† The science of Geology can scarcely be called a century old ; and the innumerable contradictions of its teachers have in a great measure reduced it to a series of conjectural speculations, at least compared with the logical demonstrations and masterly proofs belonging to the science of astronomy. Who questions the discoveries of Copernicus or Newton ? While, on the other hand, what geologist of note has not had occasion to modify his own views during his lifetime, as Sir Charles Lyell and others have frankly confessed ? The variations of geologists can only be described under the term "Legion," as a French author justly remarks :—"Depuis l'époque de Buffon, les systèmes se sont élevés les uns à côté des autres en si grand nombre, qu'en 1806, l'Institut de France comptait plus de quatre-vingts théories hostiles aux saintes Écritures ; AUCUNE n'est restée debout jusqu'à ce jour." (*La Bible et la Science moderne*, par M. E. Panchaud, p. 13.)

tion of ver. 1, which includes, as I have before remarked, all the long geological periods up to the end of the tertiary, ver. 2 teaches that the earth was reduced to a condition different from its previous one, as it is said "the earth became empty and desolate,"—i.e., in a chaotic state,—previous to its being prepared by its Maker for the use of man. I am aware that some interpret these words as our English version reads, "the earth was without form and void," implying that it means then God commenced reducing chaos to a state of order in accordance with what geology asserts respecting the first dawn of organized life on the face of the globe. But not only are the LXX. and the Vulgate versions generally in conformity with the English word "became," in preference to the authorized version "was," inasmuch as the Hebrew verb היה, *ha-y-ah*, is twenty times in this chapter translated by the Greek and Latin γίνομαι and *fit*, and not by εἶμι, or *sum*; but also the teaching of the book, "Zohar," a work, as I have before remarked, of the highest authority with the Jews, distinctly points to the same view. Thus, it is written:—"These are the generations of *tho-hú* which are signified in Genesis i. 2. The earth was *tho-hú* and *bo-hú*—i.e. empty and desolate; and they mean that the blessed God originally created the worlds and then destroyed them; and for that reason the earth became empty and desolate."*

76. I believe, therefore, that the declaration in ver. 2, of the earth becoming empty and desolate after having been previously filled with organized life, pointedly refers to that last change which took place in the physical appearance of our globe, and known to geologists under the term, the "post-tertiary era." During previous ages the atmosphere of our globe must have been of a very different temperature from what it is at present, as the coal of Baffin's Bay and other places of very high latitudes proves that there must have once existed there a different climate from what it has now; though whether of a tropical nature

* Excerpta from Zohar on Genesis ii., by Ludovicus Capellus, quoted by Dr. Baylee (*Transactions of the Victoria Institute*, vol. iii. p. 260). Dr. Pye Smith quotes Dr. Dathe of Leipzig, a cautious and judicious critic, as rendering the passage in Genesis thus:—"In the beginning God created the heaven and the earth. But afterwards the earth became waste and desolate." (See *The Relation between the Holy Scriptures and Geological Sciences*, by Pye Smith, D.D., fifth edition, p. 249; and also the valuable supplementary Note B., p. 435.) Dr. Pusey, in the Preface to his *Lectures on Daniel the Prophet* (see pp. xix. lxxxiii. et seq.), appears to adopt the same view, if I do not misunderstand him, but he writes, unfortunately, in such a profuse and mystified manner, that one is not quite sure what is the exact meaning of this learned author. The best work, however, where the subject is exhaustively discussed, is to be seen in Dr. McCaul's *Essay on the Mosaic Record of Creation*, in *Aids to Faith*.

we are unable to say; for, as Lyell points out, "heat hastens the decomposition of leaves and trees, whether in the atmosphere or in the water, and we know too little of the sigillaria and other peculiar forms of the carboniferous period to be able to speculate with confidence on the kind of climate they may have required."*

77. But this we do know, that all these magnificent coal-fields, extending more or less through the geological periods, must have been designed by a wise and provident Creator; not for the creatures which existed on earth after their first formation, but solely for the use of that being made in His image and after His likeness in the person of MAN. And herein consists one of the many enormous gulfs between Man and Beast, which some philosophers are vainly doing their utmost in the present day to minify as much as possible, in order to adopt the wildest hypothesis that was ever conceived in the human brain, of seeking to show man's pedigree from an ascidian tadpole and an Old World monkey; for it is well known and admitted by all *savans* that those animals which have approached nearest the human in the way of reason or instinct, have never had the slightest conception of the meaning of those vast coal-fields which the Creator has provided so beneficially for the use of man.†

78. This will lead us to the consideration of the declaration of Moses respecting the existence of LIGHT. "And God said, Let there be light, and there was light." It may be fairly assumed that in the whole range of literature from the beginning of time nothing has ever equalled this sublime speech respecting the creation of that to which the Creator likens Himself; for "God is Light," as St. John taught, and, as St. Paul declares, "dwelleth in light which no man can approach unto"; since it argues uncontrollable authority and omnific power. And it

* Lyell's *Elements of Geology*, c. xxv. p. 501.

† An anecdote is told of the late George Stephenson once asking Dr. Buckland, on seeing a train rush by, "What propels those carriages?" "Steam," was the natural reply. "But how is steam produced?" retorted Stephenson. The man of theory and science, knowing it would be useless to say, "Because water boils," was discreetly silent, when the self-taught and practical engineer made this memorable reply:—"It is light bottled up in the earth for tens of thousands of years." A most original idea. Like a flash of lightning it illuminated an entire field of science. For coal, as is well known, is the formation of decayed vegetable matter, which would inevitably perish, were it not for the absorption of light, by which its vitality has been retained in another shape as countless ages have rolled by. Light absorbed by plants and vegetables is necessary for the condensation of carbon during the process of their growth, and now after being buried for so vast a period in fields of coal, that long-hidden light is again brought forth and made to work, as in the produce of steam, for the use of man!

was no slight testimony to the inspiration of this passage that when the celebrated heathen Dionysius Longinus first met with this sentence in the LXX. Version, he described their effect on his mind in these striking words:—"The Jewish lawgiver, who was no ordinary man, having conceived a just idea of the Divine power, expressed it in a dignified manner, for at the beginning of his laws he thus speaks:—'GOD SAID,—*What? LET THERE BE LIGHT! And there was light.*'"*

79. An objection has been raised by infidels of old like Celsus, and revived by modern sceptics like Voltaire and Goodwin in our own day, to this part of the Mosaic cosmogony, that the author represents light to have existed before and independent of the sun. But, passing by the fact that Moses only says respecting the sun, as one of the heavenly bodies which were "created in the beginning," that at a certain time of His preparing earth for the habitation of man, God appointed the chief light-bearer in the solar system to give light to the earth during the day, it does not conflict with his previous assertion that there was light independent of the sun, for modern science has at length discovered that such is indeed the case.

80. Had Moses been a mere speculator, well posted up in the scientific conceptions of his own day, or, as Mr. Goodwin terms him, "some Hebrew Descartes or Newton," he would not have recorded the creation of light as separate from sunlight. But in this seeming inconsistency we have one of the strongest testimonies possible to the Divine authority of the Mosaic cosmogony; for science teaches that the sun, though supreme in our system, is not the only source of light, but that there is, throughout the endless regions of space, a fine, subtle essence, called *ether*, which, restrained by no limits, washes the remotest shores of the universe with an invisible ocean, and which is of so refined a nature that the stars move through its depths very slightly affected by what is termed, *the resisting medium*, which astronomers consider identical with the luminiferous ether. † Hence arise those waves, or undulatory motions,

* Dion. Long., *On the Sublime*, § 9.

† As certain phenomena of optics require for their explanation a vehicle for light, so certain phenomena of astronomy demand for their satisfactory explanation the existence of a subtle fluid, such as the luminiferous ether is conceived to be. Hence Encke, in his *Dissertation on the Comet*, which bears his name, observes:—"Another question is this, whether the hypothesis of a resisting medium gives the true and probable explanations, though hitherto no other appears to have equal weight." On which the Astronomer Royal says: "There can scarcely be a doubt that the hypothesis of a resisting medium, or something which produces almost exactly the same effect, is the true one."—Airy's *Translation of Encke's Dissertation on the Comet*, 1832.

which, spreading with excessive velocity in every direction, produce, according to the theory of Huygens, the effect of *light*.

81. It is by the properties of this universally diffused ether that not only *light*, but also *heat*, and probably *electricity* and *magnetism*, are supposed to exist. And the fact of there being such latent light may be shown by the following experiment. Take two pieces of smooth flint and rub them together in a dark room, and the latent light or caloric matter will be immediately produced and become visible. The existence of this caloric or primitive light may be detected in various other bodies by rubbing two hard sticks together, or by hammering cold iron, which, in a short time, becomes red hot, or by the sudden compression of atmospheric air in a tube.

82. The theory originated by La Place respecting the creation of our solar system,* which is taken for granted by Humboldt and others, is an additional proof of light existing independent of the sun. La Place conceived that "in the beginning" the whole solar system consisted of a mass of vaporous matter, having a central nucleus, and the whole rotating on its axis in one uniform direction, from west to east. Such a mass would, in condensing by cold, leave in the place of its equator zones of vapour composed of substances which require an intense degree of cold to return to a liquid or solid state. These zones must have begun by circulating round the sun in the form of concentric rings, the most volatile molecules of which must have formed the superior part, and the most condensed the inferior part. In consequence of this revolving motion our globe became flattened at the poles and bulging at the equatorial region, and, in consequence of the greatness of the centrifugal force at the equator, and the contemporaneous condensation and contraction of the nebulous mass, a free, revolving ring, like that of Saturn, detached itself at the equator. This ring not being of uniform density, and in consequence of contraction, broke in one or more places, and these fragments, in obedience to the law of gravitation, became planets, revolving from west to east round the parent mass. †

83. Thus, according to the theory of La Place, not only the earth, but all the planets, existed before the sun was in its present condition, as giving light to the earth. And as these

* Professor Challis, in his *Creation in Plan and Progress*, considers that the Sun, like the other heavenly bodies, was "created in the beginning," but was prevented from illuminating the earth during the first three Yoms, or periods, by a vast stratum of vapour (see pp. 19 et seq.).

† La Place, *Exposition du Système du Monde*, pp. 465 et seq. See "Reply" for remarks on La Place's theory.

planets are not now self-illuminating, it is supposed that the rings when detached from the original mass were dark also, and that the sun did not receive its luminous photosphere * until all the planets had been detached from it.

84. Professor Nichol, in his *Planetary System*, accounts for the primitive light in a somewhat different way from La Place's theory, adducing the auroras and other phenomena as indicating the existence of a power in the matter of our globe to emit light; and, concluding that the matter of the planets is capable of evolving the energy which we term *light*; and that the atmosphere of the sun is at present under influences favourable to the high manifestation of a power which, from the other orbs in the solar system, has not entirely departed.

85. Another instance of light, independent of the sun, is seen in the *Rhizomorpha*, a species of fungus, vegetating in dark mines, and remarkable for its phosphorescent qualities. In some of the coal-mines of Saxony it is seen in great splendour, giving them the appearance of an enchanted castle; the roofs, walls, and pillars being entirely covered with them, while the beautiful light emanating from them is perfectly dazzling to the naked eye.

86. The progress of science has, therefore, dispelled the objection that light could not exist before the sun was in its present condition. And it has done even more, for it has served to prove the accuracy of the Mosaic cosmogony, which persons unacquainted with Hebrew necessarily overlook. Moses, speaking by inspiration, uses different words to express the primitive light and the luminary which God appointed to "rule the day." For when he describes, in ver. 3, the creation of light, he employs one word אור, *aor*,† to denote the light

* Arago considered that the Sun consists, first, of a dark central sphere; second, of a vast stratum of clouds suspended at certain distances from the central body; third, of a photosphere, or luminous envelope, surrounding the cloudy stratum. Sir W. Herschel calculated that the light reflected outwards by the clouds was equal to 469 rays out of 1,000, or less than half the light of the photosphere, and that the light reflected by the opaque body of the sun beneath was only 7 rays out of every 1,000. The more recent discoveries, however, by means of the spectrum analysis have somewhat modified these views.

† The word אור signifies not only light, but fire, if the Mazorete vowel points be unnoticed, as in Isaiah xlv. 16, and Ezekiel v. 2, &c. Also in Job xxi. 26, it is used for the sun, and in Job xxxvii. 3, 11, 15, for lightning. And inasmuch as God has diffused heat through every part of nature, without which there could be neither vegetation nor animal life, we may conclude that it is heat as well as light which is intended by the original word. Besides *aor* there are four other words occasionally used in Scripture to denote the sun, and which may be rendered in their more literal sense as follows:—

itself; while, in speaking of the luminary which rules the day, at ver. 16, he calls it מאור, *maor*, i.e. "a place or instrument of light," "a light-bearer," like a lighted lamp, as science has shown it to be. Hence, as M. Marcel de Serres, Professor of Geology at Montpellier, observes, "Scripture does not say that God created the light or made it, but said, 'Let it be, and it was.'" If, then, light be not a separate and definite body, but only vibrations or undulations of ether, somehow set in motion, the sacred writer could not have expressed its appearance in words more beautiful or more agreeable to truth.

87. Assuming, then, that ver. 3 speaks of the existence of light independent of that which we receive from the sun, and which in the Mosaic cosmogony is described as acting on the earth in the fourth day, when the Almighty was preparing earth for the habitation of man, we may consider whether Scripture affords us any clue to determine the duration of that period which is here so frequently mentioned under the term "*Day*."

88. It is a remarkable fact that the Hebrew word "*yom*," which we translate by the term "day," has no less than three different meanings in the first thirty-five verses of Genesis. 1. The diurnal continuance of light, or half one revolution of the earth on its axis, is called "day" (v. 5). 2. The evening and the morning combined, constituting an entire revolution of the earth, is also called "one day" in the same verse. 3. In the fourth verse of the following chapter the same word is employed to describe *the six days' creation*, or, more correctly speaking, the whole period employed in preparing earth for the habitation of man (Genesis ii. 4). And believing this period to represent what geologists term the "Post-Tertiary," I would adduce the testimony of an acknowledged authority, who observes, irrespective of any attempt to harmonize the Mosaic cosmogony with the discoveries of science, that "at the close of the Pleistocene period the present distribution of sea and land seems to have been established; the land presenting the same surface of configuration, and the sea the same coast-line, with the exception of such modifications as have since been produced by the atmospheric, aqueous, and other causes. At the close of that period the earth also appears to have been peopled by its present flora and fauna, with the exception of some local

1. *aoor*, "light"; 2. *maor*, "light-bearer"; 3. *chamah*, "heat of the sun"; 4. *cheres*, "orb of the sun"; 5. *Shemesh*, "The Visible Sun." This last, as Gesenius notices, is the primitive word for "sun," and found under the radical letters *sm*, *sn*, *sl*, in very many languages besides the Hebrew, as in Sanscrit, German, Latin, English, &c.

removals of certain animals and the general extinction of a few species."*

89. Moreover, Scripture employs the term *yom*, or "day," to denote various other periods of undefined length. Thus, in Job xiv. 6, it expresses the period of a man's life. In Ezekiel iv. 6, it represents the solar year. By St. Peter, 2 Epistle, iii. 8, it is used for one thousand years. By Daniel, viii. 14—26, the vision of one "evening—morning," a similar term to that employed by Moses, is represented as equalling a period of two thousand three hundred days. In Zechariah xiv. 7, "the day of the Lord" is defined as "one *yom*, which shall be known to the Lord, not day nor night." All these passages, to which many more might be added, are sufficient to prove that, according to the *usus loquendi* of Scripture, the term need not necessarily be limited to a period of twenty-four hours. And, consequently, many writers before the science of geology was known, such as Josephus and Philo amongst the Jews, and amongst Christians Augustine and Theodoret in ancient times, and Whiston in modern, have advocated the opinion that the term "day" in the Mosaic cosmogony denotes a period of long duration. While those who have written at a later period—such as Cuvier, Parkinson, Hugh Miller, &c., having a knowledge of geological facts before them—are irresistibly led to a similar conclusion.

90. Immediately after it is stated in ver. 5 that God called the light *Yom*, or "Day," it is added, "And there was evening, and there was morning, one peculiar day." Moses here uses the cardinal number *one*, and not the ordinal *first*, as in the Authorized Version, and as on other occasions, which appears to show that this was a peculiar day, one *sui generis*; *dies unicus*, *prorsus singularis*, as Mauer says; or, as De Witte calls it, *ein einziger Tag*; or, as Hitzig terms it, "the only one of its kind." This appears to refute the idea that nothing but a period of twenty-four hours could be meant by the term employed by Moses.

91. Further it is to be noted, that the expression "there was evening, and there was morning," which is used to express the completion of each of the six days' work, is omitted in respect to the seventh, from which we may infer that it has not yet reached its termination. The seventh day of the Mosaic cosmogony appears to be a period of undefined length; and it is not unreasonable to infer that if we can obtain from Scripture anything like its approximate duration, we have some clue to determine the length of the other six days.

* Page's *Advanced Text-book*, p. 300.

92. We read in Genesis (ii. 2, 3) that "On the seventh *Yom* (or day) God ended His work He had made; and He rested on that seventh day, and blessed it, because that in it He had rested from all His work which He had created to make." And so in Exodus xx. 2, it is said, "In six days Jehovah prepared* heaven and earth, the sea and all that in them is, and *rested* the seventh day"; from which it is argued that our warrant for observing a weekly sabbath of twenty-four hours' duration is dependent upon God's rest from His work for a similar period. But, as Hugh Miller has observed, "I know not where we shall find grounds for the belief that that Sabbath, during which God rested, was commensurate in its duration with one of the sabbaths of short-lived man—a brief period measured by a single revolution of the earth on its axis. We have not a shadow of evidence that He resumed His work of creation on the morrow. The geologist finds no trace of post-Adamic creation; the theologian can tell us of none. God's sabbath of rest may still exist; *the work of Redemption may be the work of His Sabbath day.*" †

93. If we accept this suggestion, that the work of Redemption may be, so to speak, the work of God's rest, or Sabbath day, it may serve to explain our Lord's words, "My Father worketh hitherto, and I work" (John v. 17), as showing that when God rested from the work of Creation, He commenced the work of *Redemption*, by planning out a mode consistent with His justice, whereby man might be restored to that Divine image in which he had been originally made, but had lost when Adam fell. Thus God's sabbatic rest becomes a restoring process, a building up from the ruins of the fall, including both a Divine purpose and a Divine work, in raising man to a higher level than that on which the material creation placed him. In this work both the Father and Son are said to be engaged, the work of the one being a reflex of that of the other—a work in which the profoundest rest is not excluded by the highest activity.

94. Have we, then, any intimation afforded in Scripture of the duration of God's day of rest? I think we have. The

* It is necessary to remind the English reader that the word "made" in the Authorized Version is very far from conveying the actual meaning of Moses's teaching; as it is very naturally understood to express the same sense as "in the beginning God created the heavens and the earth." But a totally different word עָשָׂה is employed here, and which can only be adequately rendered by the English word "prepared" or "made ready," as Jehovah prepared the earth for the use of man.

† Miller's *Footprints of the Creator*, p. 307.

best chronologists amongst Jews and Gentiles, who take their stand upon the infallible Word of God, are agreed in this, that the age of man on earth, since the time of Adam, is limited to a period, speaking in round numbers, of six thousand years.* But, inasmuch as Scripture speaks also of a future millennial period of blessedness, lasting for one thousand years, which is termed in Hebrews (iv. 9) "a rest or keeping of a Sabbath by God's people," we find that Christ's kingly rule over His "possessions in the uttermost parts of the earth" (Psalm ii. 8) is then said to end. Then will come the end of this age, as St. Paul declares, "when Christ shall have delivered up the kingdom to God, even the Father . . . that God may be all in all" (1 Corinthians xv. 24, 28).

95. Scripture records in many places the creation of a new heaven and a new earth, as well as many physical changes on the surface of our present globe, which, it may be supposed, will resemble the geological changes of the past; and therefore we are warranted in assuming that God will resume His creative power at the termination of the period known as the millennium, when His rest-day will of necessity come to end, which would appear on Biblical authority to have extended through seven thousand years; and if this be a correct estimate respecting the duration of one Yom or day, on the principle of analogy we may understand the remaining six Yoms to be of the same duration.

96. If this reasoning be correct, nearly fifty thousand years must have passed away since the beginning of the post-tertiary†

* Of modern chronologers, Clinton considers the 6,000 years since the time of Adam to have expired about A.D. 1862. Usher's date would bring it up to A.D. 1996; and the current chronology of the Jews about a century later still. It is unnecessary to notice the various hypotheses which those who ignore Scripture authority, have propounded for the age of man on earth; whether it be the modest proposal of the late Baron Bunsen, who fixes it at B.C. 20,000; or the Brahmin chronology, which, according to Sir William Jones, allows him an antiquity of 4,300,000 years; or that of Professor Huxley, who in his speech at Norwich contends that "the appearance of man on the globe should be thrown back to an era immeasurably more remote than has ever yet been assigned to it by the boldest speculators!" The earliest proof of man on earth is unquestionably a tablet now in the Ashmolean Museum at Oxford, from the tomb of a priest named SHERA, containing the cartouche of the reigning sovereign King Senta, before the name of "Pharaoh" was known in Egypt, which may be approximately dated as B.C. 2,300, or three centuries before the time of Abraham. All beyond this is mere speculation.

† M. D'Orbigny, who together with M. Elie de Beaumont, has mapped out the geography of Europe during the Jurassic age with great care, asserts in his *Prodrome de Paléontologie*, that not a single species, either animal or vegetable, is common to the tertiary and the post-tertiary or human periods;

period, when God began to adapt earth for the habitation of man. But we learn from the Mosaic record that the earth did not exist in its present condition until the *third* of these Yoms,—“God called the dry land Earth, and there was evening and there was morning, a *third Yom*.” Supposing, then, seven thousand years to be the duration of each of these Yoms, including that wherein God is now said to be resting, this would give, after deducting two of these Yoms, or 14,000 years before the earth appeared in its present condition, from the forty-nine thousand years, the sum total of the whole, a period of thirty-five thousand *years* as the duration of the period, reckoning from the third Yom until the present time.

97. Many tests have been suggested by geologists in order to measure the age of the post-tertiary period, the favourite one being dependent on the time required to fill up the deltas of the largest rivers known on earth; but for various reasons such data are too uncertain to allow any dependence to be placed upon them, through the impossibility of making a correct estimate of the annual rate of these subaqueous deposits. There is one test, however, which seems to afford some grounds for arriving at something like a sounder conclusion, and that is the computed age of the falls of Niagara. Sir Charles Lyell,* after the most careful inquiries which he was enabled to make on the spot in 1841, came to the conclusion that the average of *one foot* per year was the rate at which the waterfall has been cutting through its stony bed; and he considers that it would have required 35,000 *years* for the retreat of the Falls, from the escarpment at Queenstown (a distance of seven miles) to their present site. If this be a correct estimate, we may fairly infer that we have some clue to the approximate duration of the *Yoms* or “days” mentioned in the Mosaic cosmogony.

98. With regard to the formation of man, and the teaching of the human race having sprung from one pair, as stated in the Mosaic record, my space prevents me from entering upon

and therefore, in his opinion, a break must have occurred previously to the human period, since it is through species alone that an hereditary succession is kept up. This conclusion has, however, been denied by other geologists.

* Lyell's *Principles of Geology*, vol. i. ch. x. In reference to the Falls of Niagara, which are situated between Lake Erie and Lake Ontario, the level of the former being 330 feet above the latter, Sir Charles Lyell utters a very solemn prediction concerning a future catastrophe which he considers will inevitably happen in that region of the earth. He says, “The existence of enormous seas of fresh-water, such as the North American lakes, is alone sufficient to assure us that the time will come, however distant, when a deluge will lay waste a considerable part of the American Continent!” ch. v.)

that question now, so I must content myself with adducing the testimony of an acknowledged authority, the celebrated Dr. Pritchard, who had investigated the subject as deeply, perhaps, as any man who ever lived, and whose conclusions are set forth in the following words:—"On the whole, it appears that the information deduced from this method of inquiry is as satisfactory as we could expect, and is sufficient to confirm, and, indeed, by itself to establish, the inference that the human kind contains but one species, and, therefore, by a second inference, but one race. It will, I apprehend, be allowed by those who have attentively followed the investigation of particulars, that the diversities in physical character belonging to different races present no material obstacle to the opinion that all nations sprang from *one original*, a result which plainly follows from the foregoing consideration."* To which I would add, that "one original" must have been a separate act of creation on the part of the Divine Creator, and not the outcome, in the process of development, of an ascidian tadpole, according to the favourite hypothesis of certain *savans* in the present day. †

99. In summing up a review of those heathen cosmogonies at which we have slightly glanced, rather than considered at any length, and comparing them with the Hebrew, we cannot help noticing the vast gulf between the two ‡. The only

* *Researches into the Physical History of Mankind*, by James C. Pritchard, M.D., vol. ii. p. 589. The great question between Mr. Darwin and those who oppose his views may be said to consist in this:—"Is man a separate act of Creative Power?" The Bible teaches that he is—Mr. Darwin, the contrary. It is satisfactory to know that the results of a large number of experiments made by Dr. Parker, President of the Microscopical Society, and Professor Huxley, tend to prove that man must have been a separate creation. (See *Transactions of Victoria Institute*, vol. vii. p. 282.) On the question, however, of mankind being descended "from one original," as Scripture teaches, and Dr. Pritchard considers that he has proved, Professor Huxley observes, in an article in the *Fortnightly Review*, "On the Methods and Results of Ethnology," that the idea of our descent from Adam and Eve is quite a mistake. "Five-sixths of the public," he says, "are taught this Adamitic monogenism, as if it were an established truth, and believe it. I do not; and I am not acquainted with any man of science or duly instructed person who does."

† It was a profound saying of William Humboldt that man is man only by means of speech, but that in order to invent speech he must be man already. —Lyell's *Antiquity of Man*, p. 468.

‡ Even Mr. Goodwin, with all his apparent prejudice against the Mosaic cosmogony, is obliged to admit that in the Biblical record "things are called by their right names with a certain scientific exactness widely different from the imaginative cosmogonies of the Greeks" (*Essays and Reviews*, p. 223). Justin Martyr was justified in asking, "Who can believe in the drivelling theogony of Hesiod?" (*Discourse to the Greeks*, ch. ii.). And a member of

important resemblance of any ancient cosmogony to the Mosaic record is to be found in the Persian, which may be accounted for by the probability of Zoroaster, its founder, having been brought into contact with the Jews at the court of "Darius the Mede," at the close of the Babylonish captivity; though, as we have seen, some parts of it are of such a fabulous nature as to forbid the thought of their being taken from the cosmogony revealed to Moses, who could not have written as he did, in such accordance with the discoveries of true science, without the direct inspiration of God.

100. In the brief and rapid outline sketched in Scripture relating to astronomy and geology, we are enabled to see the all-perfect harmony which must ever exist between the word and the works of God. To mention only a few instances. 1st. We have the simultaneous creation of the heavens and earth at so remote a period that it requires the known rate of the speed of light to enable us to grasp either its magnitude or its age. 2nd. The earth is represented as being balanced in the air, poised by its own weight—a somewhat different conception from that of the Hindoos, who declared it to be resting on a big snake, which is itself upheld by a gigantic tortoise; but who supports the tortoise they cannot tell. 3rd. Moses teaches that the luminary which God appointed to rule the day is only a light-holder, the truth of which astronomy confirms by showing the sun to be an opaque body, dependent for its light on a luminous atmosphere. 4th. Light is said in the Mosaic record to have existed independent of the sun, which science has proved to be the case, in place of its being, as was very naturally supposed by all nations, the sole source of light and heat. 5th. Moses teaches that there is an expanse extending from earth to the ends of the Universe in which all the heavenly bodies are placed; and recent discoveries lead to the supposition of some subtle fluid in which they all move. 6th. Man is represented as having been created after the fowls, the fishes, and beasts of the field, which the modern science of geology has at length discovered to be the case.

101. With reference to the origin of the human race, the subject of so much discussion in the present day, the more we reflect on the strange nature of man, the anomalies he presents,

this Institute very properly argued that "one proof of the inspiration of the Bible is seen in the fact that in all other cosmogonies the greatest folly and nonsense is talked; while in the Bible it is sublimely stated that in the beginning God created all things" (*Transactions*, vol. vi. 161).

the knowledge of his power to do so, and his unwillingness to attempt it, according to the fine saying of the poet,—

Video meliora proboque
Deteriora sequor—,

we ask, What philosophy, ancient or modern, has ever been able to account for all these things? But the whole subject is revealed to us in the majestic narrative of Scripture—how man was originally created in the image of God, and how he lost it through the fall. Place side by side these two statements—the theory that man is no better than a well-developed ape, and the Biblical statement that he was created after the image and likeness of his Maker; the one based on the testimony of Revelation, and the other on the mere conjecture of a speculative human being; and it will surely approve itself to the intelligent mind that on such a subject science has no evidence to offer which can be compared to the proof afforded by the Bible. It is true that the fall has darkened our reason, but it has not destroyed it. There is light enough, as Pascal has pointed out, for those whose sincere wish is to see, and darkness to confound those of an opposite aim. We encounter objections to our faith, some of which it may be difficult to answer in consequence of our ignorance, and proofs drawn from our knowledge in the opposite scale. Concerning the evidence in the Biblical record, it has been well said, “If it were greater the Gospel would cease to be a faith, if it were less the Gospel would become a superstition. If it were more there would be no probation for the heart, and if less no grappling point for the reason.” But, alas! how often is the voice of reason drowned in the cry of imaginative folly! To what absurdities will not the understanding often assent when the will has determined upon their advocacy! How little way can truth make with the intellect when there is something in its character which opposes the inclination; as it has been remarked, that Athens was but the rudiments of Paradise, and an Aristotle or a Socrates only the rubbish of Adam. Dryden, in his *Religio Laici* has forcibly expressed this idea in the following nervous lines :—

Dim as the borrow'd beams of Moon and Stars
To lonely, weary, wandering travellers,
Is reason to the soul : and as on high
Those rolling fires discover but the sky,
Not light us here ; so reason's glimmering ray
But guide* us upward to a better day.

* In the edition of Dryden's Works, 1808, now before me, it is printed *guide*, not *guides*—the former being allowable.

And as those nightly tapers disappear
 When day's bright lord ascends the hemisphere,
 So pale grows reason at religion's sight,
 So dies, and so dissolves in supernatural night.
 Some few, whose lamp shone brighter, have been led
 From cause to cause to Nature's sacred head,
 And found that one First Principle must be,
 But what, or who, that universal He ;
 Whether some soul encompassing this ball,
 Unmade, unmoved ; yet making, moving all,
 Of various atoms' interfering dance,
 Leap'd into form, the noble work of chance ;
 Or this great All was from Eternity,
 Not even the Stagyrte himself could see ;
 And Epicurus guess'd as well as he.
 As blindly groped they for a future state,
 As rashly judg'd of Providence and Fate ;
 But least of all could their endeavours find,
 What most concerned the good of human kind.

* * * * *

Thus anxious thoughts in endless circles roll
 Without a centre where to fix the soul ;
 In this wild maze their vain endeavours end,
 How can the less the greater comprehend ?
 Or finite reason reach infinity ?
For what could fathom God were more than He.

The CHAIRMAN (Rev. Preb. Currey, D.D.).—I am sure we all thank Mr. Savile for his able paper ; and it will be open for those present to offer remarks thereon, after two communications have been read.

The HONORARY SECRETARY.—The following remarks upon the paper have been sent in by Professor Birks, M.A., of Cambridge:—

“ I have read Mr. Savile's paper with much interest. The first twenty-two pages, which give a summary of heathen cosmogonies, do not call for any observation. In the other thirty pages there is much with which I agree, and a good deal from which I differ. My remarks will naturally turn chiefly on the points of difference. I agree with Mr. Savile—(1) that Gen. i. 1, refers to the original act of creation, distinct from the six days' work, which was the preparation of our planet for the abode of man ; (2) that a long, undefined period separates the beginning from the first of the six days ; (3) that Gen. i. 2, describes not the first state of the earth, but a later state, just before the six days began, and probably implies a previous convulsion, involving general, if not complete, destruction of any precedent forms of life ; (4) that this probably answers to the post-tertiary or close of the tertiary period ; (5) that each of the six days must be a period of equal or nearly equal length ; (6) that man was created last in order, and at a date, geologically, very modern and recent. The points on which I differ are these : (1) that Mr. Croll's hypothesis is either proved or provable, or probable, which explains the glaciation of the earth by a greater excentricity

of the earth's orbit, either 800,000 or 200,000 years ago; (2) that Sir W. Herschel's earlier speculations on the Milky Way and the nebulae are worthy of confidence, being half-abandoned in his own later papers, and wholly disproved, I think, by still later observations; (3) that the words of Scripture not only admit, but require, a vast interval from the first creation, so that these speculations, if they were part of the science of astronomy, and not rather erroneous guesses, could be truly said to confirm its teaching (§ 75); (4) that a comparison of vv. 5, 14 and 16, proves that the light of the first day was wholly independent of the sun; (5) that the nebular theory lends thus a direct confirmation to the Mosaic record; (6) that *yom*, because it may sometimes be used in other senses than a natural day, may be so used in this case, where it is joined six times with a numeral, and is composed, each time, of successive periods of darkness and light; (7) that each of the six days was a period of 7,000 years; and lastly, that the world's history, from Adam till the close of a future millennium, is really the seventh day, or God's Sabbath of rest. I. Mr. Savile starts from Mr. Croll's work, published last year, which he praises as one 'of the highest order of scientific knowledge,' and says that 'a somewhat perplexing point for our geologists, naturalists, and botanists may now be accounted for by the gradual advance of science in our own times.' I think, however, that this facility in accepting the latest guess or hypothesis of scientific men as a proved conclusion of science is a delusion and a snare, and has wrought, not only temptation to the faith of Christians, but injury to the progress of science itself. In Mr. Callard's essay, 'the Geological Evidences of Man's Antiquity re-examined,' Mr. Croll's hypothesis is reviewed, and I think it is shown, very plainly, that it is quite inadequate to account for the facts it attempts to explain. How uncertain are these estimates may be shown by one extract. 'Sir Charles Lyell, in the earlier editions of his *Principles of Geology*, favoured the view of Mr. James Croll, that the ice age was 800,000 years back; he, therefore, placed man's origin near that period. But Sir John Lubbock considered 210,000 years to be a more probable time; and to this latter antiquity both Mr. Croll and Sir C. Lyell afterwards give in their adherence, and it is also adopted by Mr. Geikie in his recent work, *The Great Ice Age*; the calculations of Mr. Croll go to prove, simply, that the excentricity of the earth, about 210,000 years ago, would be ten and a half millions of miles, and, 850,000 years ago, thirteen and a-half millions. Taking the lower date, the distances of the earth from the sun would vary from 81 to 102 millions of miles, a ratio of four to five, and the ratio of incident heat, in aphelion and perihelion, would be nearly two to three. Thus the excess or defect at the extremes would be one-fifth of the mean value. The theory assumes that the northern hemisphere will be subject to the greatest cold when its winter solstice is in the aphelion. But Mr. Callard observes, I think decisively, that Mars has a greater excentricity than this ascribed formerly to the earth, and is more distant from the sun, and yet gives no sign of an ice age, and the snow cap never extends more than six degrees from the pole. Still further, it seems very doubtful whether the effect would not be both very much smaller than the theory requires, and of an opposite kind. An addition of one-fifth to the incident heat at the winter solstice would be greater than the defect of one-fifth heat at the summer solstice, because the mean incident heat is less in winter than in summer. It seems to me that while the winter cold and the summer heat would both be greater by an increased excentricity, the total heat incident on the northern hemisphere, when its winter is in the aphelion, would be increased, and not diminished. At any rate, the difference is so slight, either way, in the total amount, that it could never account for a glacial period. II. Again, Mr. Savile remarks that 'stars situated in the more remote edges

of the Milky Way require a period of 20,000 years for the transit of their light, according to the estimate of Herschel; and the splendid nebula in Orion would absorb 60,000 years for the transit of light to our system. But the elder Herschel's estimates were based on an assumption of the nearly equal size of all the stars, and their nearly even distribution, which all his own later discoveries and modern observations have completely disproved. His great discovery of binary and triple stars was the first blow to the system. The Magellanic clouds, as Sir John Herschel candidly admits, furnish a strong argument against the view that a nebulous appearance is the result of greater distance alone. Mr. Proctor's reasonings and observations seem almost to prove that all the parts of the Milky Way are in physical connection with each other, and hence that there can be no immense disparity of the distance of its various parts from the sun. Again, the nebula in Orion is said to be 60,000 years of light distant from us, or 20,000 times as remote as the bright star of the Centaur. But θ Orionis is a sextuple star, of which four components form a trapezium, and are of the 4th, 6th, 7th, and 8th magnitudes. And within this trapezium, Sir J. Herschel remarks, there is no nebula. They are also in the neighbourhood of the opening of the jaws, a part where there is a void space of large extent. Hence there must be a strong presumption that this sextuple star has been condensed from the nebulous matter, where it is now missing. In this case, the distance of the nebula would correspond to that of stars between the 4th and 8th magnitudes; or light might, perhaps, travel from it, not in 60,000, but in a time of from 20 to 30 years. At least, the high numbers quoted from Sir W. Herschel and Professor Nichols have no solid warrant. When two causes, distance and inferior size, might equally occasion inferior optical magnitude, the reasonable course, in the absence of other data, is to assign it equally to both. Thus, instead of reckoning 20,000 years for the smallest distinct stars in the Milky Way, the more reasonable reckoning would be that they are really a hundred times smaller than α Centauri, and about a hundred times further off, or their distance answering to 200 or 300 years only. I wholly disagree with the statement (§ 79) that the mention of light as created before the sun is 'one of the strongest testimonies possible to the Divine authority of the Mosaic cosmogony.' It is quite enough for believers in the inspiration of the Bible that it furnishes no argument against that authority. Mr. Savile refers to the conclusions of science that light may and does emanate from other sources. He seems to think that the sun may have existed for a time without its photosphere, and that this was added by a distinct act of creation. Now that is possible in the abstract, but wholly opposed to the general scope of modern scientific theory. The most simple and natural view is that the light of the sun depends on its immense mass and the process of central condensation. But Mr. Savile refers the beginning of the first day to the post-tertiary period, about 48,000 years ago. Now Mr. Croll's theory, which he also adopts, ascribes the glacial period to great varieties of solar heat and light, due to the excentricity of the earth's orbit 800,000, or at least 160,000 years earlier than this date. The two opinions are thus wholly irreconcilable. If the sun was not the light-giver fifty thousand years ago, the other hypothesis would be plainly excluded altogether. But even rejecting that theory, which I believe we ought to do, as quite baseless, there can be no doubt, I think, that the sun was really the source of light during the tertiary and pre-tertiary periods. If so, we are forced back to what I believe is the very consistent exposition, that the narrative is optical, that the light of verse 3 was really, but not visibly, sunlight, because sun, moon, and stars, as discs in the sky, had not yet become visible to a spectator upon earth. So the heavens and earth which are now, are contrasted with those before the Flood, which are spoken of as having perished, because they were wholly blotted out from

human view, and disappeared.* I cannot spare time to enter on two other main questions,—whether the six days are literal or figurative, and whether the world's history can be the seventh day of Moses, or God's Sabbath of rest. On both I wholly disagree with Mr. Savile, and have seen nothing to alter my conviction that the six days are literal days, and the sixth the first day of Adam's lifetime. The strength of the argument for this view does not depend on an assertion that *day* can never have a figurative or extended meaning, that would be plainly absurd to affirm; it rests on the double and triple fact, that this light-time is named *day*, just as the dry land is named earth, and the gathering of the waters is named seas, which fixes day, night, sky, earth, seas, to their usual and customary sense; that each of these days consists of an evening of darkness followed by a morning of light; and that they are joined with ordinal numbers, of which no single instance, either in Scripture or other authors, can be found in the case of figurative or metaphorical days. And besides, if all the six days follow the tertiary period, as Mr. Savile, I believe rightly, affirms; there is no gain whatever for the reconciliation of Scripture with geological science, in extending their length to seven thousand years.—With thanks to Mr. Savile for his interesting and suggestive paper, I remain, yours respectfully, T. R. BIRKS. Cambridge, Feb. 2, 1876.”

I have also received the following from Professor Challis, F.R.S., F.R.A.S., of Cambridge :—

“I have had some conversation respecting Mr. Savile's paper with Professor Birks, who agrees with me in disapproval of some of the author's views. For my own part, I never could accept Buckland's idea of interposing an interval of long duration between the first and second verses of Genesis i. Mr. Birks agreed with me in the opinion that Croll's theory of changes of the earth's temperature, resulting from changes of the eccentricity of its orbit, which Mr. Savile accepts without hesitation, is not adequate to account for the observed facts of geology. I think, too, that Mr. Savile has made too much of La Place's nebular hypothesis, which is altogether speculative, not having received, and, as far as I can see, not being capable of receiving, any such confirmation as that on which Newton's theory of gravitation rests. I have noticed an inaccuracy as to matter of fact in sec. 74. Lord Rosse's telescope showed that a great number of minute stars are scattered about the great nebula in Orion, and thus *partly* resolved it; but the spectroscope has since proved that, in addition to these stars, there is a large portion of the nebula which is strictly nebulous or gaseous matter, and therefore quite irresolvable. Do what you please with these remarks.—I am, &c., J. CHALLIS.”

The Rev. Prebendary Row.—There are some parts of Mr. Savile's paper upon which I would wish to make a few observations; and, first, as to the Jewish work, *Zohar*, I believe it is full of a greater mass of extravagance than any other book. Most certainly many other literary productions of that time are full of the wildest speculations. There is one thing which I saw in section 51 of Mr. Savile's paper which astonished me, and made

* This question was taken up by Dr. Dawson, F.R.S., who says (*Journal of Transactions*, vol. ix. p. 173): “The Bible abounds in illustrative references to natural objects and phenomena. I think it is the conclusion of all competent naturalists who have carefully studied these, that they are remarkable for their precise truth to Nature, and for the absence of all theoretical or hypothetical views.”

me question the general character of the references which the author has made, as to whether they had been fully verified: "There are those who stand midway between atheists and theists, like Professor Tyndall, and content themselves with a sort of ideal Deity of their own composition; while others, like Herbert Spencer, are unable to make up their minds as to the existence of a God or not." Now, if one thing is more certain than another, it is that Herbert Spencer maintains in his philosophy that the conception of a God as first cause is an actual necessity of thought. Such is the unquestionable opinion of Herbert Spencer. It is abundantly borne out by the cosmical philosophy of Mr. Fisk, which I have just been reading, who is a devout disciple of Herbert Spencer. When I took up this paper I had been writing, as part of my lecture for Norwich Cathedral, a comparison between John Stuart Mill and Herbert Spencer; Mill denying that the principle of causation affords any proof of the existence of a God, and Herbert Spencer distinctly affirming that a first cause to the universe is a necessity of thought. On the question of ancient philosophy the Christian Fathers are quoted, and among others Justin, as being authorities as to the tenets of the ancient Greek philosophers. Now, you cannot rely on worse authorities. Several of the Fathers were very desirous of forcing the Greek philosophers into a sort of advocacy of Christianity. If you wish to get at the real opinions of the Greek philosophers you cannot rely on guides who are more untrustworthy. We know that they were anxious to get the ancient philosophers into Egypt, in order that they might bring them into contact with the ideas in the Old Testament; but there is a very general disbelief that many of them ever visited that country. Nothing can be more doubtful than the evidence on which this rests. Again, in sec. 24, there is another reference to the authority of the Fathers. It is many years since I have read Aristotle's *Treatise on the Soul*, but I recollect his observations on it in the *Ethics*. This is what Mr. Savile gives us, in reference to the assertions of Aristotle:—"Likewise, respecting the soul, while Plato says it consists of three parts, including the faculties of reason, affection, and appetite, Aristotle declares the soul is not so comprehensive, but only includes *reason*." In the *Ethics* the contrary is most distinctly affirmed. I do not accuse the author of this paper of misrepresenting the Fathers, but I say this merely to show you that such references to them are worthless and misleading. If we wish to have the real opinions of those ancient philosophers, the proper mode would be to refer to the statements of those great authorities, or to the philosophers themselves, instead of taking those of the Fathers, which cannot be relied upon. I am aware that there is considerable doubt about the Aristotelian canon; but it has been fully discussed in several of the greatest modern works, such as of Grote, Lewis, and others. Grote has found considerable difficulty in determining it. In the time of Cicero it is clear that other works must have been attributed to Aristotle than those which we now possess, for Cicero speaks of the great pleasantness of his style, and that is certainly not its characteristic in the

works which we have at present. An eminent writer says that Aristotle's style is so dry and terse that it is more like a table of contents than anything else. There is no doubt that if you read some of the Platonic writings, for instance, the *Phædo*, you will find that there are things in them which, doubtless, are not meant to be taken seriously; fancies which are not meant to be seriously propounded as realities. Take also Mr. Savile's reference to the earlier philosophers; there is the greatest difficulty in ascertaining what their opinions were. The best writers represent them vaguely, and what we have of their works are mere fragments. We need not, therefore, wonder, when we read them, that they seem exceedingly strange. But as these men lived at the very first dawn of human thought, we ought not to expect to find anything like a very coherent theory respecting the universe. There is one philosopher, Pythagoras, who is referred to in the paper; now, nothing is more doubtful than the history of Pythagoras and the subjects of his teaching. If he is correctly reported to have discovered the forty-seventh proposition of the First Book of Euclid, he cannot be responsible for some of the excessively stupid things which have been attributed to him. Our knowledge of him, and of many of his doctrines, rests on an authority which is extremely doubtful, and which can only be accepted with the very greatest care. There cannot be a doubt that the speculations of many of the ancient philosophers were very wild and vague. This could not well be otherwise, for they had no facts to go upon. They were mere *à priori* speculations, and could not be of much assistance to us one way or the other. I wished only to point out two or three things which appeared to me to be exceedingly doubtful in Mr. Savile's paper, and among them his references, which have rather shaken my faith in the value of others in the paper which I have not been able to verify.

Mr. T. K. CALLARD.—I see from the valuable paper we have listened to this evening, that Mr. Savile regards the days of creation,—the six yoms,—as six epochs of time, and supposes each yom to be a period of 7,000 years. This appears to me to be adding a fresh difficulty to the reading of Scripture, instead of removing one. I can well understand why Hugh Miller should contend for the days being immense epochs, for he thought that by so doing he was gaining the time required by geology for the great antiquity of the globe; but then Hugh Miller supposed the days to begin with the construction of the globe, whilst the yoms of Mr. Savile only date from the post-tertiary period. Mr. Savile has already got rid of the difficulty arising out of the earth's antiquity by reading Gen. i. 2 (*Tho hu* and *Bo hu*), "without form and void," not as the chaotic condition of the primary creation, but as the desolation of the earth's surface, with the destruction of the flora and fauna, at a subsequent period, yet prior to the creation of man. I think the author is perfectly right in this rendering; for in no part of Scripture do these words occur without referring to something which has had form coming into a state of disorder,—it never refers to a chaotic condition of material that has not yet received form. If then there

has been any devastation on the earth corresponding to the description of Gen. i. 2, in recent geological times, and if the yoms date from that period, then there is plenty of time for the Palæozoic, Mesozoic, and Cainozoic eras, without making the yoms also great epochs. It appears to me that the most natural way of reading Genesis, is to think that a day means a day, and not 7,000 years. And nothing is gained by the extended time; the difficulty of time is met by the yoms commencing, as stated, in the post-tertiary period. There is no difficulty in the yoms being natural days that would be removed by making the six days 42,000 years. I would now, in support of Mr. Savile's interpretation of Gen. i. 2, ask the question, Whether physical science knows of any great devastation of the earth's surface and destruction of the flora and fauna taking place in the post-tertiary period, that would correspond with the *Tho hu* and *Bo hu* of that verse? And I would repeat the question that I put some years ago,—whether the glacial epoch was not the period of such destruction of the flora and fauna as would make the creation recorded by Moses a necessity, if life was to be continued on the globe? Mr. Savile has quoted an eminent geologist, Mr. David Page, who without any attempt to harmonize the Mosaic cosmogony with the discoveries of science, says, that at the close of the Pleistocene period “the present distribution of sea and land seems to have been established, and at the same period the earth also appears to have been peopled by its present flora and fauna.” And M. Agassiz, after exploring the valley of the Amazon, in an address given before the Cooper Institute, New York, and quoted in the *New York Tribune*, December 30th, 1873, says, “that the valley of the Amazon about the equator was filled by a vast glacier which came down from the Andes, and went into the Atlantic; the ice then, perhaps, covered the sea to such an extent that it is a question whether any open water was left at the equator, as it is a question whether there now is open water at the pole. And if this be so,” he adds, “you see at once how this intense cold must have modified the surface of the globe to the extent of excluding all life from the surface, . . . and prepared the earth for the new creation which now exists upon it.” If Agassiz is right (and modern discoveries are leading to the conclusion that the glaciation of the globe was vastly greater than was at first suspected), and if it can be made out that man's creation took place near to the time of this glacial period, it will be for us to consider whether that glaciation was not the cause of the “without form and void” of sacred Scripture. A difficulty in recognizing this will exist in the mind of Mr. Savile, arising from his having accepted for the present the theory of Mr. Croll respecting the cause of the glacial epoch, which theory, if correct, would necessarily place the glacial period at 210,000 or 850,000 years back, because astronomy teaches us that those were the periods when there occurred great excentricities of the earth's orbit. But if it should be proved, and I think it can be proved, that the excentricity of the earth's orbit, together with the precession of the equinoxes, was not the cause of the glacial epoch, then there

is no reason for putting it back to that remote period. Now if this *Ice Age* was of the character supposed by Agassiz and its effect so widely felt, and if it had passed away just before the time of man's creation, it would have left the world in the condition supposed by Mr. Savile's interpretation of the "*Tho hu* and *Bo hu*" which preceded the six yoms of creation, and would be an important and an unexpected note of harmony between geological science and Bible teaching.

Rev. J. J. COXHEAD.—It appears to me, that both in the paper and in the debate, one line of argument has been followed, which I think is scarcely fair under the circumstances. It is this, the ideas of one age have been compared with, or attributed to, those of another, when such a proceeding was not warranted. And are we not arguing on two distinct lines of thought, and is it possible to institute a fair comparison between the two? With regard to the question of fossils, and periods, and strata, and glacial epochs, when we come to compare them with the sublime declaration of the Word of God, it appears to me that we are bringing into our argument two sets of ideas which are not at all to be compared with each other. I do not suppose that Moses ever heard of the glacial epoch, or that the Egyptians, or the Jews, ever conceived the idea of fossils or geological periods. In fact, we are bringing in modern ideas and attempting to compare them with Scriptural ideas, with which they have nothing in common. The point is, whether we have a right to consider the Mosaic account of the Creation at all in the light of a cosmogony. The only cosmogony which we can consider to be scientific is that cosmogony which we are led to infer from the truths of geology; and if we are bold enough to carry our speculation further, as to the power of the nebular hypothesis, and still further as to the nature of the primordial atoms, of which you consider the universe to consist, I think we get ourselves into a range of ideas totally different from those which we obtain from the account of Moses. We shall make a great mistake, in my opinion, if we attempt in any way to compare these things with Scriptural teaching, or to make the one support the other. In six days, we are told, Creation took place, and that is confirmed by the fourth commandment. When we hear of the periods of time between the days, we find that is contradicted by the fourth commandment, which tells us distinctly in so many words that in six days the Lord made the heavens and the earth. If we want to know whether those days were periods of 7,000 or 14,000 years each, we have only to consider the words "the evening and the morning." We do not talk in that way of periods of 7,000 years. There is a simplicity about that language. It is language addressed to children, intended to impress upon our minds the idea of the omnipotence of God; and that as man works six days and rests on the seventh, so God, the great Creator, made all things, working in a fixed time, in regular method, and by rule. If we go into any speculation and attempt to apply geology to Genesis, we shall fall into a very great mistake. The object of Genesis is to teach us religion; the object of geology is to teach us the science of creation. If we go back to the question of atoms, we ask, who made the atoms? and science cannot answer that. When we fall back on

Genesis, we are told that God made the heavens and the earth, and everything else. I have been somewhat disappointed by this paper. I expected that reference would have been made to the *Timæus* of Plato, which gives us the basis of the Greek cosmogonies. Plato tells us how God made the world out of the four elements, according to fixed ideas in His mind, and formed all things by means of inferior deities whom He had created. Many of the moral and spiritual notions of Plato agree in a remarkable manner with the teachings of Scripture, but that has not been referred to in the paper before us.

Rev. J. W. BUCKLEY.—I cannot but think that the word "day" in Genesis means some longer period than that which we ordinarily understand by "day." There is no great difficulty in supposing that the word "day" means a period. We shall surely get ourselves into a very great fix as theologians, if we maintain, after the researches of science, that the days of creation are what we understand by days. I do not know whether that is what Mr. Coxhead means.

Mr. COXHEAD.—Yes; I do mean a day, from the rising to the setting of the sun.

Mr. BUCKLEY.—I should be sorry as a clergyman to be bound by that definition; and I do not believe that great theologians at any time have really held that view. I am afraid we shall set Science and Scripture hopelessly at issue, if we dogmatically adopt such an interpretation. Nor need we be perplexed, if we suppose "day" to mean a period, as to how we should then understand the institution of the Sabbath.* We should believe that the seventh period was God's period of rest, and that He set apart the seventh day in each week as man's period for rest; not, indeed, of the same absolute length, but in like proportion.

A MEMBER.—There have been several attempts to harmonize the account given by Moses with modern science, but many have been too prone to accept every statement of geology and astronomy as the expression of an unalterable truth. I think that we cannot shut out from our knowledge that both sciences have been growing. There have been divines in years gone by who have reconciled systems of geology or astronomy with Scripture; and when those systems have changed other divines have reconciled the new systems with Scripture. And so they have gone on, and there are in the present day divines who are trying to reconcile Genesis with modern science. But I would ask, are we to accept the teachings of science as final? "Scio" means "I know," but many of our so-called scientific truths are mere assumptions. Scientific men assume very many things in the present day, and have gone through a uniform process in all times. It is true that in our own day scientific assumptions are often advanced as "working theories,"

* Professor Challis has fully taken up this, as well as other points touched upon in Mr. Coxhead's speech; see vol. ix. p. 143.—Ed.

and we often find unscientific people regarding such working theories as the accepted results of scientific inquiry.

The CHAIRMAN.—A thought has occurred to me in the course of this debate which seems in accord with the remarks made by Mr. Coxhead, whether there is such a thing as a Hebrew cosmogony at all. We know that the ancient philosophers accounted for the state of the universe by suggesting some hypothesis with which it might seem to accord. We need not enter into the various strange hypotheses brought forward by the Eastern nations, although we must remember that in those hypotheses they were not so extravagant as may appear to ordinary Englishmen ; because, no doubt the expressions which they used had a symbolical meaning in them, and probably a more abstruse and philosophical sense than may at first sight appear. But while so many have thus endeavoured to devise cosmogonical theories, I do not discover such an attempt in the books of Moses, and I think we should be cautious in speaking of any cosmogony as authorized by Scripture. There are certain hints given in the Book of Genesis, but what we really get is the great fact that a personal God created all things and all persons ; all that exists in heaven and on earth ; and although that creation is narrated in a certain order, it is not, to my mind, at all necessary to suppose that Moses intended to dwell very much upon the distinct order in which those several objects were called into being. For whatever has been said with regard to the creation of light independent of the luminous body*—the sun—there is certainly great difficulty in the supposition. There is great difficulty in supposing the creation of luminiferous ether in one day, and in supposing the creation of the sun the day after, especially if there was, as some say, an enormous break in the tertiary period, and so on. But geological evidence will show that during the tertiary period and the secondary period also, a sun must have existed, for the fossils have visual organs similar to those which animals now possess, fitted, like theirs, to receive the rays of the sun ; nor can we conceive a vehicle of light (luminiferous ether) without the light which it is to convey. I read the opening chapters of Genesis as a

* " With respect to the *creation* of 'the greater light' and 'lesser light' on the *fourth* day, it is to be observed that the principle of the narrative demanded that their existence should date . . . from the time when they began to determine days, and months, and seasons, and years . . . Still, it is to be said that *scientific* reasons might be given for dating the visible existence of the luminaries from the fourth day, if physical science, inclusive of the science of geology, were in such an advanced state as to allow of determining the forces and the operations whereby successive changes in the earth, the sea, and the atmosphere were produced in the geological epochs. (I have made some attempts in this direction in pp. 40-43 of my work.) In any case, however, an argument for the truth of the Scripture cosmogony may be drawn from the creation of the sun being assigned to the fourth day after it had been said that day and night had been generated on the *first* day ; for this is just such a contradiction as a fabricator would have avoided."—Professor CHALLIS, F.R.S.

grand and sublime declaration that a Personal God created all things, and I dwell, not upon the particular order in which that creation may be related, but on the fact that God created those things.* We may, as a matter of interest and speculation, choose for ourselves something of a cosmical theory, based on what we consider to be the proper meaning of Genesis, but at the same time we should hesitate before we call a theory, however clever and ingeniously managed, a *Scriptural Cosmogony*. I do not in the least believe in a Scriptural cosmogony. If we try to construct one, a number of scientific questions will arise which it will be impossible to settle, although they may contain valuable suggestions on many points. After all, we are not to base our faith in the truth of the Scriptural narrative upon any cosmical theory. It is not upon a cosmical theory, but upon the creation of the universe by a Personal Agent that Scripture earnestly and constantly insists. With regard to the question of the days, many and diverse theories have been propounded, and one appears very probable until it is overthrown and another takes its place. Whether we have got to the right solution of the question yet I do not know, and it does not much matter. Many such a speculation is interesting, but do not let us call it Scriptural. It is man's ingenious theory, based upon certain words of Scripture, and it is as likely to be wrong as the theories of the ancient philosophers. There seems to be much truth in what Mr. Row said, as to taking the opinions of the heathen philosophers from Justin Martyr and the Fathers; and, perhaps, when Mr. Savile comes to consider the question he will be inclined to admit so much. Justin Martyr is no authority for what Plato or Aristotle said. The Fathers were not deeply versed in ancient philosophy. Certainly Justin Martyr did not comprehend either Plato or Aristotle very clearly; but I do not suppose Mr. Savile intended to lay much stress on that. What he desired was to draw out and state first certain ancient cosmical theories, and this he has done in a very interesting manner, showing how much they differed from the simplicity of Scripture. That is really the point, and whether we devise a cosmogony or not is not of very great importance. What is important is not to imagine that any theory which we draw out from the words of Scripture as we interpret them, is a Scriptural cosmogony, to which we are bound to pin our faith. We base our faith on the simple, plain account that a Personal God created the world, and the rest is matter of speculation. I am sure we must all concur in thanking Mr. Savile for his

* "In common with all the most experienced geologists of this age and nation, and in agreement with the conclusions of Conybeare and the lectures of Buckland and Sedgwick, I see in the vast geological record, not an anti-Mosaic history of the creation of man, but pre-Mosaic tables of stone, inscribed by the hand of the Divine Master, and bearing traces of His earlier works, earlier co-ordinations of the appointed powers of nature, earlier terms of the one creative series, whose latest period includes the history of man."—J. PHILLIPS, late Professor of Geology at Oxford.

very learned paper, from which many of us must have derived much information.

Mr. SAVILE.—Respecting Mr. Row's objection to my implied opinion of Aristotle, I would point out that it is not mine, but that of Justin Martyr, whose opinion of that famous philosopher is given at length, in the work to which I have referred in § 26. There are reasons why I must still prefer the opinion of Justin respecting him to that of Mr. Row ; inasmuch as he was a Grecian, and not an Englishman ; he lived seventeen centuries nearer the time of Aristotle, and was therefore more likely to understand him aright. Moreover, he was himself an eminent philosopher ; which can scarcely be said of any of the early Christian Fathers, with the exception of Clement of Alexandria in the second century. I must, therefore, still believe that Justin Martyr has correctly interpreted the opinion of Aristotle, whose philosophy, I venture to think, will not be much enhanced, when we hear of his grave and numerous errors of detail ; e.g. he affirmed that only in man we had the beating of the heart, that the left side of the body was colder than the right, that men had more teeth than women, and that there is an empty space at the back of every man's head ! (See Professor Tyndall's "Address to the British Association at Belfast in 1874," p. 15.) In reference to what is said in note to § 48, about the way in which Genesis i. 1 has been interpreted by those who in former days attempted to explain the Mosaic cosmogony without any knowledge of geology, I have recently discovered that Dr. James Anderson, in his work on the *Royal Genealogies*, considered a very learned work at the time of its publication, 150 years ago, explains the teaching of Moses in the following way :—"In the beginning of Time, God Almighty made out of nothing the Heavens and the Earth on October 23rd in the afternoon, B.C. 4004 ; and the All-wise God thought fit to perform Creation gradually in the space of six days !" As regards the quotation from Herbert Spencer referred to in § 51, I gave it on the authority of Dr. Irons, but have recently been favoured with a letter from Mr. Spencer on the subject, and am obliged to own that I think Dr. Irons's interpretation of Mr. Spencer's opinions is, to say the least, certainly "misleading," as Mr. Spencer expresses it.* And inasmuch as Mr. Herbert Spencer, in the chapter on "Reconciliation," admits "the Creative Power," though divested of all anthropomorphisms, I do not see how any one can be warranted in asserting that he thus teaches,—“I do not affirm that there is no God. I am simply between the two statements. Some say there is a God ; some say there is not. I only say that I am not aware of it.” In a similar manner I cannot help thinking that Professor Tyndall has been much misunderstood ; for though it is true that he has “as little fellowship with the atheist who says there is no God, as with the theist who professes to know the mind of God” (*Use and Limit of the*

* Dr. Irons has since written to say that he considers the quotation faithfully represents Mr. H. Spencer's statements in *First Principles*.—Ed.

Imagination in Science, p. 50); and again at p. 72 of the same work, he declares that "the question, Whence come we? Whither go we? dies without an answer, without even an echo, upon the infinite shores of the Unknown"—in a work written four years later, he expresses his more mature thoughts in the following candid way:—"In connexion with the charge of atheism I would make one remark. Christian men are proved by their writings to have their hours of strength and of conviction; and men like myself share, in their own way, these variations of mood and tense. . . . But I have noticed during years of self-observation that it is not in hours of clearness and vigour that this doctrine commends itself to my mind; that in the presence of stronger and healthier thought it ever dissolves, as offering no solution of the mystery in which we dwell, and of which we form a part." (Preface to the 6th edition of the *Belfast Address*, p. viii.) With regard to the letters from Professors Birks and Challis, remarking on some portions of my paper; entertaining, as I do, the highest opinion of those two distinguished professors of my own Alma Mater, I proceed to offer the following reply. Professor Birks objects to Mr. Croll's theory, mentioned in § 72, respecting the glacial period, and the excentricity of the earth's orbit in bygone ages. Although I am quite ready to admit that it is only as yet an hypothesis, which must abide the test of time and investigation, yet I still think it the best mode of explaining the appearance of our coal-beds in high latitudes, where the flora of which they are composed could not exist with the present climate; but I do not understand, as Professor Birks does, that Mr. Croll's hypothesis respecting the glacial period being 800,000 years ago, in any way affects the supposed antiquity of man. I understand Professor Birks' objection to my assumption at § 73, to the supposed distance of the "fixed stars" from our solar system, according to the theory of Herschel and Nichol, rests upon the disputed question, both in respect to the magnitude of the fixed stars, and also the full velocity of light, which depends upon the exact distance of the sun from the earth, whose mean distance is assumed to be 91,400,000 miles, but which may be hereafter rectified by the calculations dependent upon the transit of Venus, which occurred in 1874, and will again take place in 1882. The Astronomer Royal of Scotland, however, speaks of this "merely as *one step* towards getting the sun-distance number perhaps a trifle better than before"; and he proceeds to call attention to the variations of science respecting the supposed distance of the sun in various ages of the world. Thus, of the learned Greeks, Herodotus supposed the sun to have been a mere satellite of the earth, acted upon by the same forces which are sensible to us (lib. ii. § 24), and consequently could only have been distant about ten miles. Anaxagoras computed it at about 14,000 miles. Aristarchus increased it to over 5,000,000 miles. Two thousand years later, Kepler enlarged it to over 26,000,000. Delambre, in the eighteenth century, advanced it to 96,100,000 miles. Since that time, the distance in mileage has been gradually receding, until Henderson, in 1832, reduced it to 89,586,000 miles. Since then,—“the real sun-distance, by

modern astronomy, has been held, during the last half-century, to be over 95,000,000 miles, because it had been produced by the calculations of a late first-rate German astronomer,—calculations so vast, so difficult, and with such prestige of accuracy and power about them, that no living man cared to dispute their results. One group of astronomers declared the true mean sun-distance to be about ninety-one to ninety-one and a half millions of miles; another group declared it to be ninety to ninety-two and a half millions of miles. While they were fighting together as to whose results were the better (an actual duel with swords was expected at one time between M. Leverrier and the late lamented M. de Launay), an eminent chemical engineer, when studying the mensurations of the great pyramid of Ghizeeh, came to the conclusion that 91,840,000 miles was the true measure of the sun's distance from the earth" (see *Our Inheritance in the Great Pyramid*, by Piazzi Smyth, F.R.S.E., F.R.A.S., Astronomer Royal for Scotland, pp. 49-51; also a valuable pamphlet *On the Sun's Distance and Parallax*, by St. John Vincent Day, C.E., F.R.S.S.A.). If this estimate of the sun's distance be confirmed by the calculations resting upon the transit of Venus in 1882, and the velocity of light be only slightly reduced in consequence, the effect would be, as I venture still to think, notwithstanding the able remarks of Professor Birks, to lower the distance of the nebulae in Orion from a period of 60,000 years, according to the estimate of Herschel as the time required for light to pass from Orion to our solar system, to about 50,000 years. And this would have had but slight effect upon my illustration of our distance from the fixed stars, which I used as an argument in proof that the simultaneous creation of the heavens and the earth "in the beginning," according to the Mosaic cosmogony, must have meant something far more distant in point of time, than merely 6,000 years ago, when man was first made after the image and likeness of God. I have spoken at § 83 of La Place's theory respecting creation as hypothetical, and only so as it does not appear to me to contradict what we may gather from Scripture respecting cosmogony as contained therein; but I readily bow to the superior judgment of Professor Challis respecting the nebular hypothesis, and accept his assurance that "the spectroscope has proved (since Lord Rosse's telescope was first directed to the nebulae in Orion) that, in addition to those stars, there is a large portion of the nebulae which is strictly nebulous or gaseous matter, and therefore quite irresolvable,"—merely remarking that if the nebular hypothesis, over which the scientific world has been battling so long, be confirmed or not, it in nowise affects my argument respecting the beginning of creation, according to the testimony of the Divine record. I may add that neither Sir John Herschel, in his *Astronomy*, nor Mr. Grant, in his *History of Physical Astronomy*, both standard works, makes any mention of the nebular hypothesis. In reply to another remark of Professor Challis, he misunderstands me in supposing that I advocate "Buckland's idea of interposing an interval of long duration between the first and second verses of

Genesis i." What I understand by these two verses is this,—that the former refers to that lengthened period from the beginning of creation to the end of the tertiary; and the latter to what geologists term the post-tertiary, when God finished the preparation of the earth for the habitation of man. I use the word "finished," because all the previous conditions of the earth,—the carboniferous eras, for example, were evidently designed by an All-wise Providence for the exclusive use of man; but I do not see any necessity for believing in any interval of long duration between the catastrophe which took place at the close of the tertiary, when the earth was again reduced, as it had often been before, to that state of chaos, which is expressed in Scripture by the definite terms of *tho hā* and *bo hā*. The late M. D'Orbigny, in his *Prodrome de Paléontologie*, after an elaborate examination of vast multitudes of fossils, gives reasons for believing that there have been twenty-nine creations, separated from one another by catastrophes which have swept away the species existing at the time, with rare exceptions never exceeding $1\frac{1}{2}$ per cent. of the whole number discovered. And though he states that both animals and plants appeared in each of these twenty-nine periods, I am unable to see how it conflicts, as some have concluded, with my theory that the duration of the *yom* or "day" mentioned in the first chapter of Genesis cannot be limited to a period of 24 hours. If the argument referred to in § 97, as Sir Charles Lyell's conclusion respecting the correct age of the falls of Niagara must be given up,—and I think that recent intelligence of the rapid way in which the falls are decreasing tends to that conclusion, we have still the far stronger argument of *analogy* to rest upon; and if it be true chronology that man has existed on earth for a period of about 6,000 years, and has before him the promised millennial period of another 1,000 years, making 7,000 in all, previous to Christ delivering up the kingdom, as St. Paul teaches, to the Father, in order that "God may be all in all," I cannot see why Hugh Miller's conclusion should not be accepted by all believers in the Divine record; viz., that the Sabbath, during which God rested, was commensurate in duration with one of the Sabbaths of short-lived man, and that God's Sabbath of rest has continued ever since His creation of a being after His own image,—while, in consequence of the Fall, the work of redemption may be understood as in some sense the most blessed work of His Sabbath Day.

The Meeting was then adjourned.

INTERMEDIATE MEETING, FEB. 21, 1876.

J. E. HOWARD, ESQ. F.R.S., IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following elections were announced :—

MEMBERS :—

Rev. J. Gould, M.A., Cantab., Repton (Life).
T. B. Green, Esq., M.A., F.R.S.L., F.R.H.S., London.
Rev. W. G. Abbot, M.A., Cantab., London.
Rev. W. H. M. H. Aitken, M.A., Oxon., Brighton.
Rev. J. Harrison, D.D., Edin., Fenwick Rectory.

ASSOCIATES :—

Rev. W. C. Badger, M.A., Cantab., Birmingham.
E. Seeley, Esq., London.

Also the presentation of the following Works to the Library :—

- “Transactions of the Geological Society,” Part 125. *From the Society.*
“United States Geological and Geographical Survey,” Bulletin 5. *From the Survey*
” ” ” List of Photographs, *Ditto.*
“The Earth and the Word of God.” By Rev. W. C. Badger, M.A. *From the Author.*

A Paper “On Traces of Early Phœnician, Jewish, and Carthaginian Intercourse with the British Isles,” by Mr. F. A. Allan, was then read by Mr. Adney, in the author’s unavoidable absence. A discussion ensued, in which Mr. J. Jeremiah, Messrs. C. and L. Dibdin, Mr. W. Seeley, and the Chairman took part. Mr. Adney having replied, the meeting was then adjourned.

ORDINARY MEETING, APRIL 10TH, 1876.

THE REV. PREBENDARY CURREY, D.D., MASTER OF THE
CHARTERHOUSE, IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—

The Very Rev. H. T. Edwards, M.A., Dean of Bangor.
Rev. the Hon. E. Carr Glyn, M.A., Doncaster.

ASSOCIATES :—

J. H. Gresham, Esq., London.
Rev. H. Linton, M.A., Birkenhead.
Rev. H. W. White, B.A., Navan College.

Also, the presentation of the following Works to the Library :—

- “United States Geological and Geographical Survey,” Bulletin. *From the Survey.*
“Warwickshire Natural History and Field Club Reports, 1867 and '75.” *From the Society.*
“Fossil Insects.” By the Rev. P. Brodie. *From the Author.*
Arnold's “Sermons and Christian Life,” 2 vols. *From J. Walter Lea, Esq.*
Bosanquet's “Essays.” *Ditto.*
Carlyle's “Heroes and Hero Worship.” *Ditto.*
“Claims of Labour.” *Ditto.*
“Graves on the Pentateuch.” *Ditto.*
Harris's “Highlands of Ethiopia,” 3 vols. *Ditto.*
Hutton's “Mathematical Tables.” *Ditto.*
Maurice's “Kingdom of Christ.” *Ditto.*
“Rabett on No. 666.” *Ditto.*
“Tracts. By a Layman.” *Ditto.*
Waud's “Algebraic Geometry.” *Ditto.*
“School Guardian,” from No. 1. *Ditto.*

The following paper was then read by the Rev. T. M. Gorman, the Author being unavoidably absent.

THE PLACE OF SCIENCE IN EDUCATION. By H. ALLEYNE NICHOLSON, M.D., D.Sc., F.R.S.E., Professor of Natural History in the University of St. Andrews.

THE subject of the place which Science ought to occupy in an ideal scheme of education is one which can only receive its full exposition at the hand of one who is at the same time practically acquainted, both with the methods and aims of Modern Science and with the merits and defects of our present Educational System. Having no claim to the rare combination of knowledge thus implied, I shall treat the question in a simply partial manner, taking, of course, the aspect in which it presents itself to a scientific worker. Nor is there any apparent reason why this aspect should lead to conclusions materially different from those which would be arrived at from the standpoint of the educational reformer. In any case the subject is one of vast extent, involving a number of theoretical questions of the utmost complexity, environed by formidable practical difficulties, and more or less overshadowed by the great divergencies of opinion which exist as to what is its true solution. I shall, therefore, simply touch upon some of the more salient and more purely theoretical features of this question; and I would wish, whilst expressing my own personal views, to approach the matter at issue in a spirit entirely free from dogmatism, fully recognizing that it is not only inevitable, but also right, that there should be many differences of opinion on such a subject.

Amongst the many problems, however, in our complex civilization which press with an ever-increasing urgency for solution, none, perhaps, is more pressing than the question of Education. Many burning questions may have grown cold, but this is one which will ever remain warm, until men shall have arrived at some general consent as to what constitutes its true basis of settlement. Many elements must go to form such a basis, but we have at present to deal only with one of these—

namely, the scientific element. Until recently this ingredient was comparatively unimportant, for Science, in its modern acceptation, hardly had come into existence, and its whole energies were employed in winning for itself a foothold in the world of accredited knowledge. This long and arduous struggle for existence is now nearly at an end, and there is at the present day, perhaps, a tendency, born of its successful and marvellous career, to exaggerate the claims of science, and to overestimate the benefits which it can confer. Without, however, going to either extreme, there seems to be a general *consensus* of opinion that some change is necessary in educational systems which were established in pre-scientific eras. A new mental nutriment has come into existence, and some alteration in our intellectual dietary is thereby imperatively demanded.

What this alteration shall be, and to what extent it shall be carried, must depend on many things, and on nothing more than on the precise signification which we may attach to the words "Science" and "Education." The former term, in particular, is often employed loosely, and some confusion has thereby been caused in more directions than the one now under consideration. The so-called Sciences, also, are many-sided, and short definitions always leave much unsaid; but we may consider "Science," as a generic term, to be, in its fundamentals, the analysis of the truths of the senses. In one signification of the term we may apply the name of "Science" to any kind of knowledge whatever, when this knowledge is methodized and reduced to its principles. In its more restricted, and at the same time more general acceptation, we understand by the "Sciences," what are known as the Natural and Physical Sciences. *These* deal with the phenomena of the natural world primarily, and their ultimate data are obtainable only through the medium of the *senses*. The foundations of the sciences rest, therefore, deep down in the sensuous life of humanity. By this definition it will be seen that we exclude Psychology, the *ultimate* data of which are derived from the internal consciousness of the individual, and not by means of observations carried on through the medium of the senses, though such contribute accessory and secondary data. Those, of course, who believe in the purely physiological basis of all mental phenomena, will naturally demur to this exclusion, and, from their point of view, rightly so; nor is it at all necessary that I should in this place endeavour to answer any objections on this score. I think it may be maintained, however, that though a "methodized knowledge" of Psychology has of recent years sprung into existence, there is no "Science" of this name,

nor will such ever exist unless mental actions and cerebral actions are proved to be one and indivisible.

It has been said that "*vere scire est per causas scire*"; but "Science," strictly speaking, deals with nothing more than phenomena and secondary causes, and in all cases leaves us in total ignorance of the primary causes of things. It is "Philosophy" in the true sense of the term, which finds its proper home in the world of causes. *Phenomena*, by the very derivation of the word, are *per se* only appearances, and they are, therefore, at bottom nothing more than our own *sensations*. They are the results of impressions made upon the senses; and though this does not prove them to be unreal, it leads us to see that they are to a certain extent infected with that fallaciousness and uncertainty which necessarily attends the operation of the sense-organs. What "Nature," then, really *is*, "Science" will never teach us; nor can we ever hope to attain to a knowledge of the essence of the universe by means of our scientific and natural faculties alone. Still less will these faculties assist us in the attempt to fathom that world of the unseen spiritual forces of which our material world is but an outward manifestation, and the very existence of which can only be learned by the moral and emotional faculties. Hence, Science, as pursued only in its lower plane, and as divorced from Reason, leads of necessity to the conclusion that there exists nothing outside of, or beyond, the purely phenomenal; or, that if such a further region should have any existence, it is for ever closed to our investigation by the irreversible limitations of our faculties. To this conclusion pure Science leads us inevitably; but its decision in a matter of this kind cannot be accepted, unless it be endorsed by the higher tribunal of Reason. Nor has this endorsement so far been forthcoming. The belief in the merely phenomenal is, by its very nature, at variance with the primeval and inherent instincts of the human race: its life is the life of the Schools and not of the People. The senses can show us nothing but phenomena—they would cease to be the senses, if they could; but the unquenchable assertions of our souls compel us to believe that these *Phenomena* rest upon a corresponding substratum of *Facts*. It may be, as some philosophers prefer to believe, that these facts belong to the domain of the "unknowable"—that vast and shadowy realm, in which the warm and living human spirit incontinently expires for want of air and heat. It may be so; but it is worth our while, even in this case, at least to convince ourselves that the world of realities is no myth or phantom. Whether or not we may ever be able to investigate it, there exists a world of which our material cosmos is but the faint

reflex and adumbration. This of itself is worth taking some pains to be sure of, unless man is to be regarded as simply an exceptionally cunningly-constructed machine. For my own part, I prefer to believe—and at present the known facts of the case render this preference entirely legitimate—that the region of the “knowable” is wider by far than some are inclined to admit; provided only that we obey the necessary laws of our mental being, are content to apprehend where we cannot comprehend, and learn to recognize that certain faculties are keys to certain locks in this marvellous universe of ours, but are of no avail if employed against other locks of a totally different construction.

In the second place, what are we to understand by the term “Education”? In its widest sense, I conceive we may take education as being the sum of the means necessary for the full development of the mental and physical faculties. In the comparatively rare cases in which its object is entirely attained, we have the “*mens sana in corpore sano*”; and we have the human being in the ideal condition of being at harmony at once with the material universe in which he lives and with the higher world of the moral and spiritual forces. Taking this view of the matter, it is clear that an ideal scheme of education presupposes the existence, for its basis, of a perfect science of physiology, and a complete knowledge of psychology. Obviously, we cannot determine how best we may train and develop the mental and physical faculties, unless we have previously determined the true constitution of both mind and body, and have made ourselves acquainted with the laws under which these act in combination and react on one another. At present, it need hardly be said, we are far from being in the position to claim any such complete knowledge of the human body or the human mind. Physiology, gigantic as its strides have lately been, is still far from its maturity; whilst psychology has not so much as fairly established, in the eyes of differing schools, its primitive and absolutely fundamental data. In the meanwhile, therefore, all schemes of education are necessarily more or less of a tentative and provisional nature.

Speaking thus tentatively, a study of the internal constitution of the marvellous composite resulting from the temporary wedding of a complex spiritual organism with a correspondingly complex corporeal mechanism, would seem to show that the order of knowledge is as follows:—*Firstly*, the senses should be brought into exercise, and trained to investigate and duly appraise the various phenomena of the material world. *Secondly*, the truths acquired by the senses should be analyzed, methodi-

cally arranged and reduced to sciences, and these sciences must be applied in practice. *Thirdly*, the mind should be conducted into the region of philosophy, which, as regards its fundamental nature, is properly an analysis of the truths of the sciences, just as the sciences are a more elementary analysis of the truths which we learn through the senses.

The order thus indicated by physiology and psychology is the one which has apparently been followed in the progressive development of the collective human mind, and sound reason shows that it is equally the order of development for each individual. *In the first instance*, we employ the senses, which make us acquainted with phenomena, or, in other words, with the world which is relative to Man. This portion of our education is commenced in early infancy, and is at first wholly unconscious and independent of lessons and penalties; nor is it wholly pre-empted or abandoned sooner than the last hour of conscious life. And it may be here observed, *en passant*, that the objects of the senses are, in themselves, below reason and outside it—being simply objects capable of being perceived and apprehended by the special organs of sense. Sense alone is the faculty properly applicable to them, and when the higher faculties take in hand the task of investigating what they *are* in their essence, and whether they are within the mind or without it, or, in other words, whether they have or have not any real existence—then we get into the true Serbonian bog of Transcendental Metaphysics, in which some of the finest intellects the world has yet known have become hopelessly entangled and bewildered. *In the second place*, having acquired a knowledge of sensible things, the mind next proceeds (or ought to proceed) to consider the world of causes—of *noumena*. This is effected by reason, being the faculty by which the mind establishes a balance, proportion, or ratio between the outward and the inward, between the world of external effects and appearances and the world of internal causes and realities; reducing variety to unity, and establishing general laws in the chaos of apparently disconnected phenomena. *In the third place*, finally, the mind passes from the world of causes to what has appropriately been termed the world of *principles* or *ends*, in which it seeks for the link of purpose and design by which each effect may be duly united with its antecedent cause. The bridge for this passage is built by the combined exertions of philosophy and religion.

I am aware that there is a tendency at the present day, in certain scientific circles, to ignore all but the world of phenomena, to deny the existence of the world of causes, and still

more of the world of ends; or, if not to ignore their existence, at any rate to deny that they form, or ever can form, subjects which can be properly or efficiently studied by the human mind. From this view I must be understood as entirely dissenting; and it is the adhesion of certain powerful schools of thought to this opinion to which may be ascribed the singular intellectual one-sidedness which is often seen as a result of an exclusively scientific training. I think, also, that it can be shown that those who hold these views are, as votaries of true science, false to their own fundamental principles. By the senses (on strict and admitted Berkleian principles), we can only discover the mere surfaces and integuments of things, and can never explore the *penetralia* of matter, or unravel the mysteries of creation. Reason, however, is not bound by the same limitations, but is endowed with the sublime and heaven-sent power of penetrating on the one hand to the apparently inscrutable secrets of mechanism underlying the superficies of sensible things, and, on the other hand, of soaring beyond the "*flam-mantia mœnia mundi*," unfolding the infinite analogies of the universe, and establishing in all things that unity which is due to their origin from one Great Cause.

This will be the more obvious if we consider for a moment the positions occupied in this respect by the Ptolemaic and Copernican systems of astronomy. The former, firmly believed in more than a millennium, is a scientific system strictly founded upon the evidence of the senses. It takes the appearances presented by the heavenly orbs as being realities—it regards the sun, moon, planets, and stars as so many bright and luminous points placed in a firmament which immediately surrounds the earth—and it looks upon our terrestrial globe as the centre of the universe, round which the celestial bodies wheel subservient in their orbits. On the other hand, the Copernican astronomy rejects the apparently plain evidence of the senses—it concludes that the phenomena of the moving heavens and the seemingly stable earth are illusions—it shows by *reason* that the *senses* are wrong, that the earth is in constant revolution round the sun and on its own axis, and that, far from being the centre of the universe, we are not so much as the centre of our own little solar system. Similarly, to take another familiar example, it is well known that vision, to all appearance the most acute and trustworthy of our senses, assuredly does not show us things as they really are, either as regards their position to ourselves or their position to one another. The apparent phenomena of vision require to be interpreted by reason, acting through experience, before we can project the field of sight

outside the eyeball, combine the double visual spectra into single ones, and place in its proper position the inverted map of the retina. In these, therefore, as in many other instances, we have on the one side *sense* and *appearance*, and on the other side *reason* and *reality*. In these cases, there has been no hesitation amongst scientific men as to which side is to be chosen ; but it can hardly be said that they have invariably followed the guidance of the same principle of choice. Whilst recognizing that the senses have led men totally wrong as to the real sequence and nature of some of the most stupendous, and at the same time most familiar, phenomena of the material universe, they have implicitly followed the guidance of the same senses as regards the interpretation of other phenomena of a kindred nature. When overmastered by strongly-held theoretical convictions, it is true of all men,—of men of science as of the profane vulgar,—that “*populus vult decipi, et decipiatur.*”

Leaving theoretical questions in the meanwhile for others more practical, it may here be pointed out that the Sciences are twofold in aspect and constitution, and are adapted to play a double part in the complicated machinery of education. The *data* of the sciences, the facts which each embraces, are learnable by the senses, and are not truly or properly learnable by any other channel. It is possible, of course, to learn some or all of the known facts of a given science out of books, by memory alone, and without having submitted one of these facts to the test of the senses. It is possible to do this ; but, from the very definition of what Science in its essence is, it must be evident that no real knowledge can be obtained in this fashion ; and the Sciences, if they are to be learnt, or taught, after this method, assuredly present no special advantages over many other studies. On the other hand, the Sciences, as we have seen, have the peculiarity, as compared with the non-scientific branches of study, that they are grounded in the sensuous and natural life of the human being. They reach the higher spiritual plane of the organism through the senses, and it is properly through “the five gateways of knowledge” that scientific truths should be imparted to the learner. Hence, the Sciences present, to begin with, the advantage that they can be taught, as regards their simpler and more fundamental data, at a time when the higher mental faculties are comparatively undeveloped and in abeyance. Whether purposely taught, indeed, or not, every individual of our race, from the moment that he opens his eyes upon the world, commences perforce such a course of scientific education, which is none the less complete because it is involuntary and guided only by the

instincts. In post-infantile life, science may be, and often is, so taught as to deprive it of its native and inherent advantages; but this is clearly the fault of the teacher or the system of teaching; and it remains certain that the *practical* teaching of Science can be commenced at an earlier period than can profitably be attempted with the more ordinary branches of education—if only upon the ground that the senses attain their working powers much sooner than do the intellectual faculties.

Whilst the data of the Sciences have their foundation in the senses, the deductions from these data are purely intellectual; and hence Science, in this second aspect of its twofold constitution, stands in precisely the same educational position as any non-scientific branch of knowledge. The *facts* of the Sciences can only be discovered, in the first place, through the medium of the senses; and even after they have been thus discovered, and have become common property, they should, nevertheless, be mainly handed down from individual to individual through the same channel. On the other hand, the *generalizations* of Science are super-sensual, and are the result of purely intellectual operations. The observation of the celestial phenomena which constitute the groundwork of the science of astronomy can be carried out solely through the sense of sight; but no acuteness of vision, no complexity of apparatus, no repetition of investigation or experiment would lead to the discovery of the law that the radius vector describes equal areas in equal times. We pass here from the region of sense into the more ethereal atmosphere of rational mind and intellect. The physical properties and phenomena of a thistle are presumably as well known to a donkey as they are to the highest of human beings, in so far, at any rate, as the senses of the two are equally efficient; but the latter can draw certain deductions from the facts which he knows about the thistle which might perhaps embrace the constitution of the solar system in their scope, and which, in their humblest extension, are entirely undreamed of in the philosophy of the latter. In the alembic of Reason, the lowest facts of the Sciences take their proper place as parts of an infinite whole. It may be repeated, then, that Science, from an educational point of view, is fundamentally a duality, as composed of two distinct but closely-related departments. Its facts are most suitably taught to the young, in whom the senses are most acute. Its deductions, acquired by the working of the mind on the facts presented to it by the senses, are rather fitted for later periods of life, when the senses may be less active, but the higher intellectual faculties are more matured.

If we now consider more closely what are the specific objects to be aimed at by any rational System of Education, we find that they may be naturally discussed under three heads:—(1) *Discipline*, or the training and development of the mental and physical faculties as so many instruments of the human organism: (2) *Practical Utility*, or the acquisition of certain knowledges, which will be of actual practical value to the individual in his struggle for existence, and will secondarily enable him to be of use to his fellow-creatures: (3) *Spiritual Culture*, or the improvement and development of the higher moral and emotional faculties, together with the unfolding of the æsthetic capabilities of the individual. In considering the educational value of Science under the above three heads, no digression will be made into the controversy as to whether the above objects of all sound education are attained more perfectly by a scientific or a non-scientific training alone, or by a judicious intermingling of the two. All that will be attempted here is to show, very briefly, that Science has strong claims to be regarded as an educational power in all of these three departments. No unprejudiced thinker can hesitate to admit, most fully, that an ideal education is many-sided, and that no knowledge, however profound, of a *single* subject, entitles any man to the honourable designation of “educated,” in the widest and truest sense of the word. The learned German philologist who failed to recognize what potatoes were, on seeing them in their native condition, in spite of his enormous erudition, was “uneducated,” in the same sense as is the man of science who is wholly devoid of literary culture. To be altogether “*teres atque rotundus*” one must know something of many things, and everything of something. We have to deal, however, with a state of matters very far removed from the ideal. The only real practical question lies in determining whether those individuals—and there are unfortunately many of them—who have time and opportunity for examining but one of the facets of the crystal of knowledge, should rather attend to the scientific or to the non-scientific branches of study. Into this much-vexed question, no excursion need be made here and now. No further general conclusion seems to be safe, except that even the most elementary education should have some flavouring and tincture of *both* kinds of knowledge; and it might be predicted, without rashness, that the Sciences are likely very materially to alter their complexion, before this question will be really ripe for solution in any final sense. All that is proposed here is to cursorily examine how far the Sciences fulfil the three great objects of education, without

entering into any accurate comparison of their value as contrasted with other departments of study.

Firstly, as regards *Discipline*, very little need be said as to the value of scientific studies. That the study of Physical and Natural Science is of the highest efficacy in developing and training the mental powers in their lower plane, may be assumed, without danger, as being generally admitted. Witness—if witness be needed—the unchallenged position occupied by mathematics, at once the handmaiden and the mother of so many of the sciences. From one point of view, however, Science has a special value as a disciplinary agent; since its training is of a twofold character. The labour, namely, necessary for acquiring the *facts* of Nature develops and increases the powers of observation and sharpens the senses; whilst the study of the *generalizations* of Science constitutes one of the severest forms of intellectual training. It may be claimed, therefore, with some show of reason, that the educational discipline afforded by scientific studies presents certain advantages over that which can be derived from other branches of knowledge. Even if this be admitted, it can only be with the strong assurance that these advantages cannot be realized unless Science be taught *practically*. It is not enough for the teacher to rely upon books, either for his own knowledge or in his teaching. He must himself have a personal knowledge of his subject; and the facts which he brings before the learner must be illustrated by actual examples from the world around him. So far, at any rate, as concerns the young, it may be doubted if science-teaching is of any avail, unless it be carried out in the laboratory and the museum, on the hill-side or by the seashore, by the living voice of Nature rather than by diagrams and technicalities. When so taught, Science yields to no other study as a means of mental discipline; and its value as an educational agent cannot be fairly estimated when it is taught otherwise.

If we inquire, in the second place, what educational standing Science can claim on the score of *Utility*, here, again, it would appear that its pretensions are well-founded and undeniable. Always admitting that the ideal education would consist in a judicious intermixture of the scientific and non-scientific knowledges, we must remember that the time allotted by the majority of mankind to learning is too short to admit of this general culture, and that the average schoolboy is not likely to conquer with any thoroughness more than one department of knowledge. Having painfully mastered “the three r’s,” the ordinary schoolboy is driven to make choice as to what set of studies he will more especially pursue; and his choice is,

or ought to be, guided by a due consideration as to what knowledge will be most *useful* to him in later life. If the limitation of his choice to *one* set of knowledges be an absolute necessity, then the claims of Science in this respect can hardly be denied. Most men in civilized communities lead lives of an eminently practical character; and it is no exaggeration to describe human existence as being in its essence, and primarily, an incessant struggle with the natural forces with which the human being is environed. The more intelligently this struggle is carried out, the more thoroughly man succeeds in bending the material forces of the universe to his imperious will,—the higher is the stage of civilization which is attained to, and every victory in this fight raises man nearer to his ideal condition. I am far from saying that the satisfaction of his material wants is all that man requires for his happiness and welfare, or that the highest and best elements of civilization are merely material. Man is more than an animal, and his wants other than those of the day. Nevertheless, all that we know of savage life, and of the worse than savage life of certain classes in so-called civilized communities, teaches us that no conspicuous spiritual progress is possible where man's material wants remain unsatisfied. Too certain is it that the higher faculties of humanity will assuredly be allowed to lie fallow, or will be perverted, if all the available energies of the organism have to be devoted to securing a bare and hazardous existence. It is useless, then, to hope for a high mental development, unless we can first satisfy the primary and clamant wants of the bodily frame; and we cannot satisfy these unless we can bring about a more or less complete harmony between man and nature.

And how can this harmony be brought about? Surely in no other way than by instilling into the plastic minds of our children some knowledge of the world they live in, some love for the wonders of Nature by which they are surrounded, some acquaintance with the laws which govern the universe. Most men, as I have said before, lead lives of an eminently practical character. In winning their bread, they are brought into daily contact with natural productions; they conduct operations depending entirely upon natural laws, or they have to deal with artificial products or machinery removed by the skill of man but one stage from the raw material of nature. It were an easy matter to unroll the long list of scientific achievements of which our present civilization is the crown and superstructure; but there is no necessity for this. The common working life of man pre-eminently demands a knowledge of common things; and this knowledge can only be obtained from Science. How,

then, can we doubt the *utility* of science in education? I will only draw attention, in this connection, to one further consideration. Apart from the actual practical value of scientific knowledge to those who have to lead hard practical lives, and who have not time to devote themselves to the attainment of a general education—apart from this, no one but a medical man can estimate, even imperfectly, the amount of misery, disease, and even vice, which may be justly attributed to a gross public ignorance of the commonest scientific laws, and which might be more or less completely removed by a more general diffusion of scientific knowledge. How many lives might be preserved, if mothers in general had but some knowledge of physiology, or had any accurate acquaintance with the structure and functions of the animal body? How much suffering might be obviated, if there existed any generally-diffused knowledge of the laws of health. How many of the ills to which humanity is heir might be mitigated or altogether abolished, if sanitary science were at all generally understood by those who frame municipal laws?

Higher and deeper, however, than either discipline or utility is *Culture*, by which in its most general sense may be understood the bringing of man into harmony with the spiritual world, in which he truly lives and has his being. What can science claim as an apparatus of education on *this* score? Taking science as it is at present, I think it may be at once conceded that it is in this respect markedly inferior to other non-scientific branches of study, with, however, the important proviso that the studies in question cannot claim any superiority in this matter, unless they are carried beyond a certain point, which is certainly not commonly reached in school life. The literary appreciation of Homer and Æschylus, of Juvenal and Tacitus, of Shakespeare and Tennyson, of Goethe and Schiller, presupposes a high culture—much higher than mere science can afford—as much higher, in fact, as the spiritual part of the organism is higher than the merely natural. To yield this culture, however, the study of literature must be carried far enough to develop the higher faculties, to unfold the laws of our spiritual being, to elevate and purify our moral natures by communion with the great souls who have lived and laboured and passed away. When studied for mere commercial or utilitarian ends, literature is no better than the driest and most repulsive of the sciences. It may very much be doubted if it be not worse.

It may be willingly conceded, then, that the prosecution of literary studies, in their higher walks, gives rise to a form of culture, which is more elevated, more polished, and more spiritual

than that engendered by the study of the sciences pure and simple. It may, also, be freely conceded that the too exclusive study of natural and physical science is apt, in certain temperaments, to harden the mind, to close the eyes to the higher and less tangible elements of human life, and to disturb the true balance between the intellectual and emotional faculties. Science, however, when rightly pursued, yields a culture in which these are by no means necessary or inevitable defects, and which, if *sui generis*, is, nevertheless, real and abiding. It brings man into harmony with the natural world in which his present lot is cast ; it shows him, on the one hand, how profoundly ignorant he is of the real essence of even the material things around him ; and, on the other hand, it leads him from Nature to Nature's God, and teaches him to find below the rind and surface of the cosmos the Divine Spirit that dwells in the innermost recesses of natural phenomena. To the religious temperament, the study of science must ever conduce to the highest of all forms of culture—the culture that is implied by *reverence*. Relegated to its true place in the educational system, the scales removed from its eyes, and its self-imposed fetters struck off, Science will yet see that its true mission is only partially discharged when men have learnt the laws and investigated the phenomena of the material. A larger and by far more important portion of its task must consist in developing a profounder admiration for the wondrous works of the Creator as displayed in the visible universe, a truer insight into the real objects of human life, and a more intelligent and helpful compassion for those who ignorantly sin against the inevitable laws of existence.

Nor need we think that the capabilities of science as a means of culture are exhausted, or so much perhaps as dimly guessed at, by the present generation. In demonstrating to us that all which we can learn by the senses is but the sequence of phenomena, Science at the same time leaves the field clear to philosophy, to show us that below the phenomenal is the real. That man's sensuous nature is, to a certain extent and in a certain sense, at discord with his higher spiritual nature, is true ; and the same truth is expressed, in other language, by saying that there is an apparent discord between Science and Religion. Assuredly, however, this discord is but apparent, and will vanish as our vision becomes more enlightened, and our knowledge more widely extended. For many generations now, some of the highest intellects of which humanity can boast have occupied themselves with the study of natural phenomena. With passionate patience, uncompromising labour, uncalculating

self-denial, and boundless enthusiasm, men have sought to wrest from Nature her inmost mysteries, and are just beginning to learn that the real secrets of the universe are not to be dragged forth by the retort, the scalpel, and the microscope. If in this blind and fervid impulse to solve "the riddle of the painful earth," men have sometimes reached the despairing conclusion that probably there is no riddle after all, or that, if there be, it is not worth our while to try and solve it, who shall wonder? There will always be those who, like Faust's "Famulus," dig with eager hands for treasure, and rejoice if they come upon an earthworm. Only to the chiefs of our race is it given to use "the hammer for building"; but any apprentice can wield "the torch for burning."

Surely, however, it is no mean thing if we at last learn—even though it be by the painful process of beating our heads against the walls—that the province of Science, though a mighty and a noble domain, is one limited by the strictest confines. No experience will be too dearly purchased, if we thereby convince ourselves that Science alone is powerless to satisfy the wants of human nature. Modern science has long been trying to establish a "law of necessity" to embrace all things natural, the quick as well as the dead; and there are not wanting those who would place the things which we somewhat misleadingly call *super-natural*, under the heel of the same iron despotism. The free human soul, however, imperiously demands freedom, not only for itself, but still more for the power by which the universe is governed. Man is not a dead machine, nor is the universe a lifeless system; and the formulæ of the schools are of no avail as opposed to the triumphant instincts of humanity.

Nor is this freedom in any way incompatible with the theory that the universe is strictly governed by law, and even by unvarying law. That every event in nature, every event in human life, is strictly the result of an antecedent event, as its cause, and gives rise to some succeeding event, as its effect, may be most fully admitted without any involved or implied denial of freedom. The freedom of a spiritual being of known character and nature must be as strictly reducible to law as the automatic working of a machine—though the law of its action may be infinitely more difficult to discover. We may protest, therefore, against the assumption by which Prof. Draper's remarkable work on "The Conflict between Religion and Science" is saturated, and its conclusions vitiated—the assumption, namely, that "Science" demands that the world shall be governed by immutable laws, whilst "Religion" demands that it shall be controlled by "discontinuous, disconnected, arbitrary

interventions of God." It is simply not correct to state that there are *two* conceptions of the government of the world, one by *Providence*, the other by *Law*; and that Religion favours the former, and Science the latter. It is not correct to state this, because the statement involves the conception that there is something radically incompatible and antagonistic between the conception of *Providence* and the conception of *Law*. No such antagonism exists, however, and there is a *third* conception,—namely, that the government of the world is by *Providence, acting through and by secondary causes and according to invariable laws*. The true state of the case, therefore, may be put thus:—Certain forms of *Theology* maintain that the world is governed by incessant, arbitrary interventions of Providence. Pure *Science* maintains that the world is governed by necessary *Law*—in so far as the human mind may be supposed capable of conceiving that "Law" can exist or subsist without the existence or subsistence of a "Law-maker." Rational *Religion* maintains that the world is governed by Providence acting through secondary causes, and through laws which are necessarily invariable, as they must be supposed to be laws of the Divine nature itself.* Dr. Draper appears to hold the second of these views; but his strictures fall harmless at the feet of Religion, however hardly they affect the views of Theology, against certain dogmas of which they are rightly directed. He does not appear to rightly comprehend what the views of *Religion*, properly so-called, really are upon this subject; and he has, therefore, necessarily left these views untouched and unaffected by his arguments. His work ought to have been entitled the "Conflict between Science and certain Forms of Theology." Its present title is simply a misnomer; and, in spite of the great ability of the work, there is thus betrayed a total misconception of the fundamental point at issue.

For my own part, I think there are not wanting indications that Science is, at last, approaching the point at which it will be able to confer upon the world, if not its last, at any rate its greatest

* No being, even though his powers should extend to what is ordinarily called "Omnipotence," can be conceived of as endowed with the power of acting *against* the laws and constitution of his own nature. The laws of Divine action *must*, therefore, be invariable, as grounded in the nature of a Being in whom there is "no variableness or shadow of turning." For the same reason, the material universe, regarded as the product of Divine love and wisdom, *must* be governed by invariable laws. Any departure from invariable law can but be apparent, and can simply be the result of the intervention of a higher law, equally invariable in its operation with the lower law which it supersedes.

service, by discovering that, though its own powers are strictly limited to the region of the phenomenal, there exists outside and above the phenomenal another world of existences—the only real one—which requires the employment of non-scientific faculties for its investigation and apprehension. Nor will Science, in making this discovery, be in any proper sense committing a “happy dispatch” upon itself. On the contrary, Science will not know its true strength, nor attain its full stature, till it has entered into an alliance with Religion, and is reconciled with Reason. It must learn to admit its own limitations, and to recognize the comparatively small field which it covers; it must feel that it deals only with the husk and the shell, and that the kernel and the life-blood belong to something higher and deeper; it must recognize, in the imperishable words of Teufelsdröckh, that “the universe is not dead and demoniacal, a charnel-house with spectres, but God-like and our Father’s.”

In considering the true position which Science ought to occupy as an educational agent, it is perhaps to be admitted with regret, that, if studied in accordance with some of its prevalent doctrines at the present day, it does not greatly conduce to a higher culture—certainly not so much so as it ought to do. The work of destruction, however, is always easier than that of construction, and is, moreover, sometimes an essential preliminary to it. You cannot put new wine into old bottles; and the failure of Science as an apparatus of culture is a temporary accident, and not a permanent necessity. This failure is inevitable so long as Science is held to be exclusively concerned with phenomena alone, and to have no secondary interest in causes and ends—so long as it is held that she is to exclude or deny all but material explanations or ideas, to sever herself from the emotions, and to keep herself estranged from her sisters, Philosophy and Religion. The laws of Science, however, are but the laws of the moral world in a lower plane, and embodied in the natural sphere. Science may, if she pleases, confine herself to the study of the series of effects, of which Nature is the sum; but it is at her own risk, if she ignore the corresponding series of causes which form the domain of Philosophy, or the corresponding series of ends, with which Religion has more especially to deal. Once united with these higher departments of knowledge, as assuredly she will be, Science will enter upon a new and higher life, and will be prepared to play her proper part in the development and regeneration of humanity.

The age of gold has passed away, and man no longer walks

the earth clad, as with a garment, in primeval innocence. The original order has been reversed, and natural truth has now become the groundwork and basis of all truth. We live, as has been truly said, but weakly lamented, in a "mechanical age"; but humanity need not, on that account, despair of its future. Properly speaking, "mechanics" deals with machinery, and, therefore, with "forms"; but there are living and spiritual forms, as well as dead and material ones; and the laws of mechanics are, in all strictness, laws of the infinite, and partake of infinite perfection. The great problem of the future is to translate the laws of material mechanics into those of spiritual mechanics—to show, in other words, that the laws of Matter and the laws of Spirit are not laws of a different *order* but of a different *degree*. When we can do this, the Spirit of the Age, mechanical though it be, will be justified of its children. The claims of philosophy to its own proper estates will no longer be disputed, for they will rest upon an unassailable foundation of scientific truth. We shall hear no more of the discordance between Science and Religion, and Theology will again be reinstated in the respect and affection of thoughtful men, by acquiring a natural basis, and becoming indissolubly connected with the truths of the material universe.

It may be that we are yet far from this happy consummation; that we must yet fight through a long period of spiritual unrest and disturbance before the lion can lie down with the lamb, and the higher and lower notes of the mighty organ of the universe can be brought into complete accord. No man dare prophesy on such matters, but the signs of the times are clear to read. I would only say, in conclusion, that it appears to me to be of the utmost importance in the investigation of truths of whatever order, to maintain an affirmative rather than a negative mood of mind. It may be regarded as tolerably certain that the greatest intellectual discoveries have been made by men, to whom affirmation was more easy and more natural than negation. There is no gift, no endowment of genius, which the student of truth should so earnestly endeavour to preserve as that positive mental habit which we all possess in childhood, but which we frequently cast away in later life as useless or pernicious. It is not a good thing to hold beliefs so tightly that we cannot give them up if need be, and if the evidence against them be sufficient. We should not even hold our beliefs in any way which would render us unwilling to examine the grounds on which they rest and to patiently listen to all that can be urged against them. We may rest assured that as no truth is without its modicum of human fallibility and human error, so

no error has ever been widely accepted, save when it contained some grains of truth. Experience teaches us that those who hold opposite or apparently conflicting beliefs, are, in many instances, but looking with too fixed and immovable a gaze upon different aspects of the same object. The shield is golden on the one side, on the other it is of silver. Above all, transcendental speculations are not to be lightly entered upon, since they are not only barren in themselves, but deserve their self-chosen title by wholly transcending the limits of our finite faculties. No pseudo-philosophy ought to be allowed to seduce us into questioning the validity of our senses, or doubting the reality of the external world. Nature is the living garment of the Deity, and the veil of the temple—not the mere phantom of a diseased imagination. *There*, we stand on firm and solid ground, and *there* long generations to come will find scope and verge enough for the rational employment of those faculties, in virtue of which alone man claims the noble and inalienable title of “Homo sapiens.”

The CHAIRMAN (the Master of the Charterhouse) said, he was sure the meeting would approve a vote of thanks, both to the Author of the paper and the Member who had so kindly read it.

Mr. T. HARRIOT adverted to the degrading influences to which this world was still subject, in spite of the advances of Science: influences which we might suppose would characterize a world in its infancy rather than our own. Such a state of things could only be the result of a want of Faith, the absence of which prevented man placing himself under the guidance of that Unseen Power, Who controlled the Universe and gave true wisdom to people to comprehend His laws and see harmony where there now sometimes appeared to be discord.

Mr. L. T. DIBDIN considered that the study of mathematical science would be more useful as a training of the mind if it were accompanied by practical illustrations. Cambridge University was considered to be the great centre of scientific education in England, and when he went through the mathematical course there, he found that practical Experimental Science was very little taught, in fact almost neglected by the great bulk of the undergraduates. He was glad to say that the Duke of Devonshire had lately founded a splendid laboratory at Cambridge, with the most complete arrangements for work in experimental science; but at present the use of the laboratory was virtually restricted to graduates; hence it could hardly be regarded as an Educational Establishment. Professor Challis, who gave an annual series of lectures on Magnetism, Electricity, and Practical Astronomy, had frequently found it impossible to get together enough men to form a class;

and in his (Mr. Dibdin's) year it was a positive fact that his own was the only name entered for these lectures: he need hardly add that if Professor Challis was unable to get men to come and hear him on these subjects, no other man in the university was likely to do so. He believed that such a result was mainly due to the high-pressure system of examinations. In order to pass successfully *in honours*, a man was obliged to study solely with a view to the examination, instead of his first object being to master the subjects in which he had to be examined. This was particularly the case in regard to Mathematics; some of those who passed *tripos* most successfully had not studied experimental science at all; and in regard to Astronomy he had actually heard the objection made, that going to the Observatory at all and examining the instruments tended to confuse the mind in calculations relative to those instruments. As regards Professor Nicholson's remarks on miracles, he did not think his definition of them satisfactory—that mode of treatment would do away with miracles altogether; because if, using a mathematical illustration, miracles were merely exceptional terms in a series of which the other terms were the ordinary course of Nature, the exceptional terms being the same in everything but the frequency of their recurrence with the ordinary terms, it followed that miracles were events as *natural* as any other events, and differing from other events only in this, that they seldom occurred. He himself preferred Professor Westcott's definition of a miracle, which was—speaking from memory—anything which suggested the active interference of a *Personal God*.*

The CHAIRMAN thought the point which had been brought forward by Mr. Dibdin, with reference to the mode of instruction at Cambridge University, deserved considerable attention. Certainly, at Cambridge the mathematical studies of undergraduates had been, for the most part, directed to the acquirement of the knowledge of what have been called Pure Mathematics, independent of observation, and to mastering all the processes of reasoning and calculation by which the results obtained by our greatest mathematicians had been arrived at. It was to his mind a question of considerable doubt, whether it was essential to unite with the teaching of pure mathematics a constant observation of phenomena. The two things were quite separate, and it was questionable whether they should not be considered separately. In the study of Astronomy it was no doubt true that some men would not go to the Observatory, but would confine themselves to abstruse calculations; but at any rate that mode of study was not without its value, for the great

* Professor B. F. Westcott, D.D., writes:—"These words give a fair general view of the definition of a miracle, and I prefer it to any other. The exact words which I have used, are, that a miracle is 'an event or phenomenon which is fitted to suggest to us the action of a personal spiritual power. . . Its essence lies not so much in what it is in itself as in what it is calculated to indicate. . . .' The points on which I wish to lay stress are, (1) that a 'miracle' involves an *interpretation* of facts observed; and (2) that it *assumes* the existence of a spiritual power adequate to produce the effects."

discovery of Professor Adams was made by calculations. His work was a great work of pure mathematics and calculation, and no one could deny, after such an example, that there was a great utility in the study of mathematical science independently of the observation of phenomena. The question was, whether it is not better first to store the mind with a knowledge of pure science and then proceed to the observation of phenomena, rather than to begin with the observation of phenomena and then proceed to derive our laws and calculations. It would, he thought, be impossible to study phenomena with any advantage, without a considerable acquaintance with pure mathematics to begin with. A person who wished to make calculations or observations in Astronomy must be acquainted with many common mathematical rules quite independent of observation; rules, he thought, must be learnt before observation could be productive of any good. No doubt boys were often to be found rushing to observe phenomena, but they did it in an offhand and superficial manner through lack of the necessary preliminary knowledge, and there they stopped, for they were just in the position of a person who attempted to learn a language without studying its grammar. He wished to know how far this applied to Science, and whether there was not some danger in pressing the young mind too quickly into the field of phenomenal observations.

Rev. T. M. GORMAN.—With regard to the question of miracles, Professor Nicholson had attached an important note to one part of his paper. He said :—

“No being, even though his powers should extend to what is ordinarily called ‘Omnipotence,’ can be conceived of as endowed with the power of acting *against* the laws and constitution of his own nature. The laws of Divine action *must*, therefore, be invariable, as grounded in the nature of a Being in whom there is ‘no variableness or shadow of turning.’ For the same reason, the material universe, regarded as the product of Divine love and wisdom, *must* be governed by invariable laws. Any departure from invariable law can but be apparent, and can simply be the result of the intervention of a higher law, equally invariable in its operation with the lower law which it supersedes.”

In this passage Professor Nicholson evidently referred to miracles, and laid it down as an axiom that no being could act against its own constitution, and applied that axiom to the Infinite Being. Therefore, as the laws of the universe were the laws of God’s divine power and wisdom, there might be things in these laws which totally transcended the natural sphere, and these laws transcending the natural sphere would appear to us to be miracles and against law, although they were really under law. In this view he thoroughly agreed with Professor Nicholson. The difficulty which non-Christians or atheists felt about miracles was owing to the fact that they never ascended out of the natural sphere into the spiritual sphere. The argument of Professor Draper, for instance, had no meaning, for it did not belong to true theology to suppose that the world was “controlled by discontinuous, dis-

connected, arbitrary interventions of God." God could do nothing that was arbitrary, for all that He did was in the exercise of the highest wisdom. He did not act intermittently, but with the omniscience of One who saw from eternity to eternity. One of the most valuable portions of the paper was that one in which Professor Nicholson pointed out that—

"The great problem of the future is to translate the laws of material mechanics into those of spiritual mechanics—to show, in other words, that the laws of Matter and the laws of Spirit are not laws of a different order but of a different *degree*."

In fact, there was the material world, and there was another, a higher and an inner world, which was governed by another set of laws. There were two great regions of existence, the natural and the spiritual, and they corresponded, the one being a symbol of the other. There was not a single idea of the super-sensual kind which was capable of being expressed at all, except by some idea in the things of nature. All things in the natural world corresponded to all things in the spiritual world, and the great problem was to translate the material world and its phenomena into the terms of the spiritual world in reference to spiritual things.

The Rev. T. C. BEASLEY said that one of the most interesting points in the paper was the relative value of learning from books and from actual sight. In his experience he had often felt that it would have been a great help, could he have *seen* or *heard* illustrations of the truths of science. That, however, was not always possible, and even if it were, it would not always be the greatest help. The greatest help would be to work the two systems together in combination. For instance, a clear conception of a steam-engine could only be obtained from description, accompanied by diagrams and a working model; and the possession of a sextant would be of little avail, without some acquaintance with Trigonometry, joined with a *vivâ voce* explanation and practical illustrations of the method of using the instrument.

A MEMBER thought that one could learn equations, for instance, with nothing but a paper and pencil, but not the construction of machinery; the one was *Pure*, the other was *Experimental or Practical Science*.

The meeting was then adjourned.

PROFESSOR NICHOLSON'S REPLY.—Professor Nicholson writes to express his thanks for the opportunity of adding any remarks to the discussion: he adds, "On reading it over, however, I do not find anything to say that would be of any importance excepting that the remarks made by the Chairman, as to the value of the purely theoretical study of Mathematics (apart from observation) do not touch the point at which I was aiming in my paper. Mathematics stands in a perfectly unique position in this respect, and, in so far as it does so, it is hardly a true *Science*. I was alluding to the *Natural and Physical Sciences*, which certainly cannot be properly taught or learnt except upon a previously-acquired basis of actual observation of phenomena."

ORDINARY MEETING, APRIL 3, 1876.

VICE-ADMIRAL E. GARDINER FISHBOURNE, C.B., R.N.,
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections announced :—

MEMBER :—R. Bagster, Esq., London.

ASSOCIATES :—T. Harriot, Esq., London.

C. E. Moilliet, Esq., Birmingham.

G. Spear, Esq., Portsea.

Rev. J. Fisher, D.D., London.

Miss E. I. Philpot, Bedford.

Also the presentation of the following Works to the Library :—

“Proceedings of the Royal Society,” Part 167. *From the Society.*

“United States Geological and Geographical Survey,” Vol. II.

From the Survey.

“London Quarterly Review.”

A. McArthur, Esq.

Three smaller Works from General Nelson, Rev. Dr. Leask, and J. Robinson,
Esq.

The following Paper was then read by the Author :—

EGYPT AND THE BIBLE. By J. ELIOT HOWARD, F.R.S.

Introductory.

IT is in accordance with the professed objects of the Victoria Institute, "to investigate fully and impartially the most important questions of philosophy and science"; and as the progress of archæological inquiry brings before us many new phases of thought, to keep ourselves informed of these, and without dogmatism or assumption to lend our assistance in the discussion of "supposed scientific results," in order to "get rid of contradictions and conflicting hypotheses, and thus promote the real advancement of true science," and religion also.

It is with these objects, and without having any title to speak as one profoundly versed in Egyptian lore, that I propose for discussion this evening some results of investigations such as were within my power, into the published works of the most advanced Egyptologists.

I think that we ought to hail with thankfulness the labours of these *savans*, and to believe that when the truth is fully brought before us, much light will be thrown on the even minute accuracy of Holy Scripture. In the mean time, we may do something towards obviating the danger of rash and imperfect conclusions.

In what manner may we expect Confirmation of Scripture ?

Egypt and the Bible present us with such vast fields of research, and with so many points of contact, that it is quite needful to state the limits of the present inquiry.

Let it be understood, then, in the first place, that with the exception of casual and incidental notices, it is not the writer's object to illustrate Scripture. This has been already to a certain extent successfully accomplished, and it is announced that materials are being accumulated for the further

completion of this great work, on which more than one of our Egyptologists are now presenting us with the fruit of their highly interesting researches. The result will be to bring out in strong relief the accuracy of the Biblical narrative, although it may not satisfy some of our preconceived notions. It is not at all to be supposed that any pictorial representation of the drowning of Pharaoh and all his hosts in the waves of the Red Sea will ever be discovered; nor is it at all probable that the work of the Israelites in building the walls of Pithom and Ramses, should have been recorded in such a manner as to have withstood the specially destructive influences which have spared us so little, except the almost imperishable granite figures which once adorned the field of Zoan, or the Temple of the Setting Sun, the glory of Heliopolis, the On of the Bible. I shall therefore confine myself to such a dissertation as may be brought within the compass of an evening's paper, and shall treat specially the early history and the antiquity of the Egyptian race, their religion and civilization, concluding with some remarks on the present state and the prospective future of this interesting country.

What light does Egypt throw on man's early history?

I would first remark that we have here the opportunity of observing MAN in one of the earliest aspects under which he is presented to our notice. Whatever the date we may assign to the monuments of the Old Dominion of Egypt, that era must be admitted to be of so great antiquity, that if the speculations of our modern theorists were correct, we ought to find him slowly developing from some apelike condition, and scarcely yet master of human powers; instead of which we behold him in full perfection of all his godlike faculties; and looking back to an era of still greater brightness, even to the reign of the demigods, when Osiris taught the people the use of the plough, and Isis invented the cultivation of wheat and barley, which were carried about at her festival.*

And beyond this, in the dim past there was no era of barbarism, no "age of stone"! I hold then that the more the early ages of the history of the country we are considering are thrust back into the dim obscurity of the past, be it, for argument's sake, 5,000, 10,000, or 100,000 years, the more does it contradict the theories of the disciples of evolution.

* Smith's *Dict.*, *sub voce* Isis.

I will therefore, without further preface, examine *the origin of the Egyptians*.

The 10th chapter of the Book of Genesis is a document of inestimable importance to all who would study the origin of nations. It is called by Knobel, who has written an admirable treatise on the subject, the *Völkertafel*, for which word I do not remember an equally succinct English equivalent. For want of the guidance of this precious record, the Greek and Roman historians went much astray as to the origin of the Egyptians; and Herodotus relates a curious story of the attempt made by one of their own monarchs to ascertain which of the nations could boast of the greatest antiquity; showing that they were themselves much in ignorance of their own extraction.

In this *Toldoth beni Noach* we learn the common descent of Cush and Mizraim and Phut and Canaan from Ham; and thus the close affiliation of large and important populations, spreading from Mesopotamia round the southern portion of Arabia into Eastern Africa, and again from the same central position into Syria and Egypt.

The researches of modern science equally show us that the Egyptians do not belong to any one of the races which inhabit Africa properly so called.* The formation of the skulls and the proportion of different parts of the body, studied in a great number of mummies,† demonstrate that they must have belonged to what has been (absurdly enough) called "the Caucasian race." See especially Dr. Granville's "Essay on Egyptian Mummies," *Philosophical Transactions*, vol. 115, from which it will be seen that the mummy which he so carefully examined might have served, even better than Blumenbach's Georgian slave, as a type of the most perfect race of mankind. There never was a Caucasian race, but fragments of very many races in that mountainous country. The Egyptians form a third branch, differing by certain specialities from the Pelagic and Semitic branches. It is certain (we are now told) that the study of the language leads to a similar conclusion. As indelibly portrayed in the hieroglyphics, and as preserved in the religious books of the Christian Copts, it offers no analogy with the tongues of the people of Africa. On the contrary, the roots of the words and the elements which constitute its grammar present striking affinities with the Indo-Germanic and Semitic tongues.

The cradle, or rather the *centre*, of the early civilization of Egypt was at Memphis, and dates from the era of Menes, when

* Brugsch Bey, *Histoire d'Égypte*, chap. i. † Appendix A.

it appears in the full vigour and power of youthful might, astonishing the minds even of our practised modern architects and *savans* by the grandeur of its conceptions and the finished grace of its works. And yet, strange to say, the language must, at this early period, or that of the arrival of the people in Egypt, have existed in an incomplete or confused or imperfect state. It would seem that the ground and framework of the language must have been brought down with them into Egypt from the common cradle of the human family in the East, and gradually perfected in connection with the new objects which surrounded them in the place of their settlement.

There is a tradition preserved by Plutarch, in his work *De Iside et Osiri*, that when Thoth, the god of letters and intelligence, first appeared on the earth, the inhabitants of Egypt had no language, but only uttered the cries of animals. It is certain that the language of ancient Egypt did to a far greater extent than any other known language make the common appellatives of living creatures close imitations of the cries they uttered.

The following instances will, I trust, be found correct and sufficient :—

mau—a cat

eō—an ass

ehe—a cow

phin—a mouse

rir—a pig

eshau—a pig

djadj—a sparrow

hippep—an ibis. The cry of the black and white ibis consists of the syllables ep-ep.

mrret—the adjutant crane. This bird utters a cry resembling the word *marrarat* when it takes wing. The Arabs call the bird *marabout*.

khepir—the scarabæus. The name being an attempt to imitate by vocal articulations the loud whirring sound produced by the elytra of this beetle striking together when it is on the wing.

hm—the pelican. This is as close an imitation as articulate sounds could produce of the loud plaintive cry of this waterfowl.

Early Migration of the Egyptians.

Brugsch Bey gives us the complete view of the amount of knowledge now possessed by Egyptologists. The opinion of

this writer is that "during the last twelve years the study of the Egyptian texts has made such enormous progress that the Pharaonic language and writing may be analyzed almost as well as any text in one of the classical languages."

This eminent Egyptologist says (p. 6), "It is certain that the cradle of the Egyptian race must be sought in the centre of Asia. At some epoch previous to all historic recollection, and impelled by causes unknown to us, the Egyptians quitted their primitive soil, directing themselves towards the west, in order to cross the Isthmus of Suez, and to seek a new country on the happy banks of the Nile.

"Diodorus, in the fifth book of his Universal History (p. 125), has preserved to us the description of an island which, according to the terms of his recital, is found in front of Arabia Felix, and which bore the name of the 'Divine' island. Notwithstanding the difficulty which has been found in fixing geographically the position of that island, which probably must be understood of the coast of a part of Arabia Felix, still it is incontestable that the description of Diodorus, with regard to the products of the divine island, and the worship of the divinities, applies marvellously to the indications of the Egyptian texts as to their sacred land in the East. The name of 'the divine island' at once recalls the name of *nuter ta*, 'the sacred land,' which the inscriptions agree to give to that country which recalled to the Egyptians the origin of their religious worship.

"To trust the texts which express themselves very distinctly in the sense indicated, 'the sacred land,' from which the greatest divinities of Egypt took their origin, must be regarded as a *prehistoric station of the Egyptians before their entry into Egypt*, and as a resting station of the Cushite race before their dispersion over the different countries of Eastern Africa. If the texts recall a thousand times the mention of the sacred land, if the monuments delight to recall the ancient cradle of the greatest divinities forming the foundation of the Egyptian mythology, they only confess clearly the direction of the road which the ancestors of the Egyptians took before arriving at the scene of their political life, and of their work of civilization."

The native testimony of India agrees with that of the Scriptures in bringing the race that peopled Egypt from the East, and allying these with other Cushite tribes.

In all this we have the direct contradiction of the doctrine recently propagated on high authority, and evidently in the interests of a certain theory,—that Egypt was the cradle of the human race, in which the ape-like savage gradually developed into the civilized man.

Early Civilization.

It has been well observed by Mr. Osburn that the hieroglyphic writing, in its earliest and simplest form, shows that the arts of civilization, such as pottery, metallurgy, rope-making, &c., must have already reached a state of considerable perfection when symbols were taken from their finished products to express ideas in this mode of writing. M. de Rougé observes, in reference to the architecture of this early period, "We know not the beginnings of this art, but we find it extremely advanced in several respects from the time of the monuments of the IVth Dynasty,—the first to which we can assign a certain place belonging to this period. The architecture already shows an inconceivable perfection as to the cutting and the laying of blocks of large dimension. The passages of the great Pyramid remain a model of setting *which has never been surpassed*. We are obliged to guess the exterior style of the temples of this first epoch, and to restore the conception of it according to the *bas-reliefs* of the tombs or the decoration of the sarcophagi. This style was simple and noble in the highest degree,—only one mode of ornament varies the style, composed of two *lotos-leaves* opposed to each other."

The style of the figures, both in the statues and the bas-reliefs of the earliest time, is distinguished by a larger and more square-set appearance. It seems that by the lapse of ages the race became more lean and lank by the action of the climate. In the primitive monuments they sought to imitate nature with more simplicity, and, preserving all the proportions, the muscles are always better placed and more strongly indicated.

The *only* * change in 5,000 or 6,000 years, following the most modern computation, has been one of physical deterioration and intellectual degeneracy. A son of the present Khedive, if his features are rightly portrayed in our periodicals, might very well boast, "I am the son of the wise,—the son of ancient kings" (Isa. xix. 11); but where is the might to bend the bow as of old, and to subdue, † "with his shoulders," all the lands

* A wooden statue found by M. Mariette in a tomb of the Vth Dynasty, resembled so much the Scheik of the village of Sakkarah, that the inhabitants at once named it after this functionary.

† Herodotus says (Book ii. 196) of a statue of the conqueror Sesostris, "There is an inscription across the breast from shoulder to shoulder, in the sacred character of Egypt, which says, 'With my own shoulders I conquered this land.'"

of the men of the East, and where is the wisdom to govern them if subdued ?

The Egyptians and their Early Neighbours.

The Egyptians called themselves (*Retou*) the men of Egypt, and probably spoke of themselves to foreigners arriving amongst them as the Autochthones of the country, and "men" *par excellence*. The fertile valley of the Nile formed, in their opinion, the heart or centre of the whole world. To the west were the *Ribou* or *Libou*, the Libyans inhabiting (*Tesar*) "the Red Country," contrasted with the Black Country (*Kem* or *Kemì*), of rich alluvial soil, in which they themselves delighted. These Libyans, according to the monuments, belonged to the white race, with blue eyes and blond hair, who probably came from Europe, and invaded North Africa, displacing, in part at least, the original population, whose traits are preserved in the monuments of the IVth Dynasty, and who were probably the *Lehabim* of Gen. x. The negro tribes, who are represented with all the characteristics of the present period, were called *Nahasou*. The *Kar*, or *Kal* (the *Gallas*, apparently, of our day), Ethiopians rather than negroes, are also mentioned in the Egyptian records.

The great mass of Eastern people were called by the generic name *Amou*, perhaps from the Coptic word *ame*, in the plural *améou*. They are painted with skins of a yellow colour. Their costume was of great simplicity, sometimes characterized by a certain richness, especially in the choice of designs and colours, such as Jacob sought out for his beloved Joseph.* It must be noted as an incontestable fact that the *Amou*, even in the most glorious times of the history of Egypt, occupied the centre of the Delta, in the environs of the present Lake Menzaleh. These were probably the *Castuhim* of Gen. x., out of whom came Philistim. The *Naphtuhim* tribe remind of *Nephthys*, the sister of Osiris.

A great number of the towns, the canals, and lakes situated in this quarter were called by purely Semitic names. The centre of this colony of *Amou* had the name of *Zân*. It is "the field of Zoan" of the Bible, and was, doubtless, a territory of immense fertility. Amongst the peasantry at present inhabiting the borders of the lake above mentioned, it is said to be easy to recognize the stern features of the shepherds, as these are represented in the statues of the Hycshos dynasty, and to

* Brugsch, *Egypte*, p. 9.

which attention was specially drawn by Professor Owen at a recent meeting of the Congress of Orientalists in London.

Dispersion of the Nations.

The dispersion of the nations, according to Egyptian records, was one episode of the revolt of the wicked.* “In the beautiful text from Edfou, published by M. Naville, we read that the good principle, under the solar form of Harmachou (the rising sun), triumphed over his adversaries in the south part of the Apollinopolite nome. Of those who escaped the massacre, some emigrated towards the south: they became the Cushites. Some went towards the north: they became the *Amou*. A third went to the west, and became the *Tamahou* (the whites or European peoples). A fourth towards the east, who became the *Shasou*, said to be the Bedouins of the deserts and mountains of Asia. Such was, for the Egyptians, the division of the main branches of the human family.”

On the whole, it appears that the leading races of mankind have not altered in their essential characteristics from those they exhibited when they first came in contact with the men of Egypt, and also, as remarked by M. Chabas (p. 95), that “when the mother-race of mankind dispersed itself, it already was acquainted with metals, with writing, and knew how to raise buildings, and possessed a social and religious organization.”

This agrees exceedingly well with the scriptural history of the dispersion of mankind after the Tower of Babel. It is also very evident that the characteristics of the Black, the Red, the Yellow, and the White races of mankind were well known, and familiar to the Egyptians from the earliest period. But how does this agree with the above notion of the human family having been one and united before its dispersion?

The answer must surely be found in the belief that these apparently indelible characteristics were stamped upon the human race by the same hand from which the first pair originally proceeded.

It is sufficiently obvious that no influence of climate or of civilization has sufficed to change any of these races in their appreciable physiological characteristics.

“The Egyptians considered all the strange nations as *branches of the common trunk, of which they were the principal shoot*” (rejeton).†

* Chabas, *Etudes sur l'Antiquité Historique*, p. 91.

† *Id. ib.*, p. 95.

Prosperity and Long Life of the Early Egyptians.

The Egyptians themselves are presented before us in their own accounts of the old dynasties, as possessing in a very large measure the gift of civilization. Their fertile country, divided by innumerable canals, supported a large population, deriving sustenance not only from the land, but to a very large extent from the waters, as is the case with the present Chinese, whom in their industrious habits they must have greatly resembled. They turned to account all that fell within their reach. They tamed the animals of the country, and amongst these several species of the gazelle, and dogs of somewhat similar form to ours, and even cats, whom they taught, retriever-like, to assist them in the chase of wild fowl shot down by the skilful Egyptian archers. They had also taught them to spring from tuft to tuft of the papyrus-beds, and to bring back thence the fallen prey. They explored in various mining operations the bowels of the earth for its hidden treasures, and at the early date of the IVth or Vth Dynasty, though working as it seems with *stone* implements, could excavate such mines as now in the Peninsula of Sinai excite the surprise of our travellers, even as they may seem to have been looked upon with wonder and admiration in the days of Job (Job xxviii.), as triumphant illustrations of the wisdom and skill of mankind.

They enjoyed thoroughly, and even to extravagant excess, the good things of this life, and lived amongst its flowers. The Egyptian ladies are constantly represented as adorning themselves with these beautiful productions of nature, and especially as holding bouquets of flowers in their hand, or the charming lotos of Egypt. Not alone did the ladies, but also the Pharaohs of Egypt, delight in their flowery land, and took from thence the designs of their architecture. The normal Egyptian physiognomy is known to most persons who have ever visited the museums of Europe, or appreciated the representations occurring in the pages of our travellers. The statues in the British Museum are illustrative; Ramses II., especially the figure in red granite, shows perhaps a mixture of the Shepherd physiognomy in his ancestry. In Nott and Gliddon's *Types of Mankind* will be seen striking illustrations, in their "Pharaonic Portraits" (p. 145), of the effects of foreign admixture. The most characteristic traits of the Old Egyptians are probably those seen in the statues of the Builder of the Great Pyramid, especially in one found by M. Mariette, and now in Paris. It is interesting to notice that certain photographs in the album of M. Mariette, of

painting, which this savant believes anterior to this IIIrd Dynasty, represent persons whose names are purely Egyptian, but of which the type is completely Semitic.* It would seem as though the period of life had become shortened, as "the perfect age of 110" was considered as the term of a happy old age, and we can scarcely suppose this to have been attained in the later periods of history. In this point of view Pharaoh's first question to Jacob, "How old art thou?" appears very natural and characteristic, even as his whole mode of reception seems just such as might have been expected from a Pharaoh of the Shepherd dynasty.

In the *Bibliothèque Royale* of Paris is preserved a MS. called the *Papyrus Prisse*, from the name of the person who acquired it at Thebes, and presented it to this library. It is perhaps the most ancient MS. in the world, and is said to be a treatise composed by the Prince *Ptah-hotep*, son of Assa Tat Ka-ra, of the Vth Dynasty, who reigned, according to Brugsch, between 3,300 and 3,400 B.C. ! or in the time of Adam, according to the received chronology. It treats of the virtues which are necessary to man, and the best means of getting on in the world, and contains some excellent precepts of morality; such as the following:—

"If thou hast become great, after having been small, and gathered riches after misery, so as to become the first in thy city,—if thou art known for thy wealth, and hast become a great lord, let not thy heart become proud by reason of thy riches, for it is God who has given them unto thee. Do not despise another who is what thou wast; be toward him as towards thine equal."

This writer laments, in pathetic and touching terms, the effects of extreme old age which he was experiencing in his person whilst he wrote, at the age of 110!

According to Herodotus, the founder of the Ist Dynasty reigned sixty-two years, and then perished, *not of old age*, but made an end of (*διαπραγείλει*) by a hippopotamus. His son reigned 57 years.

Afterwards the great pyramid-builders reigned respectively,—Souphis, 60 years; Mencheres, 63 years; and, later still, Apappus † (of the VIth Dynasty) is said to have reigned, or rather lived and reigned, 100 years, with the exception of one hour!

* Pierret, *Dict.*, *sub voce* Physiognomie.

† Eratosthenes, p. 8; Coryag.; see also Pépi-Mérira in Lenormant's *Antiquités Egypt.*, p. 194.

Their History begins with Menes.

The authentic history of Egypt commences with Menes, or, more correctly, Mena, who has achieved for himself a name imperishable so long as the world endures. He was born at Teni, near Abydos, some little distance from the Nile, towards the Libyan mountains. The remembrance of these cities alone remains, marked by a vast necropolis and splendid ruins of many sanctuaries, which are found on the border of the desert at the place called Harabât-el-Madfounch by the modern inhabitants of this country.*

Mena appears to have been a monarch who lived in royal luxury and sumptuous splendour. He is said to have been the first who regulated the service of the temples and the worship of the gods. Perhaps the gratitude of the priesthood has led to the exaltation of his name. There is no reason to suppose that he was the leader of the immigration into Egypt of the nation from its previous quarters in the East. Probably the name Mitzraim, preserved in the Arabic *Misr*, is of still earlier date.† It was Mena who founded the capital of the old empire, after having changed the course of the river Nile, which used to run towards the Libyan chain, and by a gigantic dyke‡ forced it to flow in its present course towards the east. The conception and the execution alike raise our admiration, and show how far removed from the savage state were the men of those early days of Egypt's history.

The name given to the city was *Men-nofer* ("the good station"), changed into *Memphis* afterwards, and still retained by faithful tradition in the appellation Tel-monf (the Heap of Monf), given to the heap of rubbish marking the place of the old city.§ The grand Temple of Ptah was the centre of the city, and was still existing in the Middle Ages, in such a state as to excite the admiration of the Arab writer Abd-ul-Lalif, in the thirteenth century of our era, who thus depicts the scene:—

"Notwithstanding the immense extent of this city, and its

* Brugsch, *Hist. d'Egypte*, chap. v.

† Sanchoniatho calls *Isiris* (Mitzraim) the brother of *Chna* (*Xna*) (Canaan), agreeing in this with Genesis x., and calls him the inventor of the three letters (*τῶν τριῶν γραμμῶν ἐπιπέρας*), probably of the three modes of writing,—the hieroglyphic, hieratic, and demotic.

‡ According to M. Linant, the great dyke of Cocheiche, which is at present utilized to allow the waters of the inundation "to flow into Lower Egypt, or into the Nile, as is most needed."

§ *Noph*, or *Moph*, in the Bible (see Smith's *Dict.*, e.g. Hos. ix. 6,—*Noph* shall bury them). "Its burial-ground, stretching for twenty miles along the edge of the Libyan desert, greatly exceeds that of any other Egyptian town.

high antiquity; notwithstanding all the vicissitudes of the different governments whose yoke has been successively laid upon it; whatever efforts different peoples have made to destroy it entirely, and to cause to disappear even its smallest vestiges, effacing even its lightest traces, transporting elsewhere the stones, and the materials of which it was constructed, mutilating the figures which adorned it; finally, in spite of what 4,000 years and more have been able to add to so many causes of destruction, its ruins still offer to the eyes of spectators a combination of wonders which confound the mind, and which the most eloquent man would fail to do justice to in description. The longer one considers, the more admiration one feels inspired with; and every new view that one takes of its ruins is a new cause of delight. Scarcely has it occasioned one idea to rise in the mind of the spectator when it suggests an idea still more admirable; and when we think to have attained a perfect knowledge of it, it convinces you at the same instant that what you have known is still much below the truth."

A gigantic fist in the British Museum, weighing I know not how much, recalls the vastness of the architecture of the temple of Ptah.

Memphis and its Temple.

With the exception of Thebes, Memphis is the city concerning which the Egyptian texts give us the most information. It is thus that our Egyptologists are enabled to give us the most accurate information on points more especially requisite to be known.

In reference to this grand temple of Ptah, the first we must suppose of any importance in Egypt, what have we to imagine to ourselves, or what must be our conceptions? Strange to say, it is the Deity under his character as Creator who was venerated in this temple. Ptah is called "the Father of Beginnings, the Creator of the egg of the sun and of the moon." He is very distinctly characterized as "the Father of all the gods,* the first existing"; he is, as his name implies, the Architect, the Former, the Constructor.† "He is the Chief of the society of the gods, who has created the existences; all things exist after that he exists. He is the Master of Truth and the king of the gods." Another text engraven on the walls of the temple of Philæ calls him, "He who has created the beings, who has formed men and gods with his own hands."

* Text at Philæ.

† Text of Dendera; see Brugsch, *Hist.*, p. 21.

These examples, as Brugsch Bey tells us, suffice to prove the place of the god Ptah at the head of the divine dynasty. He is the Creator God, existing before the creation of the universe, his work.* The god Rā, the sun, is described in many texts, containing religious hymns, as "a creature of the god Ptah."†

The *Divine Dynasty* is perhaps the nearest expression of the original conception. M. Grebant, in his remarkable study of a hymn of Ammon, in the museum at Boulag, endeavours to prove that the gods of the Egyptian pantheon are only the manifestations (*personæ*) of one Divine Being. The whole Divinity is the *Paout Nouterou*, or Divine Substance, determined by the sign for *bread*, denoting *essence*, from *Pa*, to be.‡

If ever the worship of Ptah was at any period the worship of the Creator, such cannot have continued to be the case after the reign of Cæachos in the IIInd Dynasty of the Old Empire, when Apis was appointed to be his visible representative. Thus "they changed their glory into the similitude of an ox that eateth grass," and the Israelites in their revolt against Jehovah, when "they made a calf in Horeb and worshipped the golden image" (Ps. cvi.), but followed the example set them by these early idolaters.

The Army of Horus.

If we fail to find any satisfactory trace of pure worship in our inquiries respecting the temple of Ptah at Memphis, still less shall we find any resting-place in our researches respecting Isis, Osiris, Seb, and Horus. Some grand mystical ideas were no doubt attached to the triumphs of Horus, when he led forth his army of *Horschesu* to establish the rights of his father Osiris. To whatever form of the great contest between the powers of light and darkness this alluded, the mythical account preserved by Manetho comprises a strange amalgamation of the evidently fabulous and the possibly true, and closes with the reign of the Manes or dead (antediluvian?) persons, and the heroes, which he places immediately before Menes. It is difficult to avoid the conjecture of an analogy between this history and statements in Genesis in reference to antediluvian times; but, setting aside conjecture, the *certainty* which we gather is this, that the Egyptians possessed no reliable history before the era of Menes.

Nevertheless, some gleams of light penetrate the darkness of this (so to speak) antediluvian era. Mariette Bey has discovered § an inscription of the era of Thothmes III., which

* Compare Proverbs viii. 22—32.

† Pierret, *Dict.*, *sub voce*.

‡ Brugsch, *Hist.*, p. 21.

§ Chabas, *Etudes, &c.*, *Ant.*, p. 7.

speaks of a great plan of the temple of Dendera (dedicated to Hathor, the Egyptian Venus), which had been found embedded in a wall in the royal mansion in the time of Meri-ra-Papi, of the Vth Dynasty.

This plan is said to have been traced on goat-skins, which is a more ancient method than the writing on papyrus. It also comprehended writing accounted ancient by the Egyptians.

This is attributed in the above inscription to the time of the servants of Horus. It consequently appears that, in the highest antiquity to which the Egyptians could look back, we find ourselves in the age of temple-building and temple-worshipping men already conversant with the art of writing, and (which indicates a still further advance) of tracing out plans of their proposed erections. No such cultivation could be found amongst savages.

The Sphinx.

The great image of the Sphinx, south-east of the largest pyramid, appears also to belong to the very earliest stage of Egyptian civilization.* It is a natural rock, to which has been given, in some fashion, the external appearance of this symbolical animal. The head alone has been sculptured. The total height of the monument is 19·97m. (65 feet). It is known by an inscription now in the Museum at Boulak to have been older than the era of Cheops, or, consequently, than the Great Pyramid.

Thus this remarkable structure, called by the Arabs "the father of terror,"† looks out upon the desert with its calm, impassive smile, unmoved by the wreck and ruin of the world which passeth away,—a veritable enigma in itself and in its meaning, teaching us this at least, that man, in the conception and the execution of one of his oldest works, was a profoundly religious being. A stele has recently been discovered, from which Egyptologists learn that there was on the north of the Sphinx a temple of the goddess Isis, on the south another consecrated to the god Osiris, whilst a third sanctuary was specially devoted to the worship of the Sphinx, which is called in this inscription  "Hu,"‡ which means "the human-headed lion," whilst the more generally recognized name appears to have been that of Hormachis, or "Horus on the horizon."

Now, what conception can we form of these deities, whose

* Pierret, *Dict. d'Archéologie Egypt.*

† "Abou-l-hol."—Brugsch, *Hist.*, p. 56.

‡ Brugsch, *Hist.* 57.

worship lasted down to the era of the XXVIth Dynasty in Egypt, or say some three thousand years, so powerful was the hold they had gained on the popular imagination?

Osiris and Isis.

Osiris was considered to have reigned on the earth, and, by the benefits which he conferred, to have become the type of all that is good. He was thought to have been murdered by Set, who becomes the type of evil. Set, after having killed Osiris, dispersed the members of his body amongst the cities of Egypt. Isis, the wife and sister of Osiris, reunited these scattered members, and by her incantations, assisted by Nephthys, restored them to life. Osiris, thus resuscitated, is called Horus, and Isis is consequently considered the mother of Horus.

Osiris, according to the Egyptians, was thus associated with the death of the good. The good man was united with Osiris after his death. The great *visible* benefactor to the world is the sun, and the bright manifestation of Divine glory was, in their view, associated with this luminary. But the sun dies every night (or at least disappears), and hence goes to reign in Hades as Osiris. The sun, however, rises again, and comes forth as Horus, triumphant over all the powers of darkness. Horus is thus the type of *the good, in resurrection power*, and Horus, reappearing on the eastern horizon, is the visible symbol to man of the certainty of the resurrection of the just. Hormachis, or, in other words, the Sphinx, may thus calmly look down on all the vicissitudes of this present life, and await the triumph of the just in resurrection.

The good man, when falling asleep in death, was assimilated to the setting sun, and as the sun was renewed under the care of the mother goddess, Hathor,—*the celestial space*,—who, as Noub* (the “golden” one) animated the mountain of the west, in which the sun rested. So the hall of the Tomb, in which the sarcophagus reposed, was equally called Noub. The embalmed body rested as amidst the glories of a *golden sunset* until the *morning* of the resurrection.

At least so they believed, little thinking of the profane hands that should be laid upon their poor remains. But that they did so think we have the express testimony of the *Book of the Dead*, probably the oldest book in the world. Of this there exist quite a large number of copies more or less imperfect. It is scattered amid all the collections and in all the museums of

* “Noub” is also “gold” in Coptic (Chabas, *Etudes*, p. 17).

Europe, and is to become, this spring, under the able presidency of one of our most leading Egyptologists, the text-book in which our students of the hieroglyphics are to be instructed;* from which they may at all events learn that there is such a thing as a future life, and that rewards and punishments are then to be dispensed to the just and to the wicked.

Thus it was the dark mystery of a future life and the manifestation in the light of the morning,† which intently occupied the attention of these men of unknown antiquity. It was a subject well worthy of the spiritual nature of man, and leading us to conclusions in reference to their state, exactly opposite to those which it is the fashion to derive from the misunderstood history of the past. The old Egyptians believed that they should be gainers by the resurrection, and therefore cherished the doctrine. Our modern sceptics know that a future life would be all against them, and consequently attempt, however unsuccessfully, to conceal its truth from themselves and from others!

Antiquity of Egypt.

I now proceed to inquire what was the real antiquity of Memphis, or, in other words, what was the real era of Menes?

We have seen that one Arab writer placed it at four thousand years or more before his time. If we look to modern authorities, we shall find that this apparently fabulous antiquity is increased to the following extent. According to the authors mentioned below, the era we are in search of was as follows:—

Boeckh	5702 B.C.
Unger	5613 „
Brugsch	4455 „
Lanth	4157 „
Lepsius	3892 „
Bunsen	3623 „

The difference between those extreme limits is not less than 2,079 years. It is as if some sixty centuries after our time the

* So announced at the meeting of the Bib. Arch. Soc., Feb. 1, 1876.

† This seems, as nearly as I can gather, the meaning of the title of the Book of the Dead, “Per-em-hrou,” translated by Champollion, “Manifestation à la lumière”; by M. Rougé, “Manifestation au jour”; by M. Th. Deviera; “Sortie de la journée”; and by M. Lefébure, “Sortie pendant le jour”; as the sun rises, being a promise of resurrection after the night of the tomb. Comp. Ps. xlix. 19,—where it is said of the wicked man, “He shall go to the generation of his fathers, they shall not see light.” See Pierret, *Dict. d'Archéologie Egypt., sub voce* Manifestation.

savans should be disputing over the epoch of the Roman Emperor Augustus; some asserting that he mounted the throne many years before our era; others, on the contrary, 1876 years after the birth of Christ.

These different estimates show that the documents on which they are founded are in a deplorable state of confusion.* We have some tolerably clear notion—though still not quite defined—of the time of the Exodus, or of the arrival of Abraham in Egypt; but, in proportion as we recede into the mists of the past, we experience how difficult is the attainment of certainty.

It is reserved for the credulity of scepticism to override all these difficulties, and to “see no difficulty in believing” the most extraordinary statements, such as M. Chabas quotes from an author who immortalizes himself by giving us the information, amongst other precious “*matériaux pour servir à l’histoire positive de l’homme,*” that the horse was tamed by our Aryan ancestors “at an epoch anterior to the year 19,337 before Jesus Christ”! But if so, how came it that the horse was not introduced into Egypt till the times of the Shepherds!

The Old Egyptian chronicle, quoted by Syncellus and Eusebius,† gives us the history of thirty dynasties in 113 descents, during the long period of 36,525 years; but the enumeration proceeds thus:—“To Hephæstus is assigned *no time*, as he is apparent both by night and day.”

Now this deity (*Ἥφαιστος*) among the Greeks was the god of fire, and the skilful smith, who had in Olympus his own palace imperishable and shining like the stars. His skill is mentioned both in the Iliad and the Odyssey. It is almost certain to me that by this Grecian name the authors quoted meant to indicate the Egyptian Ptah, previously noted, the chief and original God the Creator. The sum of years given above is surely a *year* of eternity (365·25 days ‡) taken in great part out of the life (ever-enduring?) of Ptah, and filled up next by Helius, the sun, reigning three myriads of years. Then Cronus and the other twelve divinities reigned 3,984 years. Next in order are the demigods; and here, perhaps, we descend from

* “*Malgré toutes ces découvertes, les chiffres sont dans un état déplorable.*” —Brugsch Bey, *Hist.*, p. 25.

† Cory, *Ancient Frag.*, p. 47.

‡ “The Sothic year of 365½ days (365·25) was called *the square year*, the *annus quadratus* of Pliny.—Without the accuracy of the Sothic year they could not, as Herodotus supposes, have fixed the exact return of the seasons.” (Rawlinson’s *Herodotus*, ii. 239, 240.) Macrobius affirms that the Egyptians always possessed the *true calculation* of the length of the year.

poetry to prose. They were in number eight, who reigned 217 years.

Then follow fifteen generations of the Kynic cycle, of which I can make nothing; and afterwards fourteen or fifteen dynasties, making together (the particulars of one being lost) the thirty dynasties in 1,697 years. I cannot find any agreement between this and the history of Manetho, except in this, that the latter also begins (according to the Greeks) with Hephæstus, to whom he assigns only 724 years, followed by Helius, who reigns 86 years!

It is not worth while to spend more time on these legends. Let us see if we arrive at solid ground at the era of Menes.

In the new tablet of Abydos, discovered about ten years since in one of the compartments of the temple of Seti I. at Harabat-el-Madformeh, there appears an enumeration of a successive order of sixty-five kings, until the last Pharaoh of the XIIth Dynasty of Manetho.

How many years would these kings represent? Brugsch calculates three in a century— $\frac{65}{3} \times 100 = 2,166$ years; but the sixty-nine kings of the Egyptian chronicle reigned only about twenty-four years and a half each on the average of that document. This would materially alter the figures to 1,690 years, which seems more likely, as there is *no (historical)* foundation at all for the estimate of Brugsch, and it is much higher than would be justified by comparison with the more clearly known length of the reigns in the third book of Manetho.

Now, according to the tablet of Abydos, the XVIIIth Dynasty follows immediately on the close of the XIIth Dynasty; and this view of the subject is sustained by the judicious remark of Mariette Bey, that the proper names of the personages of the XIIth are equally found on the monuments of the commencement of the XVIIIth Dynasty; and still more, that in the two epochs the character of the coffins, of the ornaments, and of the style, is *quite identical*.

Notwithstanding this, Brugsch interposes 500 years as a *probable* interval* between the two, whilst fully showing that the testimony of the monuments is as I have said.

I dismiss these probabilities, for which no monumental proof (as it appears) can be shown, and look next for the era of the

* At some future era the historian may, in like manner, consider 500 years as a *probable* interval between the termination of the power of the East-India Company and the assumption by Her Majesty the Queen of the title of Empress of India, a "Sepoy" Dynasty occupying most part of the period.

commencement of the XVIIIth Dynasty, given by

Boeckh at	1655 B.C.
Bunsen	1625 „
Lepsius	1684 „
Unger	1796 „

but I prefer to all these Brugsch's estimate:—

Brugsch	1558 B.C.
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This is founded on a separate estimate of the period of 31 genealogies of architects (subject, perhaps, to some reduction as above; but it is probable that architects would live longer than kings). Then, in adding these two periods together, we have approximately the era of Mena, 1558 + 1690 = 3248 B.C.

I do not attach any importance to this period of 1690, which is probably too long by one-half; but the research shows how little we can rest upon any of the data hitherto adduced. It is possible that some new evidence may be produced which may render the matter more clear.

The whole number of the kings in the 1st Book of Manetho, he computes (but I cannot follow his computation) at 192, who reigned during a space of 2,308 years and 20 days. But this, again, is not consistent with the amount of the years of the different dynasties, as he gives them. The period of 70 days refers, no doubt, to the reign of 70 Memphite kings, who reigned 70 days! What can be made of *such* historical (?) information?

Herodotus (Book iv. 143) informs us that “when Hecataeus in giving his genealogy mentioned a god as his sixteenth ancestor, the priest opposed their genealogy to his, going through the list [of the high priests], and refusing to allow that any man was ever born of a god. Their colossal figures (which it was the custom for every high priest during his lifetime to set up in the temple) were each, they said, a Pirômis, born of a Pirômis, and the number of them was 345. Through the whole series Pirômis followed Pirômis, and the line did not run up either to a god or a hero. The word Pirômis may be rendered ‘gentleman,’—καλὸς καὶ ἀγαθός.”*

An uninterrupted succession of “gentlemen,” for 7,000 to 10,000 years, is scarcely consistent with the Darwinian doctrines of evolution of the species. It is, however, more credible, and certainly more agreeable to one's feelings, than the descent proposed either from a god or a monkey!

* So Rawlinson translates, ii. p. 191.

That which we do see, looking back over a period of 5,000 years (more or less), is *man* in full possession of all his godlike faculties — not one whit inferior to his descendants of the present day. His religious views are greatly to be preferred to those of our modern Pantheists, and his scientific ideas of development seem in part to have anticipated those of our modern evolutionists, whilst surpassing them in logical clearness. The conception of the goose of the god Seb, which laid the egg of the earth,* seems peculiarly well imagined, as this animal has been shown by Darwin to possess great inflexibility of organization, and must rank high in the list of the aristocracy of nature. †  Nothing can be more natural than for a goose to lay an egg, and in this manner anthropomorphism is avoided entirely!

It is most remarkable that *idolatry was not yet fully developed* in Egypt. This appears in several ways. First, from the testimony of Manetho, that it was not till the reign of Cæachos (Kakau) of the IIInd Dynasty, that the bulls Apis in Memphis and Meneus in Heliopolis, and the Mendesian goat, were appointed to be gods.

Next, it is apparent that in the building of the Great Pyramid no symbols of idolatry were allowed to appear.

Third, the same fact comes out in the very names of the rulers of the first dynasties which read thus:—

1. Mena ("the firm or stable one").
2. Tota ("the striker").
3. Atot.
4. Ata.
5. Husapli.
6. Mirbapen.
- 7.
8. Qebbeh.

IIInd Dynasty.

9. Buzar.
10. Kakou ("the bull of bulls").
11. Bainnuter.
12. Usnas.
13. Senta ("the terrible").
14. Neférka [Rā].
15. Neferka-Sokari.
16. Huzefa.
17. Būbni or Zazai.

* Lenormant, *La Magie*, &c., Paris, 1874, p. 94.

† Seb, Father of the Gods. His name is often written with a goose alone. The sitting figure is simply the determinative sign for a god.

These names have none of the grand combinations with the names of the *Sun* (Rā) and other deities which we find everywhere in the later lists. Certainly not till after the time of the leading idolater Kakou do these appear; even the fifteenth, which is said to signify "*good by Sokari*," seems to refer to the supreme god of Memphis, not unlike our expression, "By the grace of God." Mena and his first successors might set themselves up as objects of worship; but the nation was not degraded to animal-worship, as in later times. To the investigation of this subject I shall return.

The name which terminates this series of kings at the end of the IIIrd Dynasty is Senoferu,* which is said to signify "the Improver," and he is also called "the Master of Justice." He is recorded by the Egyptian monuments as a beneficent king. He seems to have conquered the inhabitants of the Wadi Magharah (the Amalekites, probably), and in his days the mines of the district of Mount Sinai became either for the first time, or more abundantly, the source of the supplies of copper and of a blue stone called *mafkat*, much esteemed in Egypt. Chabas calls it *mafek*, and is inclined to identify it with malachite.

The VIth Dynasty terminated, according to Manetho, with the reign of the celebrated beauty *Nitocris*, whose name is transmitted to posterity in connection with the tragedy in which she extinguished both herself and the nobility of Egypt. It is as though a cataclysm had passed over the land; for from her time the old empire disappears, and, beyond a barren list of names, we seem at present to have nothing to guide us across the dreary waste of history till we reach nearly to the end of the XIth Dynasty. For 600 years, if we take the estimate of Brugsch (p. 78), the monumental guidance fails. It recommences only with the Pharaoh *Neb-ker-rā*.

We open the XIIth Dynasty with more certainty. It numbered eight Pharaohs, who reigned either 160 years or 213 years 1 month and 17 days. The latter date, though so exact, is manifestly wrong, because it includes reigns which overlap each other. The former is as certainly wrong, because the addition sum of the reigns gives eight years more, and because one reign is avowedly omitted. In such confusion is the Egyptian chronology!

These small inaccuracies are trifles; but what can we say to the following. Herodotus tells us the priests informed him that "when Mœris was king, the Nile overflowed all Egypt below Memphis so soon as it rose so little as eight cubits. Now

* Brugsch, p. 16.

Mœris had not been dead 900 years at the time when I heard this from the priests."

Rawlinson says this would make the date of Mœris about 1355 B.C., but he cannot make this agree with any probable Pharaoh.*

There can scarcely be the shadow of a doubt that Herodotus refers to Amenemhat III., who excavated an enormous artificial lake, to which the Greeks gave the name of Mœris, accounting it one of the wonders of the world, and supposing this to be the name of the king, when, in truth, it seems to have been only the Egyptian word *Meri* applied to any construction of the kind. This Pharaoh, whose severe and Shepherd-like features, are seen in the British Museum, was a diligent observer of the height of the inundation of the river, and caused to be recorded on the rocks between Semne and Koumme the heights to which the river rose; which show, remarkably enough, that the greatest height of the inundation was at this era not less than 8·17m. above that which it can now attain. The average height of the Nile under this Pharaoh surpassed that of our time by no less than seven mètres.

Now the reign of Amenemhat III. is placed by Brugsch at 2300 years B.C., by Herodotus, as we have seen, at 1355 B.C.; a difference of 945 years! It is as though our gravest historians were 900 years wrong as to the era of the Conquest of England by William of Normandy!

And yet in this XIIth Dynasty we touch close upon historic times, when the chronicles of other nations begin to aid our research. The Egyptians of this epoch kept up a very active commerce with the people of Libya towards the east, and with the nations of the Asiatic race. The arrival of representatives of these people in Egypt is a fact proved by numerous paintings in the funeral chapels. Libyans frequented Egypt to show their address in gymnastics, negroes came in to serve the great lords, and Asiatics presented themselves at the frontier of the Delta to ask permission to enter and to trade on the borders of the Nile. The empire then commanded the respect of the surrounding nations. The two cities called by the Greeks Crocodilopolis, on the borders of the lake Mœris, and of Heracléopolis, were the centres of the busy movement of this bright era, † in the midst of which Abraham is supposed to have arrived in Egypt; and the representation of thirty-seven persons of the Shemite race coming to present their homage

* Rawlinson, *Herodotus*, ii. 12.

† Brugsch, *Hist.*, p. 99.

and their tribute of antimony to a certain Chnum Hotep was at one time supposed to represent the arrival of the sons of Jacob in Egypt. The personage above-named was a dignitary in the time of Usurtasen II., and the representation is connected with his tomb at Beni-Hassan.

The XIIIth Dynasty contains chiefly the names of Pharaohs, compounded with the title of Sebek, the crocodile-headed divinity. Were these rulers of Egypt, or of a small portion, addicted to this worship?

"The famous canon of Turin is the only monumental source which can serve us as a guide in this labyrinth, if unfortunately the fragment of the MS. which enumerated the kings successors of the Pharaohs of the XIIth Dynasty were not filled with *lacune* of an extension greatly to be regretted."*

Thus with torn and misplaced fragments of papyrus, and with extracts from the work of Manetho, "*which differ notably among themselves,*" we make our way across this immense interval, which is after all no interval at all, if we trust the tablet of Abydos; but which according to modern research is as follows:—

XIIIth Dynasty of Diospolis,	60 kings,	453 years.			
XIVth	,,	Xoïs,	76	,,	484
XVth	,,	Hycshos,	6	,,	260
XVIth	,,	Hycshos,	10	,,	251
XVIIth	,,	Diospolis,	10	,,	?
					1448
					+ say 252
					1700 years!

Of this the able author makes *collateral* :—

Legitimate Dynasties of Diospolis.

XIIIth Dynasty, 60 kings, 453 years.
XVIIth ,, ? years.

Illegitimate Dynasties.

XIVth Dynasty of Xoïs, 76 kings, 484 years.
XVth ,, Hycshos, 6 ,, 260 ,,
XVIth ,, Hycshos, 10 ,, 251 ,,

What amount of credence can be given to these figures? I have no hesitation in believing that M. Brugsch has done his best with them, and that his *History of Egypt* is the most

* Brugsch, *Hist.*, p. 113.

accurate yet published; but if displayed, as I have seen them, with the intention of unsettling the minds of commonplace people, who are not Egyptologists, it becomes the duty of those who are occupying the seat of the unlearned to withhold assent till further proof is given.

I shall not pursue the theme of the history of Egypt, although the times of the XVIIIth Dynasty invite research. It is almost beyond question that more light will be thrown from monumental evidence on the period of the sojourn of Israel in Egypt, on the era of the Exodus, and the Pharaoh whose deeds are recorded. For the present it is best to wait.

Brugsch has already given us a work on the Exodus and the Egyptian Monuments, and announces in his *Bibel und Denkmäler* the following:—

1. Egypt in geographical-political relationship at the time of the abode of the children of Israel.
2. The Hebrews in Egypt, and Moses.
3. The Exodus of the Israelites, and the Monuments.
4. The people in the East of the Delta according to the monuments.
5. The cities and fortresses of Palestine at the time of the entrance of the Jews into Canaan.
6. Egyptian travellers in the land of Canaan.
7. The Mosaic Völkertafel and the Monuments.
8. Joseph and the year of famine.

Religion of the Ancient Egyptians.

I must now take up again more definitely the consideration of the religion of the first Egyptians; premising this, that I shall be quite unable to follow the various changes which occurred in after-times, when the mutual rivalry and hatred of the followers of the differing dogmas tore Egypt in pieces, and inflicted calamities innumerable. The worshippers of Amon, the concealed or hidden god, and of Ra (or Re), the visible sun as his manifestation, and the "disk-worshippers," and those who specially devoted themselves to the Arabian god Bes, the god of pleasure—the Bacchus of Egypt—will find small place in my pages.

I wish to examine the question,—since we have seen that early Egypt presents us with man as a worshipper,—What was the object of his worship? Was he a Theist or a Polytheist? Do we discover any reliable trace of such primitive revelation of the will of God to mankind as we may fairly expect from the record of Scripture?

I say we may *fairly expect*, since we find acceptable and accepted worshippers of God from the days of Abel downwards, through the line of Enoch and Noah, and not ceasing till, in the time of Abraham, when already some XII. or XIII. Dynasties had reigned over Egypt, we read of Melchizedek, King of Salem, Priest of the Most High God, *El Elioun*; of which title of the Supreme we find the reminiscence in the work of the Phenician Sanchoniatho,*

Ἡλιοῦν καλούμενος Ὑψιστος,

mixed up by this author with many fables, but the Elioun of Melchizedek seems truly to have been *the Most High*!

There is nothing in the Bible to lead to the conclusion that these accepted worshippers were gathered together in a church capacity. Indeed, it is very evident that this was not the case in reference to Abraham and Melchizedek. The father of the faithful and the King of Salem do not appear to have met each other on more than one occasion, and the priesthood of the latter must have been exercised in a nation akin to the Egyptians.†

Whilst so much of light and truth lingered amongst the Amorites, were the Egyptians during the long period of XII. Dynasties, computed at 2,000 years, altogether devoid of such a blessing? It is hard to think so.

Shall not the Judge of all the earth do right? And will it not appear that He left not Himself without a chain of witnesses throughout the period, be it longer or shorter, already referred to?

Early Witness to the Truth and Early Idolatry.

Dr. Chwolson has gathered together a number of interesting quotations from Eastern writers, to which it may be difficult to assign any reliable historical authority; but as far as I can see, allusions to the contest between the true religious worshippers who rested on the traditional foundation (*angeborene Anlage*)‡ of a faith derived through Noah from the earliest times, and those who boasted themselves as free-thinkers, is probable enough. These latter said that their doctrine (*Ssabismus*) consisted in freedom from the fetters of men (*in dem Freisein von der Fessel der Menschen*),§ and yet they accepted the au-

* Cory, *Ancient Fragments*, p. 8.

† *Iris* and Canaan were "brothers" (see above).

‡ Dr. D. Chwolson, *Die Sabier und der Ssabismus*, vol. ii. pp. 419, 420. Petersburg, 1856.

§ *Unsre Lehre ist das eigne Verdienst.*

thority of Adsîmun, Agathodæmon, and Hermes. They maintained that the pyramid to the east was the grave of Agathodæmon, the other that of Hermes, and the coloured pyramid the grave of Ssâbî, the son of Hermes, "from whom the Ssabians derive themselves."* (Appendix B.) They devoted themselves to the worship of the heavenly bodies as mediators† (comp. Job xxxi. 27), and they probably gave those names to the days of the week, which we still continue to use. Perhaps we should use them with less satisfaction if the remembrance continued of the sickening human sacrifices described in the above pages. The sun, moon, and the five planets were the special objects of their reverence.

Harran is spoken of (p. 412) as a city of the Ssabians, and there they had a celebrated temple dedicated to the moon, which was frequented up to the time of the Emperor Julian the Apostate (Appendix C), who, according to Theodoret, resorted thither for sacrifice, to ascertain the issue of his Parthian war by one of the modes of divination practised by the King of Babylon (see Ezek. xxi. 21).

This freethinking emperor had found associates quite to his mind in the Ssabians. It is not unlikely that even to our own day human sacrifices are occasionally perpetrated for the same end and in the same land. It is not many years since the disappearance of a person at Damascus was *most calumniously* ascribed to, and occasioned a persecution of the Jews; but that he *was* put to death there was little doubt, and that for purposes connected with magic art.

Babylon seems to have been the great centre of idolatry, and Nimrod (according to tradition) the head and front of the offending.‡ It is thought by some that Asshur went forth out of that land leading a colony of those who expatriated themselves to avoid his government and religion. This inquiry leads us to this presumption, that there has lingered in the East a true remembrance of the origin, and in part, of the nature of the Chaldean idolatry, and of the worship of the heavenly bodies; and, moreover, we find that, in opposition to all this, the pure views of monotheistic truth held by Abraham are set forth with great force and clearness by certain Arabian writers, and are described as descending from the days of Noah.

* Dimeschof, *ut supra*, p. 410.

† *Trans. Bib. Arch.*, iii. 143.

‡ May there not be a connection between the worshippers of Nimrod (*Marduk, the brilliant*,—*Trans. Bib. Arch.*, iii. 141) and the invasion of the disk-worshippers in Egypt?

The knowledge of the True God in the line of Shem.

I will then recur to the account of Noah, and the division of the earth among his progeny, as to the line in which the worship of the true God should be maintained. This seems to have been quite lost in tradition; and whilst there remained a recollection that the name of Ham was in some way significant, no such remembrance appears to attach to Shem. His prerogative was not valued by idolaters.

We have very distinct *dominions* assigned, and, prophetically, a different lot to each. On Canaan, who, according to Jewish tradition, perpetrated some outrage,* he pronounces the curse of servitude, but on each of the other two "he bestows a benediction appropriate to and fulfilled in the destiny of their descendants. On Yapheth, temporal prosperity, wide-spread possessions" (*Yapht Elohim le Yapheth*), "wealth and power; and on Shem eternal felicity, a knowledge of the true God, and his especial protection."

This is Mendelssohn's exposition of the Jewish tradition, which seems, I must admit, to *exceed* anything we can find in the prophecy; but we may not be wrong in seeing in—
Yapheth, † פִּתְּי, from the root פָּתַח, with the sense of "*widely extending.*"

Shem, ‡ שֵׁם, THE NAME, certainly is connected with the blessing, "Blessed be *Jehovah*, God of Shem," for the peculiar name of the Lord is here brought in in connection with Shem (before it is only Elohim), to indicate (says another commentator §) "that by the descendants of Shem He would most purely be worshipped, according to his Unity, and immaterial, everlasting essence," which attributes are especially expressed in that name.

Ham, || חָם, from the root חָמַם, to "*wax hot,*" the one who was, in his descendants, to occupy the warm regions of the earth, and whose physique was doubtless thereto adapted.

One thing at least is evident, that it was not in the line of Ham that the knowledge of the true God was to be perpetuated; and so in due season Abram is chosen in the line of Shem. It is, therefore, not to be supposed that we shall find any esta-

* De Sola, *Genesis*, p. 38.

† Compare the Legend of Ouranus and his son Ius in Sanchoniatho,—
Cory, *Anc. Fr.*, p. 13.

‡ *Ges. Lex.*

§ Philippon, in De Sola, p. 38.

|| *Ges. Lex.*

blished worship of the true God in the line of Ham, whatever exception there may have been to the general course of events. I do not know whether any connection may have existed between Melchisedek and Shem, but it is not impossible that by descent such may have been the case.

In idolatrous Egypt, however, it is clear that Shemite influence again and again made itself felt in opposition to the worship of idols, and with more or less clearness, and certainly in favour of the worship of "the living God."

The earliest period of such influence we may suppose took place at the time of the building of the Great Pyramid, in which the name of Khufu (Cheops), the Pharaoh by whom it was built, occurs. We have reason to believe that he worshipped Ptah, but the astronomical references seem to point to Chaldean lore. There is a remarkable absence of the symbols of idolatry in the structure, and much interest has been of late aroused in connection with various particulars in its structure.

Whatever may be the import of these, we find great national—perhaps religious—aversion to the Pharaohs, who reared this and the second pyramid. Manetho records, however, of the builder of the Great Pyramid that "he was translated to the gods, and wrote *the sacred book*."

I do not know whether this means "the Book of the Dead" in its first and simple edition, but it shows the king to have been in some sense devoted to religion.

I shall not spend any time over various periods of Egyptian history, in which we find obscurely recorded the results of Shemite influence, but come to the visit of Abraham, whose attainments in astronomical science we may well suppose to have been considerable, owing to his ancestral connection. He is said by Josephus to have taught the Egyptians many things, and certainly he would not forget to impart that knowledge of the true God which was to him the most prized possession.

His intercourse with the Pharaohs seems to have been of the most friendly description.

Then we come to the period of Jacob and his family going down into Egypt, not forgetting, however, the most interesting narrative of Joseph's history, in which we see so much of appeal to the knowledge of *God*, possessed alike by the Egyptians and the Israelites; *e.g.*, "How can I do this great wickedness and sin against *God*?"

The wife of Potiphar must have felt the power of this appeal against the commission of one of the forty-two sins, concerning which she would have to answer in Hades.

Joseph says to Pharaoh's officers, "Do not interpretations

belong unto *God?*” not to *Thoth*, or any imaginary being, and they quite understand him.

Again, he says to Pharaoh, “*God* shall give Pharaoh an answer of peace”; and there is no evidence that the word sounded strange in his ears.

Again, and still more remarkably, “What *God* is about to do, He showeth unto Pharaoh.” This is most remarkable, as telling us of prophetic dreams, really God-inspired, granted to Pharaoh; and in such dreams it must be understood the Egyptians placed unbounded confidence.*

Then we find at last Pharaoh is prepared to say, “Can we find such an one as this is—a man in whom the Spirit of God is?”

Whether or not it was *Har-Knum* Horus, the good spirit, that he thought of, I know not; but certainly he traced the blessing to its right source, for “every good gift and every perfect gift is from above, and cometh down from the Father of Lights.”

Influence of the Israelites.

The effect of all this on Pharaoh—on his court and people—must have been very great. What do we find further but Joseph entering into closest relationship with one whom we might deem an idolater—the daughter of Poti-pherah, priest of On. Now, On of the text was the sacred name of Heliopolis, of which the vulgar name was *Pa-Ra*, the city of the sun.† The magnificent temple was approached between by two obelisks, one of which, reared by Usertasen I., exists to the present day, and the remains are still seen of an alley of sphinxes leading up to the temple.

Now we come to questions more easy to ask than to answer. Was Asenath *really* an idolatress when Pharaoh gave her to Joseph? If not, was she a disciple secretly of a new faith? But if so, what was her father? The very priest of the temple! who yet willingly assented, as we must believe, to this alliance of his daughter.

When Israel abode in Egypt there must necessarily have gradually arisen a great commingling of the two peoples, and many such complicated questions must have occurred, resulting, when they left Egypt, in a “mixed multitude” of no small proportions going with them.

In the mean time they must needs have been witnesses for

* Compare also 2 Chron. xxxv. 22.

† Pierret, *Dict.*, *sub voce* Heliopolis.

the true and living God, in so far as they were faithful to Him, and this for a long period, not less, if we take it literally, than 430 years.

The Egyptians do not seem to have been a bigoted race, or given to persecution for religion. It was only the actual sight of their deities—"abomination" offered in sacrifice to the God of the Hebrews—that might have led to such a result. The oppression of the people was brought about from political motives.

When Pharaoh's daughter adopted Moses, there seems to have been no difficulty about the religious education of the young lad, and, if she had fulfilled her intention of raising him to the throne, she would probably have made all her subjects worship the God of the Jews. Such a revolution would not have been without its precedent in the history of Egypt.

It is remarkable that the Shemite influence in Goshen is not only to be traced out in various ways in the names of towns and other features of the country, but also that the Egyptian texts record a deep, religious, and monotheistic impression on the mind of the nation.

On this point I cannot do better than present a translation of some remarks which I find in Brugsch's *Exode*, &c.

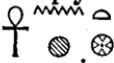
"I commence by the divinity venerated at Pithom, and in the district of Succoth. Although the lists of the Nomes and the Egyptian texts expressly designate the solar god Thom (Athomi), the same who had splendid temples in On-Heliopolis, as the tutelar god of Succoth, nevertheless they add that the god Thom represents only the Egyptian type corresponding to the divinity of Pi-thom, who is called by the name of *ānkh*, and surnamed 'The Great God.' The word *ankh*, of Egyptian origin, signifies The Life, or 'He who lives, the Living One.' It is the only time that I meet in Egyptian texts a similar name for a god which appears to exclude the idea of idolatry.

"The town of *Pi-thom* had consequently another name, which it owed to the presence and existence of the god *ānkh*, and which in Egyptian was pronounced *p-āa-ānkh*, the habitation or dwelling of the god *ānkh*. Conformably to this name, the district of Succoth was called, in another manner, *p-u-nt-pāa-ānkh*, the district of the dwelling of Him who lives. Add to this monumental word the Egyptian word 'za,' so well known to designate the governor of a city or a district, and you have the title *Zapunt pāaānkh*, 'the Governor of the district of the dwelling of the Living One.'

"And now, consult the Holy Scripture, it will tell you that the Pharaoh of Joseph honoured him with the long title of *Zaphnath-pāaneah*,* which exactly corresponds with the Egyptian word of which I have proposed the analysis."

Before I pass away from this subject, I will mention, that the symbol of life, the sacred Tau, to which many strange cabalistic

* In our translation, *Zaphnath-pāaneah*; in the LXX. *Φορθοφανίχ*.

properties were assigned, is simply the first character of the above word *Anch*, for life.  The Tau is, I believe, the representation of a lady's ear-ring, and most certainly has as little to do with any Christian mysteries as the celebrated mother and child so frequently represented in ante-Christian days, for explanation of which we must recur to Babylonian legends.

Contrast between the Idolatry of Egypt and the Truth given through Moses.

Apart from Shemite influence, it seems to me that the Egyptians must be admitted to have been wholly given to idolatry, and that of a very gross description. To prove this would be a very superfluous task, but it may not be unnecessary to remark that the worship of Osiris, of Isis, and of Horus partook entirely of the same character.

As far as can be ascertained, there can be little doubt that these were really human personages, and their worship, at the best and from the earliest period, was the worship of man. The specially Egyptian character of the traditions forbids the supposition that they belonged to any era before the arrival of Mizraim in Egypt.

On the other hand, it is evident that the priests preserved most important features of a primitive religion of mankind. The doctrines of a future life of rewards and punishments after death, and specially of the resurrection of the just, strike me as peculiarly important, and throw light upon the Bible in regard to some peculiar passages, as well as generally in reference to the belief of the chosen people.

It would, indeed, be strange if it could be supposed that Moses,* and all who followed after him, had a less definite and fixed belief on these subjects than the nation to which they had so long been in captivity, or their neighbours on the East, of whose views we have recently received so much information from the researches of our Assiriologist *savans*.

But, instead of the religion of the Hebrews being akin to that of the Egyptians, it presented, in every respect, the most marked contrast. The revelation of Jehovah was that of the living God, who had come down to deliver them from Egypt, who walked with them through the Wilderness in the pillar of cloud and of fire, who condescended to fill the tabernacle with

* Clement of Alexandria tells that "they communicated their mysteries to no one, reserving these for *the heir to the throne*, or to those amongst themselves who excelled in virtue or wisdom." (Pierret, *Dic.*, *sub voce* Initiation.)

His glory, and to commune with Moses from off the Mercy Seat, and whose very name revealed to them included in itself a pledge that, if they were faithful to the covenant which He made with them, He would be ever ready to hear their prayers, ever ready to bless and to keep them, and to lead them into the Mountain of His inheritance—the place which He had foreseen for them.

It is recorded of one of the priests of Memphis (Ptah-mer), that “he had penetrated the mysteries of every sanctuary. There was nothing that was hidden from him. He adored God and glorified Him in His designs; *he covered with a veil the flank of whatever he had seen.*”*

Moses was not content without a vision of the glory of God, but he came forth to tell *the people* all the goodness of Jehovah, and not to hide this knowledge under a veil. As far as in him lay, he sought to lead the people to walk in fellowship with an ever-present, living, and loving God; theirs in life, as well as in death and in resurrection.

Does he not tell them with his last words, that it should be their *life* if they set their hearts to all the words which he testified to them that day? (Deut. xxxii. 47). Does he not say, “O that they were wise, that they understood this, *that they would consider their latter end*”? and does he not, in that grand 90th Psalm say, in words which they must have read with the full knowledge of the belief they had seen everywhere manifested in Egypt: “Thou *turnest* man to destruction, and sayest, RETURN ye children of men”?

It may be said that both mean the same thing—return to death! But, if so, what can we make of the concluding petition, “Let the beauty of JEHOVAH our God be upon us”? How can the beauty of the Living One—the I am—be upon dust! unless, indeed, in resurrection?

And as touching the dead, that they rise; have ye not read *in the book of Moses*, how in the bush God spake unto him, saying, “I am the God of Abraham, and the God of Isaac, and the God of Jacob”? “*He is not the God of the dead, but of the living*; ye therefore do greatly err” (Mark xii. 26, 27).

The Horus Myth.

I must now preface my concluding observations with some remarks on the Horus *Myth*, or *Myths*, as there has been

* See the original given in Pierret's *Dict.* (*sub voce* Initiation), from the Louvre Collection of Hieroglyphics, A 60.

supposed that some danger might arise to Christian truth from I know not what misinterpretation of the whole matter.

I have already touched upon the solar aspect of the story of Horus; that is to say, of the Good one suffering for a season under the power of the Evil one, and in the end, overcoming all his enemies.

I suppose that this primitive portion of Divinely communicated knowledge is to be found in Genesis iii. 15: "it shall bruise thy head, and thou shalt bruise his heel."

This thought is embodied in various aspects in the above myths, as well as in other legends of the early world.

The Horus Khem *Myth* seems quite an illustration of this. We have Osiris and Isis as the Nile and Egypt, and the notion seems very pretty and poetical.

An eyewitness* says, "Perhaps there is not in Nature a more exhilarating sight, or one more strongly exciting to confidence in God, than the rise of the Nile. Day by day and night by night, its turbid tide sweeps onward majestically over the parched sands of the waste howling wilderness. There are few impressions I ever received, upon the remembrance of which I dwell with more pleasure, than that of seeing the first burst of the Nile into one of the great channels of the annual overflow. All Nature shouts for joy! The men, the children, the buffaloes gambol in its refreshing waters; the broad waves sparkle with shoals of fish, and fowl of every wing flutter over them in clouds. Nor is this jubilee of Nature confined to the higher orders of creation. The moment the sand becomes moistened by the approach of the fertilizing waters, it is literally alive with insects innumerable. It is impossible to stand by the side of one of these noble streams, to see it every moment sweeping away some obstruction to its majestic course, and widening as it flows, without feeling the heart expand with love and joy, and confidence in the great Author of this annual miracle of mercy."

Now Horus Khem must surely have been the beautiful spring of vegetation arising from the bosom of Isis, or the earth after the withdrawal of the Nile, or the Osirian fertilizer of Egypt. "Khem symbolise la végétation en même temps que la génération, car les plantes élancées sont toujours figurées derrière lui. Une fête . . . par laquelle on semble avoir célébré *les bienfaits de la germination*, était en l'honneur du Dieu." His *green* dress is said to be symbolical of resurrection.

* Osburn, *Mon. Hist.*, vol. i. p. 13.

“In the Egyptian philosophy Horus symbolizes the existence which is to begin again, the *new life*, that *which will be to-morrow the future*, and thus becomes the type of the succeeding King—as Râ (the Sun) was the type of the reigning King, and Osiris of the dead King.”

If any one wishes to know what this pretty and poetical religion did for Egypt, let them read the 2nd Book of Herodotus, and they will not wish me to present a translation: or let them learn what effect kindred rites have among the Nature-worshipping natives of India;—but as to any conceivable connection with Christianity, I must say the notion fills me with wonder!

And yet there are not wanting *verbal* resemblances which may be insisted on by those to whom the utter contrast of the things themselves is objectionable; since the Messiah is prophesied of by Jeremiah, and again by Zechariah, as the Man whose name is the *Branch* or equally the *Sun-rising*; and if *Horus Nets* be spoken of, it might be looked upon as a striking coincidence that the Christ should thus be foretold, and that He should grow up at Nazareth and be called a Nazarene! But the words are *quite different*.

State of Morality.

In reference to their state of morality it is not my intention to say much. It is now, however, generally understood that they had a very high code of morality, and very refined ideas of what was becoming in different relationships of life, and this co-existing with the exact reverse too often exhibited in practice. Their religion tended directly and only to their debasement; and the license of their festivals, as depicted by Herodotus, was certainly somewhat in excess of what is still prevalent in Christendom. On the other hand we find, in the page of Scripture, the record of a greater regard to moral rectitude in Pharaoh than seems to have at that period guided the conduct of the Father of the Faithful. Egypt was from the beginning a country of internal oppression. The lower class were ruled by the stick* (*pat*); and whilst there seem to have been good and beneficent rulers, there were also *despots* of the first water. Their *pride* seems, as we find in Scripture, to have been their ruin. Every Pharaoh was a Horus: a rising sun—

“In those remote ages the idea of government was indissolubly linked with that of coercion by personal chastisement.” (Osburn, *Mon. Hist. of Egypt*, vol. i. p. 246.) It was not the *pat* of a lady’s fan, but the terrible *-αράσσω* of the Greeks that was in question.

a freshly appearing divinity—and they naturally felt themselves above all laws, human or divine. This we see exemplified in the IInd Ramses, the great oppressor (as it is supposed) of the Israelites. Not only is the boasting of this tyrant intolerable, and his oppression of his captives extravagant, but he himself records how he espoused at the same time a princess and her mother, in order to absorb into his own line all the rights of these princesses derived by way of succession. The Poem of Pentaour, a writer of the XIXth Dynasty, is devoted to the celebration of the exploits of this Pharaoh in his campaign against the Khétas (probably the Hittites), in which Ramses ran the most imminent risk of losing his whole army, and the shattered fortunes of the day were retrieved by his own personal prowess. This poem was greatly celebrated, and its scenes were inscribed on the walls of the temples of Luqsor and of Karnak.*

The account given by Herodotus of another Pharaoh presents the reverse side of the picture, showing a nice sense of justice and morality. The priests, in answer to his inquiries on the subject of the abduction of Helen, informed him of the particulars of the voyage, and how in the end the king, Proteus, was called to give judgment in the case, which he summed up as follows, addressing Alexander:—"Did I not regard it as a matter of the utmost consequence that no stranger driven to my country by adverse winds should ever be put to death; I would certainly have avenged the Greek by slaying thee. Thou basest of men—after accepting hospitality to do so wicked a deed. . . . Now then, as I think it of the greatest importance to put no stranger to death, I suffer thee to depart, but the woman and the treasures I shall not permit to be carried away. Here they must stay till the Greek stranger comes in person and takes them back with him. For thyself and thy companions, I command thee to be gone from my land within the space of three days; and I warn you that, otherwise, at the end of that time you will be treated as enemies."

All that we read in the Bible concerning both the Pharaohs and the order of their palaces and officers comports well with the information derived from native sources. The title itself is now said to be very frequent in the hieroglyphic form, and to read Per-ão with a meaning very much analogous to "the sublime Porte" of our day, veiling the person of the monarch under the notion of his illustrious house. For his subjects he was "a divine person" and "the master" pre-eminently, and

* Pentaour, in *Dict. Pierret*.

when referred to, is often characterized as "His Majesty." To swear by the life of Pharaoh might be pardonable, or even customary, in a courtier, but was a punishable offence in a person of low degree.

His high counsellors enjoyed a title which is rendered, in our version, "Father to Pharaoh"—*ab le Pharao*, in Hebrew; but this seems to have been common as a designation of the officers of highest rank at court.*

Lower down in the scale were superintendents of the vocal music—of the wardrobe, of the baths—and others who attended as hairdressers, and in various particulars served "His Majesty": even the care of his nails gave occasion to the services of a special officer, and we may be sure the duties of chief butler and baker were not forgotten.

The character of Moses, the chosen leader of the Israelites, the King in Jeshurun—is thus given in Numbers xiii. 3: "Now this man Moses was very meek, above all the men which were upon the face of the earth"—a remarkable contrast to the divinely worshipped Pharaohs.

The Present of Egypt.

The present state of Egypt is one of great interest, as it is evidently coming forward to take some leading share in the great events which are coming upon us in these latter days. The formation of the Suez Canal is, in itself, a sure indication of this; for every country through which the great traffic between the East and West—between Asia and Europe—has flowed from the earliest ages, has been enriched and invigorated thereby. But, quite apart from this, Egypt has made great advances towards some renewal of her former prosperity. The deadly incubus of Mahomedan fanaticism has, to a certain extent, given way before the light of European civilization, and the rulers have done something for the improvement of the country. The present Khedive has brought 350,000 acres of desert into cultivation, and, by improved irrigation, has greatly increased the general productiveness of the soil. There are now, in working order, 113 navigable canals, which feed 750 smaller canals, which, again, are subdivided into innumerable little channels, by which fertility is spread over the land.

Egypt has now, as we are told, 5,250,000 inhabitants. It scarcely could have contained more at the time of the Pharaohs.

* Brugsch, *l'Exode*, p. 17.

It is more thickly populated than Belgium, the most crowded country in Europe, which contains 173 inhabitants to the square kilomètre, while Egypt has 178. It is still a land of oppression. It is a sad sight, but a daily one, to see men, *women* and *children* employed in making a canal or raising the embankment of a railway or road, and obliged, for want of better tools, to carry all the earth in small baskets, or even in their own hands. Whole villages are transported to districts not their own, to construct, without mechanical aid, public works, the utility of which may be indisputable, but which will hardly result in more benefit to the unfortunate workers than did the Pyramids to those who made them. I take these statements from a leading organ of public opinion, whose present views on the Eastern question I am disposed to hail with satisfaction. I may add, from another source of information, that the power of the stick is still so much resorted to, that, in two instances, fellahs have been beaten to death in the endeavour to extort taxes which they were unwilling or unable to pay.

It would be a good deed on the part of the Khedive to supply with tools those who are forced to labour on public works; for they are too poor to buy them themselves. The average *fellah's* or labourer's hire in the country is about 5d. per day; but payment is always delayed, sometimes paid in kind—sometimes, if report says true, not paid at all. The labourers in the Delta, however, where European enterprise has penetrated, make a higher wage, and the workman in the towns is a much more prosperous man.

The annual number of vessels which visit the ports of Egypt has doubled within the last ten years, and the average exports from 1853 to 1863 increased from two and a half millions to twelve millions. The imports have doubled in the same time, and are nearly six millions sterling.

Thus much for the rapid advance of Egypt towards that more prominent place amongst the nations of the earth, which we are entitled to expect she will maintain. But the medal has also its reverse side, on which I think it best not to look at present.

The Future of Egypt.

If we believe our own sacred books, there is surely a glorious future in reserve for Egypt. It is not like Babylon: doomed to fall and never to rise again.

This is connected with an entire change in the religion of the country; for the prophet Isaiah (xix.) tells us distinctly that the healing and restoration of Egypt shall be coincident with

their return to the God of Shem and of Abraham and of Moses, and of the new covenant in Christ. For Jehovah shall be known to Egypt, and the Egyptians shall know Jehovah in that day: they shall return even to Jehovah, and He shall be entreated of them and shall heal them. In that day shall Israel be the third with Egypt and with Assyria, even a blessing in the midst of the earth, whom Jehovah of Hosts shall bless, saying, *Blessed be Egypt, my people*, and Assyria the work of my hands, and Israel mine inheritance!

Horus shall no longer boast of the multitude of his followers; Osiris and Isis shall be remembered only as things of the past; Amon shall relapse into mystery; and "he who blesseth himself in the earth shall bless himself in the God of Truth." "For behold I create new heavens and a new earth; and the former shall not be remembered, nor come into mind" (Is. lxx. 16, 17).

APPENDICES.

(A.)

MUMMY FROM GOURNOU, EXAMINED BY A.B. GRANVILLE, M.D., F.R.S., &c.
Read April 14, 1825, before the Royal Society.

[Extract.]

"Now we find, on comparing the principal of these dimensions with those of the Venus de Medicis . . . that the difference between them is so slight as not to deserve notice. Our mummy is that of a person rather taller. The celebrated Medicean statue, which stands as the representative of a perfect beauty, is 5 feet in height, . . . and the relative admeasurements of the arm, fore-arm, and hand in each are precisely similar.

"But in a female skeleton it is the pelvis that presents the most striking difference in different races. Nothing, for instance, can be further removed from the symmetrical form, and from the dimensions of the pelvis in the Caucasian or European race, than the same part in the negro or Ethiopian race. . . .

"When subjected to this comparative test, the pelvis of our female mummy will be found to come nearer to the *beau idéal* of the Caucasian structure than does that of women in general, and to equal in depth, amplitude, and rotundity of outline the Circassian form. . . .

"What has just been observed of the skeleton generally, and of the pelvis in particular, applies with equal force to the form and dimensions of the head. So far from having any trait of Ethiopian character in it, this part of the mummy exhibits a formation in no way differing from the European.

"On looking at Plate xxi., which represents with scrupulous accuracy the

contour of the head of the natural size, it is impossible not to be struck with the likeness it bears to the skull of the Georgian female represented by Blumenbach's very instructive collection." [This skull of a Georgian slave gave origin, if I mistake not, to "*the Caucasian race.*"]

"It may be affirmed then that Cuvier's opinion, founded on his examination of upwards of fifty heads of mummies . . . is corroborated by the preceding observations, and that the systems which were founded on the Negro form, are destroyed by almost all the recent, and certainly the most accurate, investigations of this interesting subject. It is a curious fact, which has been noticed by more than one traveller, that whole families are to be found in Upper Egypt, in whom the general character of the head and face strongly resembles that of the best mummies discovered in the *Hypogei* of Thebes, and not less so, the human figures represented in the ancient monuments of the country."

(B.)

CHWOLSON, DIE SSABIER, &c., II. 634.

Schíth (Seth) was a prophet sent of God. . . . He lived 950 years, and men began religion from him. The Ssabians call him Agathodámon, and the Greeks Oráfi (Orpheus). Schíth means "the gift of God."

To his children belongs Ssábí, from whom the Ssabians descend.

Mohammed el Bashhámi.

Ibn Abi Ssalt—relates that the Ssabians and the Magi went on camels and on horses in pilgrimage to the Pyramids. They assembled from the most distant lands, and lighted *flambeaux* from the mountain to the river. It was for them a great feast. They also addressed prayers to the Sphinx.

The formal testimony of an Arabian historian, named Abou Zakarija, who appears to have accompanied the Ssabians who made this pilgrimage, seems to authorize us to believe that they went to visit these monuments after the conquest of Egypt by the Mussulmans. Besides the flambeaux which they lighted round the Pyramids, the pilgrims made the circuit of them several times—a ceremony which the old Arabs practised, and still practise, around the Kaa'bah, a temple in the origin dedicated to the moon, and much revered by the Ssabians before the appearance of Mohanimed, who destroyed Ssabism or the worship of the stars among the Arabs. These same Ssabians burnt incense, and sacrificed a black calf and a white cock—the first, without doubt, in honour of Agathodámon, the other to Hermes; two persons for whom they had a profound respect, and whose bodies, according to them had been deposited in the Pyramids.

(C.)

"Hören wir nun, wie christliche Historiker über diesen Besuch des Kaisers Julian und über die Harránier jener Zeit sich aussprechen. Die

gleichzeitige EPHRAEM SYRUS sagt in einem Gedichte, das er über die Christenverfolgungen unter Julian schrieb, 'Und er (Julian) kam nach Harrân, der Heidenstadt die reich an Götzenbildern ist, wo der ruchlose Opfer darbrachte.' SOZOMENUS sagt nur, dass er nach Harrân kam und daselbst im Tempel des Jupiter Opfer gebracht und Gelübde gethan habe. SOCRATES spricht gar nicht von diesem Besuche, um so ausführlicher aber THEODORET. Nach diesem soll Julian in Harrân in einem heidnischen Tempel gewisse Mysterien verrichtet und nach Beendigung derselben die Thüren dieses Tempels geschlossen, zugesiegelt und Wachen mit dem Befehl aufgestellt haben, dass Niemand in diesen Tempel eingelassen werde, bis er von seinem Feldzuge zurückkehren werde. Als aber die Nachricht vom Tode dieses Kaisers anlangte, sei man in diesen Tempel eingedrungen und man habe ein an den Haaren hängendes Weib mit ausgebreiteten Armen gefunden, dessen Leib aufgeschlitzt und aus dessen Leber divinirt worden war. *Τούτο μὴν* fügt THEODORET hinzu, *οὐν ἐν Κάβραις ἐφωράθη τὸ μύσος*."

The CHAIRMAN.—I am sure I may convey the thanks of the meeting to Mr. Howard for his interesting paper. Before the discussion begins, I would state that so little do the generality of people know about Egypt, that at the meeting at Sion College, on the 21st November, 1867, Professor Huxley* gravely asserted that the Pyramids were built on the mud deposits of the Nile. Much has been said by Professor Huxley and others in regard to the slow rate of the deposit of the mud of the Nile (a rate which cannot always be counted upon as uniform), and they have endeavoured to draw therefrom an argument against Scripture chronology. Mr. Howard has told us that one of the Assyrian kings turned the course of the Nile in order to get a site for the great city of Memphis, and that would alter the whole conditions of that place. The Nile is subject to great and sudden changes, with enormous deposits in a short space of time; I myself was once in a vessel which grounded in the river, and in three or four hours became embedded as it were in a dock. Arguments, therefore, based on a slow rate of deposit at once fall to the ground; and we must also consider that the Nile is a river rising beyond its banks at certain times, and spreading over a great area of country, from which it brings back large quantities of matter for deposit. Such things show that it is impossible to find a measure of the great antiquity of Egypt in the rate of the deposits of the mud in the river Nile.

Rev. Prebendary CURREY, D.D.—Before I had the pleasure of hearing the able paper which Mr. Howard has just read, I had the advantage of reading it for myself, which I did with a great deal of interest and attention.

* Vol. ii. p. 377.

So far as I can gather, the great lesson that we learn from the paper is in reference to the antiquity of the human race in Egypt. I do not quite know what the Chairman meant when he spoke of Scriptural Chronology, but suppose he did not mean the chronology which we are accustomed to see on the margin of our Bibles, because that is not Scriptural, but merely a deduction made in very late years, and is one which has not been by any means universally received ; and for my part, I think it is not at all capable of being accepted in the face of the testimony which we derive from an examination of ancient records. One naturally turns with especial interest to the records which we observe in Egypt, because we all know that Egypt is a country which was inhabited in very early times. We know that we possess in its monuments a mass of evidence which we have nowhere else ; and that a great advance has been made during the last 50 years, in deciphering the languages in which these records are set forth, so that we are now really beginning to find distinct evidence with regard to the chronology of Egypt. No doubt Mr. Howard has pointed out in his paper how very little certainty there is with regard to exact chronology. The greatest Egyptologists indeed have always given their results with much reserve, and when we examine them we find that they differ from one another by 2,000 to 3,000 years. This is perfectly true, but at the same time I scarcely know whether Mr. Howard laid sufficient stress on another fact, namely, that although we may not be able to obtain anything like an exact table of chronology, yet, at the same time we may, by collecting a great quantity of evidence, come to a kind of general result which we cannot help accepting. I know well that it is quite hopeless in the present day to have evidence sufficient to enable us to lay down anything like a chronology that shall determine the exact time in relation to our Christian era,—of the accession of Menes, for instance ; but at the same time we have abundant evidence to show that there must have been a much greater number of years between that time and the Christian era, than is accounted for in the popular chronology. It was at one time conceived that all those dynasties which Manetho brought forward on the evidence of Egyptian priests, and the vast number of years they involved, were fabulous ; but the more the Egyptian records are examined, the less is that view tenable. Those dynasties of Manetho come down to us in a very imperfect state, and no doubt we cannot accept many of them in the form in which they are given to us, but they contain remarkable evidences to show that they are, upon the whole, genuine lists of kings. Mr. Howard has pointed out the very remarkable fact that the names of the kings of the first dynasty are far more simple than those of later : in the later dynasties we have names which we know are composed, to a great extent, of the names of gods, as was the custom in those days ; but on the contrary, the names of the early kings of Egypt are without any such accession of the names of deities. This is a very strong argument against the supposition that these lists were compiled by priests for the sake of exaggerating the antiquity of their race. If this had been the case, we should surely have found that the earlier names

were not the most simple, but were names composed of the names of these deities whom they wished to honour. Then we have tables, recently discovered, one containing a list of sixty-five kings, which is mentioned by Mr. Howard, and another which Brugsch brings forward, containing a list of architects, from father to son, all showing a great antiquity—we cannot say how great—but a great antiquity. With regard to the date from the time of Menes, with which the authentic history of Egypt commences, I see that Mr. Howard accepts an estimate which puts it back about 3,300 years before the Christian era; now, that would bring us to 1,000 years earlier than the commonly-accepted date of the Deluge. But what I wish to point out is that when we get in that way to Menes, we find, not that we have got to the beginning of things, but that there is still an antiquity behind, for everything was then going on in the world with populous cities, systems of government, and all the marks of a high civilization. Mr. Howard has pointed out that this is an argument against the doctrine that man proceeded from savagery to civilization. Well, perhaps so; but whether it is or not, at all events it shows that there must have been considerable progress going on for years before, if not from barbarism to civilization, at all events such a progress as that which we find among our own ancestors; for they did not arrive without a long course of training at that knowledge of government and of the arts which is indicated by the earliest Egyptian monument. This proves that from the time of Menes we must go back a *long* number of years during which man was being trained up to the state of civilization at which he had arrived—whether in Egypt or in any other country makes no difference, because the amount of time required in any case would be the same. I therefore think that all this points to a very considerable number of years before the time of Menes; so that whatever date we take with regard to Menes, we still must go back a considerable number of years more than are allowed for in the popular chronology. It is highly important that we should recognize this. I am aware that there are difficulties in the way, because the system of chronology which we have, is said to have been framed by Archbishop Ussher, and is very ingenious, and there are always difficulties in the way of chronologies; but still these difficulties are not to prevent us from looking the real facts in the face, and if we find in the records of Egypt, as I think we do, evidence of a much greater antiquity than has been accounted for on the once received theory, we must look back to our Scriptural record and see whether there is not some method of reconciling the two, and acknowledge that we have been wrong in our former interpretations. It is far more easy to conceive that there should have been a misinterpretation of those Scriptural records, all contained in a very few chapters of Genesis, than it is to shut our eyes to the accumulating facts that speak of the antiquity of the Egyptian kings. This is one of the things which we learn from the study of Egyptian antiquities; there is also another, and that is, the existence, as indicated on monuments, of marked races, differing from one another, even in the earliest times, in the same manner as

they differ now. I think Mr. Howard's theory is that these differences were stamped by the Creator upon the progenitors of these particular races. (Mr. HOWARD.—That is, the differences arose suddenly, as happens among the inferior animals.) Precisely so; that probably at the dispersion of Babel, just as there was a change of languages by the act of the Creator, there was in like manner a change of race characteristics. This is quite a new idea to me, and certainly not unattractive at first; but it is pure hypothesis, and I do not know whether we can find in Scripture any indication of the kind; and the way in which man is mentioned as proceeding from one pair, and again from Noah, seems to be inconsistent with such a sudden change, though I by no means undertake to deny its possibility. A more common way of accounting for varieties of race is that these changes took place rapidly, from climatic and other influences—much more rapidly than they do now; and in this way, by supposing an increased rapidity, we might get all these changes within the years allowed. But could all these marked differences have been engendered so quickly? No doubt, if we assume that God was pleased, by the fiat of His creative will, to make such changes at once, this might get rid of one argument in favour of the *great antiquity* of man; but there is an obstacle in the way; the varieties are not merely three or four; but if we look over the globe we find that they are very numerous. If we adopt this hypothesis, we also practically, almost, make mankind not to have proceeded from one pair; for there would be a new creative act to disperse and divide the whole human race into different subdivisions. It is more difficult to accept any one hypothesis of this sort without evidence for it, than to suppose that there has been a mistake in regard to the computation of years in our chronology. And if we once allow the chronology to be wrong we may enlarge the time to whatever extent may be necessary. If differences of race were the only things that indicated great antiquity, such a theory as this of Mr. Howard's would come with greater force; but there is much more than this in various directions. I do not appeal to the geological argument, which can yet scarcely be neglected; but I appeal to the testimony of history. An impartial consideration of the Egyptian records leads to the conclusion that a people who, so many years back as the time of Menes, were possessed of all the arts of civilization and government, and everything that marks an advanced state of civilization, could not have risen to such a position without a long period of development. From our own experience, we know that it must have required many years to arrive at such a condition; and this furnishes strong reasons for believing that there must have been a much greater number of years in the world's history than is popularly supposed to be the case.

Rev. H. S. WARLEIGH.—Will you allow a country member to say a few words? First of all, I must avow my belief in the general deductions of Egyptologists, and I must consider that there was a civilized race in Egypt long before the era of Adam. But while I believe this, I am obliged to believe also in the truth of the Bible, from its very beginning to its very end; for I take it to be a revelation from God, the truth of which we ought not,

and cannot properly question. I believe, therefore, in both these things. But it will be asked, "Are they not contradictory? and how can you believe the one if you receive the other?" I think Mr. Howard has given us to-night a good deal of data which will show a considerable antiquity in the civilization, and perhaps also in the language, of Egypt. It appears to me that the Bible really does account for all this, if we only take it as it is, and do not read it through traditional spectacles. I believe we are all apt to read about the Bible and to read about science; but we too seldom read the Bible itself, especially in the original tongue, and some of us very seldom study science itself. It is because we apprehend so imperfectly what God's Spirit has inspired on the one hand, and what He has indicated in His works on the other, that we come to so many supposed difficulties. There are no difficulties at all about the Bible viewed as it really is, and not through men's commentaries; nor about science viewed as it really is, and not through men's theories. We must take one as God's book of Revelation, and the other as His book of Nature; and if we read both, we shall by-and-by come to a state in which, through our Saviour, we shall be far better able to understand both, than we can hope to do here. I consider that the Bible tells us that there were races upon the earth at the very time when God created Adam, about 6,000 years ago; for, Gen. vi. 4, when the words in italics are left out, and when correctly translated, would read thus:—"The Nephilim were in the earth in those days [about A.M. 800], and also at the time when the daughters of Adam were married to the sons of God and bare to them, the same [Nephilim] were the mighty ones which were from most ancient times [Heb. *me oplam*] men of renown." Nephilim means persons who had fallen away, or revolted from their rightful Lord. The word rendered "men" is in Heb. *anoshim*; and means sickly ones, and destitute of something which they had before their fall; and thus the words *Nephilim* and *anoshim* singularly agree in meaning. That they were a race is evident from the fact, that the noun has the definite article *ha* affixed to it, as in all similar cases. These Nephilim were in the wide earth [*erets*], while the Adamic family were only in the ground (*adamah*, ver. 1), that is, the now cultivated estate just outside Eden. I think the words are sufficiently strong to carry us back many hundreds of thousands of years, even in Egyptian history, if necessary. There is in the Bible that which will harmonize Egyptology with the Bible, and that which will harmonize geology with the Bible, but we must go to the original sources to find harmony in what appears at present to be contradictory.

The CHAIRMAN.—May I state that there is a great difference in the size between the large pyramid and all others in Egypt, and it is the only one without idolatrous symbols; moreover, its construction augurs a higher state of civilization at the time of its construction, in the earlier period of Egypt's history, than existed afterwards. Looked at from this point of view, it shows that a degradation of the race existed afterwards. Now, we must bear in mind that there is no case in the history of the world where any individual race has civilized itself, it has always been civilized from without. The civiliza-

tion of Egypt, taking that pyramid as the first step, has been a degradation and not an advancement. Neither Egypt nor any other country ever civilized itself. Go to Central Africa, and see how low and small is the amount of civilization there, and consider how much light has passed through it in early days. In the same way go into China, and remember that it was at one time a Christianized empire, not in the higher sense, but avowedly so, and remember that it now shows a degradation from that position and not an advancement upon it. (Mr. Row.—May I ask your authority for saying that China was ever a Christian empire?) It is mentioned by Duhold. I learnt the fact in China—the Chinese scholars were of that opinion.

Mr. MASTERMAN.—May I add a few remarks to what the chairman has said in reference to the great pyramid? The date, which is believed to have been discovered as that of its erection, may not be the true one, but the arguments in its favour are very curious and interesting. The date assigned by Piazzzi Smyth is 2170 years B.C.; and if that is the true one, and the pyramid, as is almost universally acknowledged, preceded all the other monuments in Egypt, we certainly have a great approximation to the dates generally received as part of the popular Biblical chronology. Speaking of the chronology of the Bible, I think it is apt to be forgotten that the period which is disputed is that between the creation of man and the Flood. It is in that earlier period that there is room for difference of opinion, at least within certain limits; but from the time of Noah I doubt if there is room for a variation from the received chronology exceeding 200 or 300 years.

Rev. Preb. Row.—I think we should exercise the greatest caution in pinning our faith, not to the chronology of the Bible, but to what people have called the chronology of the Bible. The whole question is one of interpretation. Some say the chronology of the Bible is part of the Bible, and, no doubt, that would be so if you could get at its real chronology, but you cannot do that, and you must not assume any interpretation as the Word of God. The Bible, not our interpretation of it, is the Word of God. I scarce agree with Mr. Howard in one part of his paper where he calls Julian the Apostate a free-thinker; I should rather have considered him as a most superstitious person. I regard the paper itself as most interesting, and it shows the great antiquity of Egyptian civilization, but I am not certain that it proves anything.

Capt. F. PETRIE.—One or two remarks made by Dr. Currey have recalled to my mind a letter which I lately received with regard to the different characteristics of the inhabitants of ancient Egypt. Dr. Currey said that a large amount of time must have elapsed to have produced such divergence in features among the inhabitants of the world. Now Mr. Parker, the President of the Microscopical Society, and an authority on such subjects, says he considers, from the researches he has made, that races have a habit of throwing out branches each having very different characteristics and that these branches have ever afterwards maintained themselves side by side, but have never come together again; and, as an instance, he alludes to the "Yankees," as a sub-species which has developed itself in less than a

century. I have received similar testimony from Principal Dawson, F.R.S., of McGill College, Montreal, and he adds that he does not think we can assign that extreme age to the human race which some claim for it.

Mr. HOWARD.—I will, in the first place, take up the remark of the Rev. Prebendary Row,—that I have proved nothing. I think that, at all events, I have proved this much, that it was quite time the subject was brought before the VICTORIA INSTITUTE, so that we might keep ourselves *au courant* with recent discoveries. As to the chronology of the Bible, I have nowhere asserted the received to be the true chronology. I think it is not a good habit of mind to come to the investigation of difficult questions with a preconceived opinion. What I set myself to do was, not to dogmatize but to investigate. In reference to what Dr. Currey has said with regard to the progress of civilization, I may say that I have not given any intimation of my opinion as to the length of time which Egyptian civilization took for its development. I know that we are tolerably clear about the 18th and 19th dynasties, and about the 12th there is not so very much doubt; but when we get beyond that the case is altogether different. It is believed by competent authorities that there are indications in the pyramid of certain positions of the heavenly bodies; if these really be correct data, we shall have to revise the supposed antiquity of the earlier dynasties, and the era of the Pyramids will be brought to within a few hundred years of the time of Abraham. In reference to Mr. Warleigh's idea that Egypt may have existed several hundreds of thousands of years, or that there may have been many races of mankind before Adam was created, such speculations, if suited for discussion, can, at all events, have no reference to the history of Egypt since the time of Menes, which runs parallel with Chaldean history, and also with that of other adjoining countries; I therefore think that we had better not go back to pre-Adamite disquisition, for we have quite enough before us this evening in the history of Egypt since the time of the preservation of something like authentic records.

The meeting was then adjourned.