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Objects of the Victoria Institute.

- First.—To investigate fully and impartially the most important questions of Philosophy and Science, but more especially those that bear upon the great truths revealed in Holy Scripture, with the view of defending these truths against the oppositions of Science, falsely so called.
- Second.—To associate together men of Science and authors who have already been engaged in such investigations, and all others who may be interested in them, in order to strengthen their efforts by association; and by bringing together the results of such labours, after full discussion, in the printed Transactions of an Institution, to give greater force and influence to proofs and arguments which might be regarded as comparatively weak and valueless, or be little known, if put forward merely by individuals.
- Third.—To consider the mutual bearings of the various scientific conclusions arrived at in the several distinct branches into which Science is now divided, in order to get rid of contradictions and conflicting hypotheses, and thus promote the real advancement of true Science; and to examine and discuss all supposed scientific results with reference to final causes, and the more comprehensive and fundamental principles of Philosophy proper, based upon faith in the existence of one Eternal God, who in His wisdom created all things very good.
- Fourth.—To publish Papers read before the Society in furtherance of the above objects, along with *verbatim* reports of the discussions thereon, in the form of a Journal, or as the Transactions of the Institute.
- Fifth.—When subjects have been fully discussed, to make the results known by means of Lectures of a more popular kind, to which ladies will be admissible; and to publish such Lectures.
- Sixth.—To publish English translations of important foreign works of real scientific and philosophical value, especially those bearing upon the relation between the Scriptures and Science; and to co-operate with other philosophical societies at home and abroad, which are now or may hereafter be formed, in the interest of Scriptural truth and of real Science, and generally in furtherance of the objects of this Society.
- Seventh.—To found a Library and Reading Rooms for the use of the Members and Associates of the Institute, combining the principal advantages of a Literary Club.

Terms of Membership, &c.

The Objects of the Victoria Institute being of the highest importance both to Science and Religion, while they are such as have not been attempted to be attained by any previously existing scientific society, it is anticipated that when its establishment is known, it will receive the most liberal support by gifts and donations from friends, and be joined by large numbers of Members and Associates.

The annual subscription for Members is now Two Guineas each ; with One Guinea Entrance Donation.

The annual subscription of 1st and 2nd class Associates (ladies being eligible) is Two Guineas or One Guinea each, without any Entrance Fee.

Life Members to pay Twenty Guineas ; and Life Associates first or second class, to pay Twenty or Ten Guineas, respectively, in lieu of the above Annual Subscriptions.

Vice-Patrons (ladies or gentlemen) to pay not less than Sixty Guineas each, as a Donation to the funds of the Institute.

* * * All who join the Society as *Members* must be professedly Christians.

On 31st December, 1866, the Foundation Lists were closed. *Members* now admitted will be required to pay an Entrance Donation of One Guinea, as above stated ; but they will receive the first two numbers of the Journal of Transactions (published in 1866) *gratis*. Associates (1st and 2nd class) will obtain these Journals on payment of 2s. 6d. for each number.

New Members and Associates, however, who are desirous of being upon the Foundation Lists, although they have not applied for admission till after 31st December, 1866, may be so elected by the Council, upon the understanding that they shall pay the annual subscription for the year 1866 as well as that for 1867.

Further particulars will be furnished upon application to the Honorary Secretaries or Clerk at the Office, 9, Conduit Street, Regent Street, London, W.

* * * *All Applications for admission and general correspondence (as to papers proposed to be read, &c.) should be addressed to the Honorary Secretaries of the Institute, and all Remittances of donations or subscriptions to the Honorary Treasurer, at the Office, 9, Conduit Street, Regent Street, London, W.*

Cheques to be crossed to Messrs. Ransom, Bouverie, & Co., Bankers, 1, Pall Mall East, London, S.W.

ERRATA.

- On page 35, fourth line from bottom, *for* "p. 14," *read* p. 18.
- „ 32, after "Postscript," *for* "Pp. 10, 11, 12, 14," *read* Pp. 14, 15,
16, 18.
- „ 224, line 13, *for* "plants," *read* points.
- „ 242, line 11, *for* "Poleynian," *read* Polynesian.
- „ 265, line 4, *for* "unmoved," *read* universal.

JOURNAL OF THE TRANSACTIONS
OF
THE VICTORIA INSTITUTE.

VOL. I.

JOURNAL OF
THE TRANSACTIONS
OF
The Victoria Institute,
OR
Philosophical Society of Great Britain.

EDITED BY THE HONORARY SECRETARY

VOL. I.



LONDON:

(Published for the Institute)

ROBERT HARDWICKE, 192, PICCADILLY, W.

1867.

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INTRODUCTION.

THE Council of the VICTORIA INSTITUTE having deemed it advisable to republish, in the first number of its *Journal of Transactions*, the Pamphlet which I ventured to issue in September, 1865 (in the first instance entirely upon my own responsibility), with the title "*Scientia Scientiarum* : being some account of the Origin and Objects of the Victoria Institute, or Philosophical Society of Great Britain, by a Member;" but which was afterwards circulated by order of the Provisional Committee, and is referred to with commendation both in the Vice-President's Inaugural Address and in the President's Speech at the Inaugural Festival, on 24th May, 1866;—it is now here reprinted (with the Preface and Postscript which were added to it upon the publication of the third thousand), as being thus connected with the history of the Society's foundation.

The original Circular of 24th May, 1865, in which I roughly sketched the first idea of the Victoria Institute, and which is referred to in *Scientia Scientiarum* (p. 5), and in the Report of the Provisional Committee and Council (p. 40), will be found on p. 33; but the Circular of July, 1865 (No. 4), also referred to at the same places, has not been here reproduced, because it contained the names of some gentlemen who, though they had at first generally approved of the formation of the Society, did not afterwards make formal application to be admitted as Members or Associates, when its objects had been agreed upon and made public. Circular No. 4 was originally issued by itself, to make these objects known; and it was also appended to the first two editions of the *Scientia Scientiarum*; but it was omitted from the third edition, published in February last, after the First List of the Foundation

Members and Associates had been printed—it being considered that the names of gentlemen who had known of the formation of the Society for about nine months, and had not in that time regularly joined it, should no longer appear as if connected with its foundation, when they had not qualified to be enrolled in the Foundation List of its Members and Associates.

The Council being also aware that some of the Members who have joined the Society, even after two hundred names had been enrolled, had only recently heard of its existence and understood what its objects were; and, knowing that many persons, both in the United Kingdom and the Colonies, cannot probably be made aware of its establishment for several months to come; they, therefore, recommended to the first general meeting, that the Foundation Lists should be kept open till 31st December, 1866, in order that as large a number as possible might have the opportunity of sharing with them in the honour of being Foundation Members and Associates of the Victoria Institute.

I would here, also, beg leave to call especial attention to the Sixth Recommendation of the Committee's Report (p. 43), and to what I have said in the Preface to *Scientia Scientiarum* (pp. 3, 4), relating to the Sixth and Seventh Objects of the Society. And I venture confidently to entertain the hope that, through Christian munificence and liberality, the Seventh Object will not long be left unrealized, when once the great importance of the work which the Society aims at accomplishing is fully appreciated.

J. REDDIE, *Hon. Sec.*

JUNE, 1866.

PRELIMINARY AND INAUGURAL PROCEEDINGS.

*SCIENTIA SCIENTIARUM: Being some Account of
the Origin and Objects of the VICTORIA INSTI-
TUTE, or Philosophical Society of Great Britain.*
By a MEMBER.

“We have all agreed to accept that kind of knowledge which we class as Scientific, without very much difficulty. If any new proposition comes with the authority of an established professor of the Science, we accept it with the confidence with which a Roman Catholic might take the decision of the infallible Church.”—*Saturday Review, Oct. 21st, 1865.*

“Cujusvis est errare, nullius nisi insipientis in errore perseverare.”—CICERO.

“Prevailing studies are of no small consequence to a state,—the religion, manners, and civil government of a country, ever taking some bias from its philosophy, which affects not only the minds of its professors and students, but also the opinions of all the better sort and the practice of the whole people—remotely and consequently indeed—though not inconsiderably.”—BERKELEY.

PREFACE TO THIRD EDITION.

IN preparing a Third Edition of this Pamphlet, the author begs leave to say, that, although it has been circulated by order of the Provisional Committee of the Victoria Institute, he alone is responsible for its contents. In the "Objects of the Society," "Terms of Membership," &c., will be found all that is strictly "official," if I may use the term; and as this pamphlet has not touched upon either of the last four Objects of the Society, I would beg special attention to them briefly here.

The *Fourth Object* merely explains that our proceedings are to be conducted like those of other Scientific Societies, by the reading of Papers or Memoirs, and discussing them afterwards. It is, however, intended that our reports of discussions are to be more than usually full, as is signified by their being described as "*verbatim* reports," instead of mere brief abstracts. In some Societies—as, for instance, the Royal Society—discussions are not reported at all; and in the Royal Institution of Great Britain, the Papers read are never discussed. The advantages of the course proposed in the Victoria Institute, as a Society for the study of General Science and Philosophy, must at once be evident.

The *Fifth Object* is distinctively peculiar to this Society. The Royal Institution, indeed, has various courses of Lectures, some of which are strictly scientific and educational, delivered by Professors attached to the Institution; but its popular Lectures on miscellaneous subjects are not the results of studies or discussions carried on under its auspices, and cannot be compared with the kind of Lectures here proposed.

Sixth Object.—The intended publication of translations of important foreign works, of real scientific and philosophical value, is similar to what the Anthropological Society of London is doing, with marked success, for Anthropology. By this means, it is hoped that subscribers will not only receive a full return for their subscriptions, but that valuable books will be placed in their hands which otherwise it might not have been easy to procure in this country, and not at all in an English form.

The *Seventh Object* also goes beyond the scope of what most

Scientific Societies aim at. As this Society will deal with General Philosophy and Science, and watch their bearing upon Religion, its objects have a general interest that societies for the study of specific branches of science cannot possibly have. Hence it is anticipated that it will become a large society, with Members and Associates all over the kingdom; and it was, therefore, deemed advisable that its head-quarters in the metropolis ought to offer the advantages slightly indicated under Object 7. To realize fully, however, what is therein alluded to, depends upon circumstances. It could only be hoped for after many years, unless more speedily accomplished by individual munificence and liberality.

In the mean time, the Society has work to do which it will have to set about at once. After what I have said on p. 9 (note), on pp. 10 and 26, and in the *Postscript* to this edition, I trust I need add no more, in order to let it be clearly understood that the Victoria Institute is not intended to discuss purely religious subjects. It is founded *in the interest of religion*, as against atheism and infidelity, but solely for the discussion of science and philosophy upon inductive and philosophical principles. What the Book of Nature teaches, as written in the visible heavens above, the earth beneath, and in the history and heart of man,—such will form our proper subjects of inquiry. Believing also that there is another Book, in which things are revealed which human philosophy alone could never have discovered, but which throw light upon what else were only dark to us (as to the ancient heathen sages) and inexplicable, we do not think it rational to forget such revelation; and we consider we shall not be found less scientific, because we believe what our reason approves, what throws light upon the mystery of our life, and gives us hope and consolation in death.

February 19th, 1866.

SCIENTIA SCIENTIARUM.

THE proposal to form a new Scientific Society in London, where so many already exist, may naturally be regarded as calling for some explanation. Such a proposal would seem to imply, either that the existing societies are defective in their aims, or that they fail to carry out their objects satisfactorily; or else, at the least, that the new Society has some other and further end in view than is contemplated by those previously established. Now, it may frankly be admitted that there is some degree of truth in each of these alternative propositions; and they might all be fairly urged as affording grounds for the establishment of the Victoria Institute or Philosophical Society of Great Britain. The great object of the Victoria Institute, as originally propounded in the Circular of 24th May, 1865,* and as set forth in Circular No. 4 of July, as the primary Object of the Society, is to defend the revealed truth of Holy Scripture against oppositions arising, not from real science, but from pseudo-science; and this is an object which no previously existing scientific society has made its aim. But then, it must be observed, that if existing scientific societies had duly fulfilled their aims, and guarded scientific truth, pseudo-science would never have been allowed to pass current as truth opposed to the Scriptures, and there would then have been no place for a new scientific society to expose the fallacies of mere *quasi* science. But this leads us further to consider whether this state of things may not be primarily due to some defect in the aims of the old societies, to which this inroad of pseudo-science is fairly attributable, rather than to the failure on the part of modern scientific men to do justice to the objects of their investigations. I venture to think that this is the true explanation of the facts of the case, as I shall now endeavour to prove. But first let us look at the facts themselves.

* See p. 30.

It may be regarded as simply notorious, that Science, so called (whether truly or not), is considered by many persons to be at issue with what had previously been regarded (whether truly or not) as truths revealed in Holy Scripture. This supposed contradiction between science and the Scriptures was most boldly put forward in the "Essays and Reviews," as a ground for rejecting the theory that the Scriptures are wholly-inspired; and Dr. Colenso and others have followed in the same path, publicly alleging the existence of such contradictions, and, so far with a bold consistency, setting aside the Scriptures, in consequence, as false. And if "science" really means, as it ought, a true knowledge of nature; and if such science really contradicts the Scriptures, then it certainly follows that the Scriptures must be in error or misunderstood. As no rational being who thinks can believe in contradictions, there can be no doubt whatever, that when the Scriptures and science are at issue, one of them must be at fault; and, in that case, it must be of the greatest consequence to mankind at large, to be able to discover which. The issue involved, indeed, is nothing less than the truth or falsehood of Revealed Religion—the maintenance or abandonment of Christianity.

It was the existence of this state of things that gave rise to the famous "Declaration of Students of the Natural and Physical Sciences," which was signed by upwards of 700 gentlemen (the greater number being members of the learned professions and fellows of scientific societies), who expressed themselves as follows:—

"We, the undersigned Students of the Natural Sciences, desire to express our sincere regret, that researches into scientific truth are perverted by some in our own times into occasion for casting doubt upon the Truth and Authenticity of the Holy Scriptures. We conceive that it is impossible for the Word of God, as written in the book of nature, and God's Word written in Holy Scripture, to contradict one another, however much they may appear to differ. We are not forgetful that Physical Science is not complete, but is only in a condition of progress, and that at present our finite reason enables us only to see as through a glass darkly; and we confidently believe that a time will come when the two records will be seen to agree in every particular. We cannot but deplore that Natural Science should be looked upon with suspicion by many who do not make a study of it, merely on account of the unadvised manner in which some are placing it in opposition to Holy Writ. We believe that it is the duty of every Scientific Student to investigate nature simply for the purpose of elucidating truth, and that if he finds that some of his results appear to be in contradiction to the Written Word, or rather to his own *interpretations* of it, which may be erroneous, he should not presumptuously affirm that his own conclusions must be right, and the

statements of Scripture wrong ; rather, leave the two side by side till it shall please God to allow us to see the manner in which they may be reconciled ; and, instead of insisting upon the seeming differences between Science and the Scriptures, it would be as well to rest in faith upon the points in which they agree."

In this Declaration we have the "facts" sufficiently acknowledged, although the manner in which they are stated may be regarded as open to criticism. The language is somewhat indefinite, and therefore not likely quite to satisfy those who have definite scientific notions, any more than those who distrust science, and have no doubt as to their theological traditions. But to say that scientific truth is perverted by some, in order to cast doubt upon scriptural truth, if that is what is meant by the words that "*researches into scientific truth*" are so perverted, is a declaration that scarcely modifies censure by its periphrasis. I do not believe the students who signed this Declaration meant really to imply that researches into science have been purposely perverted, so as to be made antagonistic to religion, as it were, intentionally. Giving due credit to men of science for having simply pursued their studies with the view to discover truth, it is surely a simpler account of the present state of things to say, that men of science, pursuing their researches in this impartial spirit, have arrived at certain cosmological and geological deductions, which they believe to be scientifically true, which are unfortunately at issue with what the Holy Scriptures have hitherto been supposed to reveal as to the Creation and the Deluge.

But it is perfectly clear—and this is acknowledged quite plainly in the Declaration—that there cannot really be a contradiction between true science and true revelation. "We conceive" (the Declaration says) "that it is impossible for the Word of God, as written in the book of nature, and God's Word written in Holy Scripture, to contradict one another, however much they may appear to differ." And on that point, of course, there can be no difference of opinion ; nor is there any such difference. If science and Scripture are at issue, plainly one of them is wrong—untrue. There can be no other issue. If the so-called "science" is really science, though contrary to the Scriptures, then the Scriptures must be in error or misunderstood. Or, if we maintain the integrity of the Scriptures as truly God's revealed word, then what appears to be science must be merely pseudo-science, that is, a false interpretation of nature.

I repeat there cannot be a doubt as to this issue and its

inevitable result. It is accepted, or rather it is advanced, in the plainest manner in the "Essays and Reviews,"—most especially in Mr. C. W. Goodwin's essay on the Mosaic Cosmogony; and it is the very ground upon which the Bishop of Natal left his diocese and came to England, to write his books against the Pentateuch. In one of the latest of his public enunciations, before returning to South Africa, he advanced distinctly the same proposition. I allude to a paper he read before the Anthropological Society of London, on May 16th, 1865. In it he says, "The elementary truths of geological science flatly contradict the accounts of the Creation and the Deluge;" and he adds, "At all events, I have done my best to secure that the simple facts revealed by modern science—some of which, as Dr. Temple has justly said on a recent occasion, are utterly irreconcilable with Scripture statements, if these are taken as announcing literal historical truth,—shall not be kept back from the heathen with whom my own lot has been cast in the district of Natal." Here Dr. Colenso is simply declaring, that he holds it to be impossible that the truths of nature can be contrary to the truths of revelation; and he quite consistently rejects the scriptural statements which are at variance with what *he* regards as truths of science.

The difference between him and the students who signed the Declaration referred to, is this:—He distrusts the Scriptures, and considers his science unquestionable; they rather question science, and are not prepared to give up the Holy Scriptures. They say, "We are not unmindful that Physical Science is not complete, but is only in a condition of progress, and that at present our finite reason enables us only to see as through a glass darkly;" and they afterwards declare, that they "confidently believe that a time will come when the two records will be seen to agree in every particular."

Now, in this state of things it is perfectly clear that men must naturally range themselves either upon the side of Scripture or of science. If, like Dr. Colenso, Dr. Temple and Mr. Goodwin, they have implicit faith in what they consider to be scientific truth, then they must distrust the Scriptures; whereas, on the other hand, if they have faith in the word of God as revealed in Scripture, they must distrust that "science" so called, which contradicts it. They cannot believe equally in both. They must hold to the one or to the other. Even those who are puzzled, and scarcely able to realize so definite a course, must feel that it is most unsatisfactory to have science and revelation thus at issue; and they must naturally be anxious that something should be done to get rid of such contradictions. Now this is precisely the end which is proposed

to be accomplished by means of the Victoria Institute. Those who rather distrust the deductions of science than the statements of Scripture are invited to join the new Society and help "to investigate fully and impartially the most important questions of philosophy and science, but more especially those that bear upon the great truths revealed in Holy Scripture, with the view of defending these truths against "the oppositions of science, falsely so called," that is, against supposed contradictions of science, which, it is anticipated, will be proved to be, not the contradictions of true science, but merely the rash deductions of false or *pseudo* science.*

To this proposed course, it may obviously be objected, *in limine*, that it assumes science to be at fault, and with this preconceived view it sets about its investigations. But the answer to this is equally easy, namely, that the assumption truly represents the state of mind of those who propose to pursue this course. It is simply a fact that they do distrust science, and do not distrust the Scriptures; and, therefore, they are in a manner bound to see whether their distrust of science can be fully justified or not. Besides, it can be a matter of little moment whether they expect to find one result or another, so

* One or two gentlemen, who have otherwise and generally approved of the objects of the Victoria Institute, and one at least who has joined it, consider that this "object" is somewhat too negative in its scope. They would have preferred that the primary object of the Society should have been, to show positively how scientific discoveries illustrate and corroborate the truths of revelation. Of course, it by no means follows that this view may not yet prevail in the Society. But it should be kept in mind that the Victoria Institute, as a matter of fact, originated as a defence movement. The first work, therefore, it has set its members and associates, is the investigation of the alleged facts and so called science which Dr. Colenso, Dr. Temple, and others have publicly declared to be in opposition to Scripture statements. And this is surely the natural and proper course for those who dispute the existence of such "facts" or "science." Moreover, for my own part, I would beg leave to adopt the prudent language employed by the Rev. H. B. Tristram before the British Association at Bath, in 1864, upon reading his valuable paper "On the Deposits in the Basin of the Dead Sea." He said he "had a dread of attempting to corroborate Scripture by natural or physical arguments which may be refuted; for the objector is apt to think that when he has refuted the weak argument, he has refuted the Scriptural statement."—(*Rep. of Brit. Assoc.*, 1864, p. 73.)

I ought to add here that the Scriptural phrase, "oppositions of science falsely so called," is not used in the sense of the Greek original, as employed by St. Paul, but only as commonly used now in the popular sense the words imply in English, which is also, perhaps, all they mean as rendered in the *Vulgate*, viz. :—"Oppositiones falsi nominis scientiæ."

that their investigations are really "full and impartial," as they profess they shall be. But some might fairly retort—in fact, the objection has been made—that the admitted preconceptions thus entertained may interfere with the impartiality of such investigations. The members of the Victoria Institute cannot, of course, dispute the probable truth of that general proposition. But they may claim it as an argument equally applicable to those who differ with them, and on the other side assume that science is always right, and who are therefore ready, with the writers of the "Essays and Reviews," or Dr. Colenso, or with sceptics generally, to set aside Scripture, or force upon it new "interpretations:"—"interpretations," that is, so-called, not of prophecies or "dark sayings," but the "explaining away" of plain language, which requires no interpretation in order to be understood.

But at this point the sceptic as to "science" may claim to join issue with the sceptic of Scripture, and say that he has good reason for his distrust of *quasi* science, such as the sceptic of scriptural truth has nothing to offer. And this brings us to the second object of the Victoria Institute. It is—

"To associate together men of science and authors who have already been engaged in such investigations, and all others who may be interested in them, in order to strengthen their efforts by association; and, by bringing together the results of such labours, after full discussion, in the printed transactions of an institution, to give greater force and influence to proofs and arguments which might be regarded as comparatively weak and valueless, or be little known, if put forward merely by individuals."

What we say is this, that what is called "science," and boasted of as so "certain" by some, is far from certain,—is continually changing and altering,—is disputed and denied and controverted, on scientific grounds, by very competent persons; and that if the arguments and disproofs even already put forward by individuals were brought together and well weighed, the public would be astonished to find how much there was to be said against the acceptance of what some persons boast of as scientific truth. And, it may be admitted, they tacitly allege that opinions and facts and arguments which happen to be against the predominant opinions of the leading scientific men, have scarcely a fair chance of a hearing in the existing scientific societies, and, at least, that they lose all influence as against theories which happen to have obtained the sanction of some man, or men, of high scientific reputation.

But, to leave generalities, let us glance at a few actual instances of how "science" so-called, has recently shifted and changed; and how the erroneous theories of the eminent have

held their ground against the sounder views of less-reputed individuals; though these views have at last tardily been admitted as most probable by the highest scientific authorities. We have, perhaps, two of the best specimens of such changes in scientific conclusions in Sir Charles Lyell's Address, as President of the British Association for the Advancement of Science, at Bath, in 1864; inasmuch as he there gives up, as no longer to be regarded as science, the two grand foundation "facts" (as they previously were regarded) of geological science, which were boldly put forth but a few years previously, as well-ascertained scientific truths that completely upset the scriptural account of the Creation in the first chapter of Genesis. I allude to what is called the nebulous theory of astronomy, with what was founded upon it, the plutonic theory of geology; and to the supposed existence of azoic ages, during which it was supposed there was no organic life in this world; a conclusion founded upon what was supposed to be a geological "fact," that the lowest sedimentary strata of the earth were totally devoid of all organic remains.

Now, it was upon the assumption of the truth of the nebular theory, and of this proof of the azoic ages of the world, that Mr. C. W. Goodwin in "Essays and Reviews" made his distinctive attack upon "the Mosaic Cosmogony." He maintained, as against the scriptural account of the creation of the heaven and the earth, that "the first clear view which we obtain [from science] of the early condition of the earth, presents to us a ball of matter, fluid with intense heat, spinning on its own axis, and revolving round the sun." This is Laplace's nebular theory; only it is put forward by Mr. Goodwin from the point when the earth has become "fluid," instead of beginning at the beginning when it was supposed to be in a gaseous state, or Mr. Goodwin may have used the word "fluid" in a loose sense, that would comprehend gaseous matter. Here at any rate is a fuller statement of the nebular theory as it appears in M. Figuier's "Earth before the Deluge," published in Paris so recently as 1863. He says:—

"The theory we are about to develop, and which considers the existing earth as an extinguished sun, as a refrigerated star, as a nebula which has passed from a gaseous to a solid state, this beautiful conception, which binds together in so brilliant a manner geology and astronomy, belongs to the mathematician Laplace . . . We have established, in commencing, that the centre of our globe is still, in our own day, elevated to 195,000°, a temperature which surpasses all the imagination can conceive. We cannot have any difficulty in admitting that, by a heat so excessive, all the materials which now enter into the composition of the globe were reduced, at the first, to a gaseous or vaporous

condition. It is requisite, therefore, to represent our planet in its primitive condition as an aggregate of aeriform fluids as a substance entirely gaseous. . . . Raised to a temperature of white-heat (*rouge-blanc*), by the excessive heat which affected it, the gaseous mass, which constituted then the earth, shone in space as shines the sun at the present time, as shine to our eyes in the serenity of the night the fixed stars and the planets.

Revolving round the sun, according to the law of universal gravitation, this burning gaseous mass was necessarily subject to the laws which affect other material substances. It became cooler, it gradually ceded a portion of its heat to the icy regions of the interplanetary spaces, in the midst of which it traced the thread of its blazing orbit. But in the course of this continual cooling down, and at the end of a period, of which it would be impossible to fix, even approximately, the duration, the primitively gaseous star arrived at a liquid condition. . . . Mechanics teach us that a liquid body kept in a state of rotation takes necessarily the spherical form; it is thus that the earth took the globular or spheroidal form which is proper to it, as to the majority of the heavenly bodies.*

Here it will be observed that the basis of this cosmological speculation is the supposed geological "fact," that it had been ascertained that the centre of our earth is elevated even yet to the inconceivably enormous temperature of 195,000°. This notion or *quasi* "fact" was again based upon an assumption that the increase of the earth's temperature, as we descend, proceeds at a certain ratio, more and more, till we reach the centre; and, further, that the granite rocks were formed by means of dry heat of this great intensity and a subsequent crystallization by cooling down.

But let us see how now stand these foundation "facts" of this astronomo-geological science, which was put forward so confidently only a few years ago against the Mosaic Cosmogony. In Sir Charles Lyell's Bath address, he says:—"The study, of late years, of the constituent parts of granite has led to the conclusion that their consolidation has taken place at temperatures *far below those formerly supposed to be indispensable.*" "Various experiments have led to the conclusion that the minerals which enter most largely into the composition of the metamorphic rocks *have not been formed by crystallizing from a state of fusion, or in the dry way, but that they have been derived*

* Figuier, *La Terre avant le Déluge*, Paris, 1863 (p. 27). Since this was written, I have observed that the publication of an English translation from the fourth French edition of this interesting work has been announced by Messrs. Chapman & Hall. In this work, geology is described as "pre-eminently a *French science!*" which may account, perhaps, for no modification of the nebular theory being made in this last edition, notwithstanding Sir Charles Lyell's Bath address.

from liquid solutions, or in the wet way—a process requiring a far less intense degree of heat.”

Thus vanishes all that had been taught as geological science for half a century, at least, as to the original formation of granite!

Sir Charles Lyell also says, with reference to a co-relative part of the same theory, with its inconceivable high temperature of 195,000° in the earth's centre, and its matter thus reduced to a gaseous or fluid condition:—“The exact nature of the chemical changes which *hydrothermal action* may effect in the earth's interior will long remain obscure to us, because the regions where they take place are inaccessible to man;* but the manner in which volcanoes have shifted their position throughout a vast series of geological epochs—becoming extinct in one region, and breaking out in another—may, perhaps, explain the increase of heat as we descend towards the interior, without the necessity of our appealing to an original central heat, or the igneous fluidity of the earth's nucleus.”

And so away goes the foundation “fact” of geology upon which was based the nebular theory of the earth's formation out of a gyrating globe of gas, consisting of intensely hot fused granite! It is at once amusing and melancholy, now, to read over the words in which this rival and scientific view of the cosmos was so confidently put forth by Mr. C. W. Goodwin against the old “Mosaic Cosmogony.” I repeat his words, pregnant as they now are with warning, as regards science falsely so-called, in its opposition to revealed truth!—“The first clear view which we obtain (says Mr. Goodwin) of the early condition of the earth presents to us a ball of matter, fluid with intense heat, spinning on its own axis, and revolving round the sun!”

So much for the primary or foundation “facts” of geology, which had been taught as “science” in this country ever since the publication of Dr. Buckland's Bridgewater Treatise; and which are yet graphically exhibited, in all the geological charts of sections of the crust of the earth, in all our still current geological works of science.

But leaving the earth's centre and its now abandoned igneous fluidity, let us come to the oldest strata, heretofore taught to have been “Azoic,” or formed before any organic beings had been created. The “fact” upon which this geological theory was based, was simply this, that what were

* This is a very different and much more rational tone than the absurd and confident enunciation of a definite temperature of 195,000°, admitted, at the same time, to be inconceivable!

supposed to be the oldest rocks, were found to be, so far as they had been examined in Europe, without any fossil traces of organic remains. Geology, in fact, unfortunately undertook to prove a negative, and affirmed it had succeeded in a somewhat positive manner.

But Sir Charles Lyell tells us, in his Bath address, that "late discoveries in Canada have at last demonstrated that certain theories founded in Europe on mere negative evidence *were altogether delusive.*"

"It has been shown, he says, that northward of the river St. Lawrence, there is a vast series of stratified and crystalline rocks of gneiss, mica-schist, quartzite, and limestone, about 40,000 feet in thickness, which are more ancient than the oldest fossiliferous strata of Europe, to which the term primordial had been rashly assigned;" and "in this lowest and most ancient system of crystalline strata, a limestone, about 1,000 feet thick, has been observed, containing organic remains." He adds, "We have every reason to suppose that the rocks in which these animal remains are included are of as old a date as any of the formations named Azoic in Europe, if not older, so that they preceded in date rocks once supposed to have been formed before any organized beings had been created."

Now, notwithstanding these frank admissions by Sir Charles Lyell, which were publicly made by him as President of the British Association for the Advancement of Science at Bath, in 1864; and although Bishop Colenso was present and heard that address delivered, the Bishop did not hesitate on the 16th of May, 1865, to use the language I have already quoted, in which he makes it a boast that he had done his best while in his diocese—that is, upwards of three years previously—to secure that the simple facts revealed by modern science should not be kept back from the heathen with whom his lot had been cast in the district of Natal! Nay, he quotes a recent utterance of Dr. Temple (I believe while preaching in Whitehall Chapel) as agreeing with himself, that these facts are utterly irreconcilable with Scripture statements! Can it be that these "educators of the world" do not read, or hear, or understand, or know what they are saying? Why, when Bishop Colenso taught what he calls "the simple facts revealed by modern science," to the Zulus,—or what he more specifically describes as "the elementary truths of geological science," which "flatly contradict the accounts of the creation and the deluge" in Holy Scripture,—he must have taught the nebulous theory, and that there were azoic ages of enormous duration before living creatures were created, as Mr. Goodwin did in his Essay! He must have then taught as "simple facts" or "elementary truths of geological science," what he has himself heard Sir Charles describe as theories altogether delusive, and what—if

he would speak as plainly about science as about the Scriptures—he must now know never to have been “facts” at all,” but “rash deductions,” founded, at best, “upon mere negative evidence;” and he might well be asked, Whether, in his zeal for the truths he thinks are “revealed by science,” he will be as anxious to make the Zulus, on going back to his late diocese, acquainted with these now acknowledged blunders in geology as he has been to let them know of the alleged blunders he thinks may be discovered in the Pentateuch as to the creation?*

I venture to say that neither Dr. Colenso, nor any sceptical geologist on his behalf, can point to a single geological fact, or even to any respectable theory entertained and taught in any geological work now extant, which any great number of geologists would say they accept, that can in the least be considered as contradictory to the Mosaic account of the creation. There is not a geological text-book at the present time in existence that gives any other foundation for the science than the igneous theory of the earth’s nucleus which Sir Charles Lyell considers “may now be dispensed with;”—a very gentle euphemism for a frank admission that the theory has no foundation at all to which it can appeal in the facts of geology, since the constitution of granite has been better understood. That we may have another theory, and another which may, like the last, contradict Scripture, is very possible, perhaps only too probable; but what I say is, there is no such theory yet invented. The theories that did contradict the Scriptures, as regards the original formation of the earth and its azoic rocks and ages, are pronounced *ex cathedrâ scientiæ*, to be “altogether delusive.” That is the present state of the case. As regards the Creation, that is the only revelation of science which Dr. Colenso can honestly teach at present to his “Zulu philosopher!”

But no doubt Dr. Colenso might yet retort, in modern style, “What about the Deluge?” He might still appeal to the “volcanic cones of loose ashes in the valleys of Auvergne,” and maintain that Sir Charles Lyell has not given up his former scientific teaching about these. He may still with Sir Charles believe that they “must have been formed ages before the Noachian deluge,” and that had the deluge been universal, the light and loose substances that cover these cones “must have been swept away.”

My object not being to refute the geological views of Sir Charles Lyell or Bishop Colenso, I may content myself with

* See POSTSCRIPT, pp. 32, *et seq.*

observing, as regards this point, that I have no reason for supposing that Sir Charles Lyell has as yet changed his opinions, and that till he does so, Dr. Colenso will probably be content to believe as he does. It is no part of my object to endeavour to prove that there are now no scientific views opposed to the Scriptures. Were that the case—had every *quasi*-fact and every “scientific” theory already shared the fate of the azoic ages and the “original igneous fluidity of the earth’s nucleus,” why then, of course, the Victoria Institute had been founded late in the day! It would have had really no occupation. I for one would never have thought of its establishment. But at the same time, I may be permitted to observe, that surely these confident appeals made by Bishop Colenso and Dr. Temple to “simple facts revealed by modern science” that contradict the statements of Holy Scripture, are put forward with an unwise effrontery so soon after such large confessions by our most eminent geologist (from whom they take their science second-hand), of science contradicting itself, and of the utterly delusive character of its former “revelations” respecting the very foundation “facts” of geology. Surely when the scientific have been all out as regards the Creation of the world,—after all the bold sneers in “Essays and Reviews” as to the blunders of “the Hebrew Descartes,”—a little modesty and somewhat less confidence might well become our once “deluded” teachers, when they come to speak now of the Deluge. There are, doubtless, men of science and authors, who have already been engaged in investigating this question of the evidence of the universality of the deluge from a scientific point of view; and who have arrived at other conclusions than those of Sir Charles Lyell.* Some of them are already members of the Victoria Institute; and it is one of the professed objects of that Society to bring such men together, to give them a fair hearing, to discuss their arguments, and further to investigate what may be regarded as the facts under discussion, and thus to get at truth. In Sir Charles Lyell’s “Antiquity of Man” he informs us, that for the greater part of his scientific lifetime, he had resisted evidences he now

* I may here draw attention to an able pamphlet by Mr. S. R. Pattison, F.G.S., *The Antiquity of Man: An Examination of Sir C. Lyell’s recent work* (Lond.: Lovell Reeve, 1863), and to the well-reasoned and larger work, *Remarks on the Antiquity and Nature of Man*, by the Rev. James Brodie, A.M. (Lond.: Hamilton, Adams & Co., 1864). In the latter work, Sir C. Lyell’s arguments, adopted by Bishop Colenso, against the Mosaic account of the Deluge, are fairly met; but my present object is not to bring forward anything that has not been acknowledged by the recognized “authorities” in science.

admits of man's contemporaneous existence with certain long extinct animals. Those who are interested in the statements of the Bible; may well be anxious that no similar overwhelming influence may be successfully brought to bear against any evidences there may be in nature of the universality of the flood.

I therefore revert to the nebular theory, to show that there were not wanting men—and men, as it turns out, better entitled to the name of “men of science,” than others more eminent in reputation—who contended strongly against that theory, but whose arguments were disregarded, or not allowed even a hearing before some of our existing scientific societies, which thus acted as hindrances instead of as helps to the advancement of science.

In 1844, when the British Association for the Advancement of Science met at York, the late Dean of York, Dr. Cockburn, a practical geologist, made a straightforward attack upon the nebular theory, “laid down by Dr. Buckland, in his Bridgewater Treatise, as to the original formation of the earth,” upon this very sufficient ground, namely, “because that theory will not account for the many facts made known to us by geologists;” and he put forward another theory in some detail, which he maintained did account for these facts, and of which he challenged criticism. He concluded his remarks in these words:—

“You will, of course, perceive that my theory accords perfectly with the account given by Moses. I do not, however, press it upon you in consequence of that accordance, but because I contend that every modern discovery may be accounted for by this theory, and cannot be accounted for by the theory of Dr. Buckland.”*

Professor Sedgwick, who was President of the Geological Section that year, replied to Dr. Cockburn, but as he “confined himself almost exclusively to remarks upon the Dean's supposed ignorance,” the learned Dean printed his speech, and requested the Professor to answer it in print; observing that “it appeared to him, and to many wiser men, that the theories, of the Geological Society were incompatible with Christianity,” although Professor Sedgwick had said that “these theories, if rightly understood, would confirm the truths of revelation.” For, if so, added the Dean, my answer is, “these theories are *not* rightly understood by me and by thousands of others.”

That Dean Cockburn formed the truer estimate of the character of the nebular theory, when he described it as con-

* *The Bible Defended against the British Association.* Fourth Edition (p. 16).

tradictory to the Mosaic Cosmogony, has since been abundantly proved. Yet many persons at one time professed to agree with Professor Sedgwick, and freely "interpreted" the Scriptures to make out a kind of agreement between them and the then current geological theories. But the thing did not last. After the publication of "The Vestiges of Creation," any such pretence of agreement was really absurd; and Mr. Goodwin's *Essay* and lastly Dr. Colenso's writings have since cleared this quite away.

Dean Cockburn asked for a second discussion, as he got no answer from Professor Sedgwick. Professor Ansted replied, that he was directed by the Committee of the section to say, "that, as there is no precedent for re-opening the discussions of the section, they consider it would not be proper for them to comply with the request." What an answer for an "Association for the Advancement of Science" to give. No precedent, and therefore "not proper!" "No precedent," in 1844, given as a reason by an Association then only in its 14th year! Well might the learned Dean be excused for observing: "Whether this refusal arose from a lofty or an humble opinion of their cause, it left the question of their Christianity where it was." He also asked that the Geological Society should "put forth *ex cathedrâ* a printed statement of their opinions respecting the Creation;" and at last Professor Sedgwick sent him a reply. In it, the Professor however "declined to support the nebulous theory!" He said, "that it was first put forth by astronomers and adopted by the geologists, as a matter of indifference to them whether true or false." Surely nothing could be very much stranger than such an account of the acceptance of any scientific hypothesis whatever. "Adopted by geologists, as a matter of indifference to them whether true or false!" But nevertheless adopted; and, as already said, to this day exhibited as a *foundation* of "the geology of the earth" in every current text-book of geological science.

Further correspondence took place between the Professor and the Dean. But the former would not consent that his letters should be published. Of the last of these the learned Dean writes: "I wish you would allow me to publish it. It has no appearance of hasty composition, but is evidently the work of an able writer perfectly conversant with his subject. It would, I doubt not, give complete satisfaction to the members of the Geological Society. But, unfortunately, there are thousands who think with me, that that society have had too much respect for the *argumentum ad verecundiam*, and have never allowed their own unbiassed judgment to investi-

gate theories introduced by former great names." The Dean afterwards addressed the President of the Geological Society, sending copies of his letters to Professor Sedgwick. He wrote as follows :—

"The members of the British Association have always been accustomed to act in strict unison. They discountenance all difference of opinion, and seem bound *jurare in verba magistri*. Professor Sedgwick could not, therefore, with propriety appear publicly in opposition to the nebulous theory; and at the same time considerations for his own character would not allow him to stand up in support of what he knew to be an absurdity."

The Dean, after challenging objections to his own theory and arguments, agreeing with the Mosaic Cosmogony, goes on :—

"You say that there are geological facts which prove the long existence of the world through many ages. I say there are *no such facts*. Here we are completely and plainly at issue. Produce, then, some one or more of these facts; and if I cannot fairly account for them without supposing the very long duration of the earth, I am beaten! I am silenced! But if you do not produce such facts, and retreat, like Professor Sedgwick, from the challenge, confess, or let your silence confess, that the whole doctrine of a pre-Adamite world has been a mistake, too hastily adopted by men of talent and learning, and too apt, like all other persons, to draw general conclusions from a few particular facts."

In a subsequent passage, which need not be quoted, the Dean refers to the Geological Society as a "valuable body," adding, in a foot note, "Most valuable, as having furnished us with unexpected and unanswerable proofs of the waters having once covered the existing earth." So that it would appear, that at that time, the "orthodox" geologists taught that the facts of geology proved the universality of the deluge, which Bishop Colenso, on May 16th, 1865,—drawing his inspiration, no doubt, from what he now regards as geological science—declared to be "an impossibility" in such absolute terms, as even to draw forth a disclaimer from the president of the Anthropological Society of London.

But it may be said that the nebular theory has now been given up by Sir Charles Lyell, not on account of arguments such as those adduced by Dean Cockburn, but because it has been found, from the constitution of granite, that its formation must have proceeded from a watery crystallization, and not from the fiery, dry heat, which the nebulous theory ignorantly ascribed to it. That is very true. Even in the absence of a knowledge of the constitution of granite, and for various other and more obvious reasons, Dean Cockburn was enabled to declare "the nebulous theory is really nonsense." But if, nevertheless, it was really believed in, merely or chiefly

because of a blunder as to the formation of granite, surely, then, earlier attention ought to have been paid to the matter of which granite is composed, before "adopting" such a physical theory as the very basis of the geology of the earth.

But even this plea will not serve as a justification for such an inveterate adherence to this now abandoned theory. Even before the Dean of York attacked it, namely, in 1843, a fellow of the Geological Society, Mr. Evan Hopkins—also now a member of the Victoria Institute—put forth a theory of the earth adverse to the nebular and plutonic hypotheses; and one of the main "facts" to which he appealed was, that granite was a water formation, or a true crystallization, and could never have been formed by dry heat as the nebular theory required. But his voice was not regarded, and not his facts, as against the great name and gratuitous assertions of Laplace, unfortunately accepted by Dr. Buckland. In giving up the theory, Sir Charles Lyell does not even notice him, although two years before the then President of the Geological Society, Professor Ramsay, had distinctly done so. At that time, also, I may observe, *i.e.* in 1862, Professor Ramsay said "that he believed that the science of geology was on the eve of a great revolution"—the "science" that Bishop Colenso but a short time before had been preaching to his Zulus as the certain "revelations" of truth! and to which, even since then, he dares once more to appeal as unquestionable truth, and as upsetting the statements of Scripture!

But if any doubt whether all that Dean Cockburn said, under somewhat provoking circumstances, was quite deserved, as to the disposition of the Geological Society to yield too much to the *argumentum ad verecundiam*, or as to the unwillingness of the British Association to listen to contradictions to theories put forward by great names; I can cite another witness, a Professor at Cambridge, with reference even to a mathematical discovery of his own, which will place in a still stronger light the fact that, in his opinion, the present organizations among the scientific rather serve to retard the advancement of science, and to foster the maintenance of established dogmas in science than to admit new truths; while, at the same time, we know that all that may appear opposed to Scripture may be very freely put forward in scientific societies, and by some men even in the pulpit! Professor Challis thus expresses himself:—"I know enough of the history of physical science to be aware that an advance of this kind in an abstruse department of science can be expected to make its way only by slow degrees." This was said but a few years ago, and notwithstanding the existence of the British Association!

But not to multiply instances of this kind in further detail ; it is surely a fair argument, for those who are anxious not to see science put unfairly or unwarrantably forward as at issue with Holy Scripture, to say that, after all this recent experience of theories rashly adopted and authoritatively upheld, while facts and arguments, adduced by numerous assailants, have been disregarded, refused a hearing, and despised,—they are anxious to see a freer discussion of scientific dogmas in a new arena, and especially anxious to invite an immediate and rigid investigation and discussion of such scientific facts and theories that are yet said to be adverse to scriptural statements, which they regard to be the revealed truth of God.

What they may well say is this : that just as Dean Cockburn and others opposed the nebular theory twenty years ago, but were not heard ; so that now other competent persons dispute other *quasi* “facts” in geology and other theories in science which now pass for true ; and they are anxious to give these investigators a hearing, which they cannot expect to secure in existing scientific societies. They say that this must be for the real interest, and that it will tend to the real advancement, of true science ; and that it has become a necessity in the interest of revealed truth, which it is so important should not be allowed to remain liable to be ever rashly impugned by crude theories in the name of science, without any independent organization of a scientific kind composed of men able and willing to watch, as it were, over the outworks of religion in this respect.

Let us revert, moreover, to the remark of Professor Sedgwick, that the nebular theory was adopted by the geologists from the astronomers, while indifferent whether it was true or false ! And only consider what must be the effect of thus carelessly adopting a hypothesis in science, without raising the question whether it is probably true or utterly absurd, and then going on for years, collecting and arranging in the mind all newly discovered facts, with sole reference to such a groundlessly assumed hypothesis. In what other way could a mere unreasoning prejudice be better instilled and made to grow inveterate in the human mind ? Adopted thus at first, as we are told, with indifference, in time the nebular theory became, what Mr. Goodwin called “the first *clear* conception” of the origin of the world ; and even now, when the intensely scarlet tint of the earth’s imagined central fire and of the welling up molten granite must be obliterated in all the future graphic representations of the earth’s sections, the cosmographers, so long accustomed to this false basis, will indeed be puzzled what

else to substitute in its room ! We really have no "science" of the world's origin at present !

Consider, too, how much valuable time has been lost for science, and how much talent has been wasted, while this untenable theory has thus been blindly entertained; and while men have generally thus been discouraged and even debarred from seeking after a true interpretation of the numerous and most important newly discovered facts made known by geological research.

But we must be content with these few brief instances of how the progress of true science has been hampered and retarded, through the mischievous influence of imperative theories and the authority of great names, to attend to some still more important considerations, which I apprehend in themselves alone constitute a sufficient ground for the establishment of the Victoria Institute; and which will further and at the same time account, in great measure, for inductive science having already acquired some of the worst vices of the false system of philosophising; which it was Bacon's great object to root out for ever from scientific inquiry.

While we have been obliged to appeal to the fact, that there is an openly alleged opposition in our day between the so-called discoveries of modern science and the statements of Scripture, especially as to the creation and deluge, I think we may also find evidence, that this is not solely if at all to be accounted for, by any desire on the part of scientific men generally, at least in this country, to establish any such opposition, or any disposition to pervert scientific research, so as to make it antagonistic to religion. If Halley was infidel in his opinions, still we know that Newton was devout. If Laplace was atheistic in his views, and applying Sir W. Herschel's speculations as to the nebulae to the first formation of this world, was thus furnished with an hypothesis which enabled him, as he supposed, "to dispense with God throughout;"—still we must remember that that hypothesis was first put forth in England, as an interpretation of geological appearances, in one of the Bridgewater Treatises, by Dr. Buckland, some thirty years ago, intentionally to exhibit God's power in His works of creation. Professor Sedgwick, also, no doubt expressed an opinion entertained by many other men of science besides himself, when he declared that the theories now admitted to be "altogether delusive" by Sir Charles Lyell,—but which some may then have believed to be true theories founded upon sufficient facts ascertained by geological science,—were confirmatory of revelation. It is very true that in saying this, it was with the understanding that considerable modification might

fairly be made as to the meaning usually gathered from the scriptural statements. But what I wish to point out is, that while many infidels and atheists have from time to time made a handle of scientific theories to cast discredit upon revelation, there have also been many earnest men of science who have adopted the same scientific theories, but have not considered them incompatible with the revelations of Scripture. Very numerous attempts were made by Hugh Miller and other eminent writers, to reconcile the Scriptural statements with every fresh scientific discovery or supposed discovery in geology.

But, unfortunately, in all these efforts, "the science" of the day was always apparently adopted with too much readiness, as if *it* required no probable essential correction, while Scripture alone was constantly tampered with, in order to get it to mean something different from what its plain language had previously seemed to imply. "Science," it may be said, was allowed to pass uncriticised; while Scripture was ever being subjected to fresh and far-fetched interpretations. But this could not, of course, go on. Professor Baden Powell, in Kitto's Cyclopædia, in his article on "Creation," rejected the 1st chapter of Genesis as "not being history;" and Mr. C. W. Goodwin ridiculed all such "attempts to reconcile the Scriptures with science" as "failures;" and he, not without some good reason, pointed to "the trenchant way in which these theological geologists overthrow one another's theories." The mischief, however, it will thus be seen, had been done. Science had been taken on trust, the Scriptures had been sceptically handled; all, it may be, with the best intention on the part of many, but not the less with fatal results—results not less fatal to true science than to religious faith. And we have to account for these results. The scientific, no less than the religious, are interested in the inquiry. For what do we now find is the case? We find that it is science that ought to have been more narrowly watched and criticised; and that it would really have been to the credit of scientific men if they had applied to "science" somewhat of that vigilance to detect its possible errors, its contradictions, and fallacies, which has been freely enough and too exclusively exercised in our day upon the statements of the Scriptures, by those who have accepted without the least examination and with an almost absolute credulity, often at second hand, all that has been passing for science upon the authority of a few names of great scientific repute. Now, I venture to say, the explanation is not far to seek why science has thus "drifted" into contradictions and delusive theories and fallacies, which have become a scandal

and discredit to science on its own account,—leaving the question of revelation altogether out of consideration.

I have alluded to Halley, Laplace, and other atheists, infidels or unbelievers, who, as individuals, have no doubt been glad to find what they considered to be scientific contradictions of God's Revealed Word. But that is not all. Not merely have some pursued science in that spirit; but others have been found who have boldly put forth the opinion that the inductive philosophy of Bacon is necessarily atheistic in its principle and foundation; and they have even claimed Bacon himself as an atheist, and accused him of being a mere hypocrite in his religious professions! Not only have the atheists themselves put this forth as a boast, but the same accusations have been strangely re-echoed by others in their over zeal for faith and religion! Thus has Bacon been libelled and his philosophy misrepresented, by ungrateful and unfaithful followers on the one hand, and by the avowed enemies of all scientific investigation on the other.

But the real truth is, that science has become, in our day, materialistic and wildly speculative, entirely through a disregard of Lord Bacon's principles, and in spite of his actual warnings. Moreover, certain branches only of human knowledge have been cultivated by too many professed followers of Bacon, and the higher and connecting links of general philosophy have been too much neglected. "Hitherto (he says) the industry of man has been great and curious in noting the variety of things, and in explaining the accurate differences of animals, vegetables, and minerals, many of which are rather the sport of nature than of any real utility to science. Things of this sort are amusing, and, sometimes, not without practical use, but they contribute little or nothing towards the investigation of nature." (Nov. Org., ii., 27.) And elsewhere: "By means of these we have a minute knowledge of things, but scanty and often unprofitable information with respect to science. Yet these are the things of which common natural history makes a boast." (Descrip. Globi Intellect., c. iii.)—In reading these passages, one almost might imagine he had been describing by anticipation the so-called natural science of the present day. True, we have speculations enough, and theories in addition, but they are rash and ill-considered, because the sciences have been too much separated, and the great majority have devoted their minds to the details of some narrow speciality. But what says Bacon?—

"Let no one expect great progress in the sciences (especially their operative part) unless natural philosophy be applied to particular sciences, and they

again be referred back to natural philosophy. Hence it arises that astronomy, optics, music, many mechanical arts, medicine itself, and what seems more wonderful, moral and political philosophy, have no depth, but only glide over the surface and variety of things; because (mark this reason) these sciences, having once been partitioned out and established, are no longer nourished by natural philosophy. Then there is little cause for wonder that the sciences do not grow, when they are separated from their roots." (Nov. Org., i., 80.)

Again :—

"Generally let this be a rule, that all partitions of knowledges [sciences] be accepted rather for lines and veins, than for sections and separations; and that the continuity and entireness of knowledge be preserved. *For the contrary hereof hath made particular sciences to become barren, shallow, and erroneous*, while they have not been nourished or maintained from the common fountain."—(Adv. of Learn., B. ii.)

It is very true that Bacon deprecated, as a "philosophical calamity," the excursions of final causes into the limits of physical causes. But he did not, therefore, as some have rashly concluded, banish final causes from his scheme of true philosophy altogether. On the contrary, he contemplates the sciences, generally, as all comprehended in one pyramid of the Truth of things or Philosophy proper, founded, indeed, upon the basis of a knowledge of the varied facts of nature, but having an apex in the intelligence of Deity. Far from participating, in the least, in any atheistic notions, he thus expresses himself:—"It is easier to believe the most absurd fables of the Koran, the Talmud, and the Legends, than to believe that the world was made without understanding. Hence, God has wrought no miracles for the refutation of Atheism, because, to this end, His regular works in nature are sufficient." (Ess. on Atheism.) And thus it was, also, that he regarded "Natural Philosophy as properly the Handmaid of Religion," and not, as some regard it in our day, as its antagonist.

But nothing could be less Baconian than to endeavour to establish any philosophical position by an appeal to any authority, even though it were an appeal to his own great name. In thus vindicating his memory from misrepresentation, I have had no wish to employ the *argumentum ad verecundiam*. On the contrary, I would appeal to Bacon, mainly because he taught us to cast off all mere authority in science, and to trust to the mind itself, with all the independent aids to reason with which we are amply furnished by nature. Let me cite, however, one other witness as to the present unsatisfactory condition of science, attributable to its over-subdivision into branches, and the undue influence of scientific coteries in the

present day; too much like what it was when unreformed in Bacon's own time. I cite from the "Introduction to Anthropology," by the late Dr. Theodore Waitz, Professor of Philosophy in Marburg University:—

"In Germany (writes the learned Professor) it is at present a common case that in the fields of the various sciences, and even within the limits of a single science, opposite theories grow up, without their respective propounders taking any notice of one another's views, or making any attempt to reconcile their contradictory dogmas. The strength of party comes in place of strength of reasoning; and the labour of giving scientific proofs seems superfluous, where deference is merely yielded to the authority of those who, agreeing in some general principles, appear to support one another with the instinctive interest of an *esprit de corps*. With the same kind of tact, all that has grown upon a foreign stock is silently passed over or eliminated, while only what seems homogeneous is assimilated. Thus scientific life moves in individual narrow spheres, and the more comprehensive and fundamental principles are no longer discussed."

It is in order to provide a remedy for this state of things that the founders of the Victoria Institute agreed that its third object shall be:—

"To consider the mutual bearings of the various scientific conclusions arrived at in the several distinct branches into which Science is now divided, in order to get rid of contradictions and conflicting hypotheses, and thus promote the real advancement of true Science; and to examine and discuss all supposed scientific results with reference to final causes and the more comprehensive and fundamental principles of Philosophy proper, based upon faith in the existence of one Eternal God, who, in His wisdom, created all things very good."

This object is surely one, at least, which requires no apology as yet in England. It assumes, no doubt, a fundamental principle—the existence of the all-wise God. It therefore precludes the advocacy of atheistic theories in the Society. It need scarcely be said it does so, simply because its members and associates, as indeed the great mass of the scientific and unscientific, of the literate and illiterate alike, in this country, have no manner of doubt whatever of the truth so assumed. And this being the case, it is in fact to be only straightforwardly honest, to say that that constitutes a major proposition, which must necessarily override and *ipso facto* overthrow all opposite and conflicting hypotheses. To teach that truth and to establish it, pertains to the ministers of religion, and, therefore, it is excluded, as a question to be investigated, from the objects of the Victoria Institute. So are all purely religious or theological propositions. Science, in all its branches and ramifications, is

what the Society will be properly occupied with. And, convinced that no real science will be found to be contradictory to the revealed Truth of God as set forth in the Holy Scriptures, all questions of science about which there may be doubts in this respect, or which some may have alleged to be thus at issue with the Bible, will especially claim the attention of the members. One great means of carrying out this object and pursuing such investigations, will be the co-relating, when that is possible, the conclusions arrived at in one branch of science with those arrived at in another; so also discovering their discordance, when the supposed scientific conclusions are at issue.

It would be easy to give instances in detail of such conflicting theories and conclusions put forward in the present day. It is almost unnecessary. Everybody must see and admit that contradictory theories cannot both be true; both cannot be regarded as science. Nay, it must further be manifest, that our "science" of the Cosmos must be discredited and not believed in as "science" at all, even among the reputedly scientific, if they themselves are looking out for still further explanations, or are entertaining, putting forward, or quietly listening to, ever new theories in existing scientific societies.

I may with propriety give one single instance of this kind of thing, respecting what has long been regarded as the highest science in this country, and indeed in Christendom, for upwards of a hundred years at least. I allude to the Copernican Astronomy as modified by Kepler, and interpreted by Sir Isaac Newton's theory of universal gravitation. I leave out of consideration a subsequent modification of the system arising from the first Herschel's notion of Solar Motion in Space, which after being received by astronomers as "science," confirmed by all their calculations since 1783, was recently assailed as untenable, and shortly afterwards admitted by the Astronomer Royal to be now in "doubt and abeyance!" I leave this out, therefore, of consideration—though it too is a notable instance of what was long regarded as a "scientific fact" turning out to be a "mere delusion,"—and wish to speak only of conclusions supposed to be established by mathematical proof in Newton's "Principia." Not only are all Newton's demonstrations based upon the assumption that the heavenly bodies are moving in what is called "free space," or "spaces void of resistance;" but this was the notorious difference in the Cosmos, between the rival theories of Newton and Descartes. When Voltaire came to visit Newton in England, he wrote to a friend, that "he had left the world *full* at Paris—(referring to the "*plenum*" of Descartes and Aristotle) but

“found it was empty in London !” And yet our own Astronomer Royal made the announcement at the first meeting of the British Association, in 1831, “that the existence of a resisting medium has once more been established in this century by Encke.” (*Rep. on Astr., in loc.*) No individual astronomer I believe, nor any existing scientific society, has made it its business to see what effect this restoration of “the plenum” must have upon all Newton’s and Laplace’s demonstrations in the “Principia” and “Mécanique Celeste,” in both of which the non-existence of a resisting medium is taken for granted. Not only so ; but recent theories, put forward by Professor Thomson before the Royal Society of Edinburgh and elsewhere, and also by others in England, assuming an intense heat in the sun, are utterly irreconcilable with the Newtonian hypothesis that, as the centre of the solar system, it must have a mass 350,000 times greater than the earth, while about 1,400,000 times greater in bulk.* If as hot as has been recently speculated, as its bulk remains the same (namely, about 850,000 miles in diameter), then its mass will not be 1,000 times greater than that of the earth ; and, on Newtonian principles, this would render its being the centre of the solar system impossible. Any child can understand, that if the calculation which required the sun’s mass to be 350,000 times greater than that of the earth, was *science*, it cannot be also “science” that its mass should be so reduced that it can only be about 1,000 times greater. Nor is this all. These speculations, as to the sun’s intense heat, have required the co-relative theory of some means of supplying the immense waste of matter by heat and radiation. So, it has further been speculated that this was accomplished by meteoric matter which was supposed to be falling constantly into the sun to supply it with fuel. This theory was noticed approvingly by the President of the British Association in 1863, and the fullest account of it is to be found in two papers by Mr. E. W. Brayley, F.R.S., in the “Companion to the British Almanack.” But scarcely had this theory been completed, as it were, in detail, and recognized as “a reasonable supposition” by the President of the British Association, than all of a sudden Mr. Brayley, who formerly appeared to be one of its staunchest advocates, put forward, in the Royal Society, another theory as diametrically opposed to it as

* *Vide* Letter of “Nauticus,” in the *Astronomical Register* for February, 1865, p. 49. (London : Adams & Francis, Fleet Street.) Also, Essay on “The Scriptures and Science,” in *Fresh Springs of Truth*. (London : Griffin & Co.)

any two cosmical theories could possibly be. He suggested a totally different theory, in which the sun is not only the centre of the solar system, but the source whence all the planets were drawn! Instead of the sun being fed with meteors to keep it from burning out, Mr. Brayley's theory makes the sun, in rotating rapidly on its axis, throw off meteoric bodies; and thus he argues the earth and other planets were most probably created! I have no intention of going further into this speculation here. I mention the fact of its having been brought forward, and that in the Royal Society, in the presence of Professor Tyndall, and of Newton's successor in the Lucasian chair, without a word being uttered against it. This forces us, I say, naturally, to ask this question, What is now our knowledge, our "science," of the sun or Cosmos? Mr. Brayley's views, of course, are entirely opposed to every part of the "Principia" and all that was dreamt of in Newton's philosophy. Professor Thomson's theory destroyed the possibility of the sun being the theoretical centre of the solar system, if universal gravitation had anything like a plausible foundation. But apart from that argument, which some people may not trust themselves to admit, any boy can see that Professor Thomson's and Mr. Brayley's theories are flat contradictions of one another, even as speculations; and then we are bound to ask, Upon what extraordinary data of facts or principles can such conflicting theories be based?

That existing societies do not trouble themselves to compare and contrast, and so to reject as unscientific such contradictory hypotheses, or one or other of them, is simply *true*. The transactions of the Royal Society—and no other need be named—bear witness to the truth of this averment. And that to do so—as proposed in the third object of the Victoria Institute—would tend to the advantage and real advancement of true science, I think will scarcely be disputed. The Science of Sciences, in fact, is the proper co-relation of all the various sciences into one grand and consistent Philosophy, which will be the interpretation of the nature of things as ordained by the one true God; and it does not require to be argued that each science should at least be consistent with itself. True lovers of Science, and all lovers of Truth, must surely unite in one desire to harmonize the conflicting elements of human speculations; and the members of the Victoria Institute may reasonably hope, that when this is done it will be found, that the highest human wisdom will be in accordance with the Wisdom of the One God, Who has created all things very good.

CIRCULAR, MAY 24, 1865.

PROPOSED VICTORIA INSTITUTE, OR PHILOSOPHICAL SOCIETY OF GREAT BRITAIN.

London, 24th May, 1865.

It is proposed to found a new Philosophical Society for Great Britain, to be composed of Members or Fellows and Associates who are professedly Christians, and the great object of which will be to defend revealed truth from "the oppositions of science, falsely so called."

In the words of a recent author, "those who believe the Christian religion to be true and to rest upon rational grounds, and who consider that the only proper mode of propagating the truth is by proving it to be true, and of opposing error by disproving it, cannot help the burden this places upon them."—"We are suffering from the consequences of a culpable stagnation of thought, or from having failed to investigate fully and fairly, but rigidly, all the facts and arguments from time to time put forth as truths newly discovered by science and as being contradictory to the Scriptures."

It is in order that this may now be done thoroughly, that the institution of a new Society for this express purpose is proposed. It will be of great advantage to *real* Science, and has become a necessity for the Christian religion.

It will therefore be the duty of this Society to enter upon controversies of the day, and to give a hearing and encouragement to all who are willing to battle with the "oppositions of science," in order to reduce its pretensions to their real value.

There is no existing scientific body that fulfils these ends. At the present time, the only thing almost that is considered a fair subject for question and free opposition from every quarter, in all such societies, is Revealed Truth. There is by no means an equal freedom allowed in questioning what is called "Established Science."

At the Anthropological Society of London, on May 16th, Bishop Colenso spoke of "the facts of Geology" as disproving the Scriptures; as if he had really not been aware, that at the last meeting of the British Association for the Advancement of Science (at which he was present), all these lately assumed foundation "facts" of Geology were publicly given up as untenable and disproved by Sir Charles Lyell in his Address, which Bishop Colenso actually heard delivered. Along with this now abandoned Geology, all the cosmological notions which Mr. C. W. Goodwin, in "Essays and Reviews," boasted of as being "certainly established science," contrary to "the Mosaic Cosmogony," have vanished like a dream.

It will be the business of the new Philosophical Institution to recognize no human science as "established," but to examine philosophically and freely, all that has passed as science, or is put forward as science, by individuals or

in other societies ; whilst its members, having accepted Christianity as the revealed truth of God, will defend that truth against all mere human theories by subjecting them to the most rigid tests and criticisms. In fact, the Society will be organized for the purpose of applying to "science" somewhat of that vigilance to detect its errors, contradictions, and fallacies which has been freely enough exercised in our day upon the statements of the Scriptures and of Christian doctrine, by those who accept, without the least examination and with an almost absolute credulity, all that passes for science.

Such a Society will doubtless succeed. Its head-quarters will be in London, but it will soon boast of corresponding branches throughout the whole country. Similar societies will be established on the Continent and throughout the world, thus affording facilities for individual and combined co-operation, and also for reproducing each other's most important publications.

The battle between the Scriptures and Science will then be fairly fought, —not any longer with all the organization on one side. Truth is great, and it will prevail! Papers will be read before the Society, discussing the most important questions of philosophy and science, without limit as to the subjects, except that those will be especially considered and have a preference that appear to touch adversely the bases of the Christian faith. Free discussion will be allowed. The discussions will be reported *verbatim*, and published in the Society's journal, probably in combination with a new review, to be called *The Christian-Philosophy Review*, in which a fair account will be given of all important new publications, especially those bearing upon general philosophy, morals, and religion. A Library and Reading-room will also hereafter be established in connection with the Society.

It is proposed that the Society shall be incorporated, and hereafter obtain a Royal Charter ; that Her Majesty shall be requested to become its first Patron, and that it be called *The Victoria Institute*, to commemorate its inauguration in her most gracious Majesty's reign. That it shall confer a medal annually upon some writer who has distinguished himself in refuting false philosophy, or exposing the fallacies of so-called science—this medal to be called, with her Majesty's permission, the Victoria Medal. Also that the Prince of Wales be requested to become its first Vice-Patron and Honorary President.

* * * * *

*** Be good enough to circulate this paper among your friends who are likely to take an interest in what is proposed. What nobler pursuit can man engage in, than in trying to discover truth by the philosophic study of God's works of creation ; and in what respect can Christians better employ themselves than in discovering ever fresh proofs and confirmation of the revelations contained in the Holy Scriptures? Those who may not be able to take a prominent part, as Fellows or Members of the Victoria Institute, may join as Associates (ladies being eligible), and thus aid the good work as subscribers, receiving in return the Society's Journal and other privileges.*

POSTSCRIPT.

(Pp. 10, 11, 12, 14.)

1. Since this pamphlet was originally written and published, Dr. Colenso has returned to Natal, and he has there repeated the same statements he made in England "as to the science of geology flatly contradicting Scripture." In doing so (if the newspaper reports are to be relied on), he referred to Dr. Temple as having publicly declared the same thing while preaching in St. Paul's cathedral. I am almost certain that I am correct in saying (p. 10) that he also said this when preaching in Whitehall Chapel; so that it would appear to be his habit to go about preaching what is only calculated to discredit the Scriptures among the ill-informed and those who, apparently like himself, have learnt nothing as to the changes that have taken place in the conclusions of the most eminent geologists since the *Essays and Reviews* were published.

2. In addition, therefore, to the citations already given in the text, from Sir Charles Lyell's Address as President of the British Association at Bath in 1864, I now cite the following passages from the Anniversary Address of Mr. Hamilton, the President of the Geological Society of London, delivered in February, 1865, which ought, as a matter of common literary decency, to stop this constant "preaching" that anything worthy of the name of geological "science" has contradicted or upset the Scriptures. He said:—

"Recent investigations have upset the ancient theories, that all the highest points consisted of crystalline rocks, and that no sedimentary rocks formed high mountains. Again it was formerly supposed" [and relied on as "certain science" in the "Essays and Reviews"] "that the crystalline rocks, particularly granite, owed their origin to igneous action. Now it is well known that these granites are chiefly arranged in layers. The granite passes into gneiss, and the gneiss into mica-schist and talc-schist; and this is again closely connected with the green and grey slates; and it is well known that many of these rocks, formerly considered as plutonic, are really metamorphosed rocks."

3. Now, in making this citation, I am not saying whether Mr. Hamilton's views are right or wrong, or whether I agree with him or not. I quote him as an "authority," like Sir Charles Lyell, speaking *ex cathedra scientiæ* to a scientific body, and declaring that what *was* called geological science as to granite, for instance, when the "Essays and Reviews" were written, is no longer regarded as science in the Geological Society of London, whatever it may be in the pulpits where Dr. Temple preaches, or among the Zulus at Natal; but, on the contrary, is itself now "*upset*." If Mr. Hamilton is wrong in his views as to the granites being "*chiefly arranged in layers, and stratified*—if

that is meant, then that will only still further show how very uncertain, after all, even the *quasi* "facts" of science sometimes are, as well as the scientific "theories" that thus get *upset* by fresh investigations. Mr. Evan Hopkins, in reference to these words of Mr. Hamilton, says:—"The primary crystalline rocks are formed in parallel *vertical* bands, not stratified, but divided in plates like crystals. . . . The distinction that exists between the semi-crystalline *vertical bands* of the primary series, and the *stratified sedimentary* rocks, is not yet fully recognized."*

4. As Mr. Hopkins was one of the first, if not, rather, the very first geologist who disputed the "plutonic," or dry-heat origin of the granites, in the first edition of his valuable and interesting work, which was written in South America so far back as 1837-38, and published in London in 1843, he is entitled to a deferential hearing upon this cognate point. But my object throughout this pamphlet, and with reference to *all* the questions of science alluded to in it, is not to show that this or that has been "established" in any case, but to show how scientific opinions have changed, and that further investigations are necessary before we can boast we have got hold of any real science at all. I find it necessary to say this much, as one or two gentlemen have managed to persuade themselves that I have necessarily adopted the opinions expressed in some of the citations and references in the text (which might or might not be true, and yet be of no consequence), but which is not really warranted by the language I have used, and not at all necessary for my argument. I have quoted recognized authorities in science against Bishop Colenso, Dr. Temple, and Mr. Goodwin; and I have quoted men whose views in science were despised, and who were refused a hearing at one time, but whose views are now accepted, as so far correct, by such authorities.

5. I go on, therefore, to make one more citation from Mr. Hamilton's Address, with reference to other changes in geological views:—

"We are daily becoming more convinced that no real natural breaks exist between the Faunas and the Floras of what we are accustomed to call geological periods. . . . We learn now that those forms of animal life which roamed over the surface of the earth before man came to *exercise* dominion over them, were not, as was at one time supposed, destroyed before his arrival, but continued to coexist with him, until the time came when they were to make way for other forms, more suited to the new conditions of life and to his requirements."

This, it will be observed, bears upon the remarks in the text (p. 12), made in allusion to Sir Charles Lyell's "Antiquity of Man." But, again, I beg leave to say I am not adopting Mr. Hamilton's opinions any more than Sir Charles Lyell's upon this point. Were I to express my own opinion, I would venture to say that, though I hold it to be clearly proved (as *now* acknowledged by these eminent geologists) that man was contemporaneous with animals at one time supposed to have been destroyed ages before his "arrival" on the scene

* *Geology and Terrestrial Magnetism*. By Evan Hopkins, C.E., F.G.S., 3rd Ed., with a new Introduction and Appendix, &c., p. vii. (London: Taylor & Francis, Red Lion Court, Fleet Street, 1865.)

of this world, I do not, therefore, admit the great antiquity of man. *I think it remains to be proved that the extinct animals are of the great antiquity that has been assigned to them.** Bearing in mind that Mr. Hamilton says, "We are daily becoming more convinced that no real natural breaks exist between the Faunas and Floras of what we are accustomed to call geological periods," I think the following remarks are worthy of consideration.

"The first step in the false inductions geology made, arose from the rash deduction that the order in which the fossil remains of organic being were found deposited in the various strata, necessarily determined the order of their creation; and the next error arose from blindly rushing to rash conclusions and hasty generalizations, from a very limited number of facts and the most imperfect investigations. There were also (and indeed are still) some wild dogmatisms as to the time necessary to produce certain geologic formations; † but the absurdities of the science culminated when it adopted from Laplace the irrational and unintelligible theory of a *natural* origin of the world from a nebula of gaseous granite, intensely hot, and supposed to be gradually cooled while gyrating senselessly in space. This necessitated the further supposition of a long lapse of ages before this gas-world cooled down; when again it was supposed that a hard granite crust would be the result, with the still hot liquid granite-matter inside! Then it was supposed (whence or how not explained) that rain would fall upon the hardened granite, and that it would break up into soil, gravel, &c., &c., in the course of another lapse of ages or millions of years; and so on and on, always supposing some fresh occurrence, without the most remote attempt at explaining how any one of them could have naturally occurred, and always allowing ages upon ages to intervene, as if to give time enough for totally inadequate causes to produce the continued series of improbable effects, which, without a Deity and without a design, were to result in this glorious world!

But, although we have now got rid of the "Azoic" strata, and the Azoic ages of this world of ours, it is nevertheless worth while to suggest that, even had they existed, and even had all the fossils ever discovered been embedded exclusively as was long supposed to be the case, this would not have afforded any proof of the sole existence of the lower orders found in the lowest strata at any particular time; but only that such animals as naturally

* In a Paper read in the Royal Institution of Great Britain by the eminent geologist Mr. Prestwich, on the Flint Implements found at Amiens, he said,— "That the evidence as it then stood, seemed to him as much to necessitate the bringing forward the extinct animals towards our own time, as the carrying back of man to the geological times." (Quoted from *Cosmogony*, by Evan Hopkins, Esq., C.E., F.G.S. Second Edition, 1865: Longmans.)

† In an able review of Sir William Logan's *Geological Survey of Canada*, which appeared in *The Times* of 21st of October, 1864, the following remark occurs, with reference to arguments based upon these "immense geological periods":—"In order to expose the fallacy of such an argument, it would be only necessary to appeal to a few of these Canadian geological monuments, the true interpretation of which, we believe, will establish the fact that the element of time has very little share in the alteration and crystallization of the sedimentary rocks."

occupied the bottom of the oceans were the first to be embedded, when the first deposits of sediments were thrown down into the waters.

Were the world even now overwhelmed with a flood, and great masses of earths of various kinds carried violently into the sea, it must be evident that sponges and sea-anemones, and other lower orders of living organisms in the sea, which inhabit or are fixed at its bottom, would immediately be embedded in the sediment, while only an occasional fish might be poisoned or otherwise accidentally covered over. In time, however, the waters might become unfit even for the fish to live in, and many of those dying would be embedded in other sediments [superimposed]. As the waters rose, the reptiles and amphibians would next be drowned and embedded; while land animals would mostly for a time escape to the higher grounds. But were the waters still to rise, even they, and also man at last, would be swept away, though, probably, in most cases their carcasses would not be embedded in sediments, but floated and dashed about, to be left [in caves, or] on the surface of the earth, and to waste away on the subsequent subsidence of the waters. Moreover, at the time of Noah's flood, it must be remembered, that many parts of the world may have then had no human inhabitants, and that strata formed in such regions would therefore necessarily be wanting in the remains even of human workmanship, though man might have lived contemporaneously in other regions of the globe, and his remains might be embedded there.

But no traces of man having been found by geologists in what was then supposed to be the oldest strata, it was concluded that man did not exist on the earth at all when these strata were formed; and long periods and intervals were therefore assigned between the time of the various formations."

This was published before Mr. Hamilton's Address was delivered. And now (the author goes on to ask), when the evidence of man's co-existence with certain extinct species of animals is admitted by the authorities, what is the consequence?

"Not a modest consideration of the whole series of geologic theories, which had rashly proclaimed Holy Scripture untrue, but which have been found to be really untrue themselves; but only further rash and extravagant generalizations, with a fresh atheistic theory tacked on to the others, to render the whole again somewhat more plausible! The long times and intervals between the various formations and the "geologic periods" are not given up; but only the abrupt divisions between each are abandoned, and man is now pushed further back into 'antiquity,' and is supposed to have been originally a savage, developed by some unexplained process, in the course of millions of ages, out of a gorilla or chimpanzee!"*

7. These observations by an anonymous author are, of course, not quoted as of any "authority," but only as a view of the whole state of the case that may fairly be entertained. Having alluded to Professor Ansted (on p. 14) as sending the official answer to Dean Cockburn, refusing to re-open the discussion of the nebular theory in the Geological Section of the British Association in 1844, I have the satisfaction of being now able to quote from

* *Fresh Springs of Truth* (chapter on "The Scriptures and Science"), pp. 104, 105, 113-115. (London: Griffin & Co., 1865.)

what that learned Professor has more recently written in his *Geological Gossip*; and which will be found an ample justification of the very strongest things I have said throughout this pamphlet. I commend Professor Ansted's candid remarks to the special consideration of Dr. Colenso, Dr. Temple, and the two or three gentlemen who have favoured me with somewhat hypercritical strictures upon some sentences in the Circular of 24th May and the *Scientia Scientiarum*.

"An account (says the distinguished Professor) of the correction of the mistakes in geology might furnish matter for many amusing and instructive chapters in a work like the present. Few of the younger geologists of the day, and fewer still among general readers, have any idea of the extent to which opinions have become imperceptibly modified in many important departments of geological science within the last quarter of a century, while there have not been wanting several absolute and formal recantations enforced from time to time by direct discovery. The great cause of this is to be found in the inveterate habit that almost all of us have of over-estimating the value of negative evidence.

Geologists examine a certain district, and remark the absence of some objects or group concerning which there seems no good reason why it should not have been handed down as perfectly as some others that have been preserved. At once the theorist jumps to the conclusion that the tribe of animals not represented had not been created. A theory is soon built up on the strength of it; for no one can oppose it without having the *onus probandi* thrown upon him. But some fine day the required fact is discovered, often to the disgust of the theorists, to the equal vexation of the student, and it would almost seem to the annoyance of everybody.

The first impulse of human nature is to put the unlucky discovery on one side—say nothing about it:—most likely it will bear investigation, and therefore don't let us have the trouble of investigating it! It is so painful to be stopped in a pleasant career of progress, and to be obliged to examine carefully, and weigh fairly, the evidence in regard to a matter we thought settled when we began work some twenty years ago.*

A troublesome Frenchman—M. Boucher de Perthes—took it into his head that some remains of men ought to be found in gravel. M. Perthes, although he found plenty of specimens, and published an octavo volume about them, and even offered his specimens to the *savants* of Paris, could not obtain a hearing. Few readers, either in France or England, seem even to have been aware of his book. The subject was tabooed, because people's minds were quite made up on the subject, confiding in the strength of the negative evidence, which really meant little more than a total absence of inquiry."

* One of my critics recently boasted in print that he continued now to teach the same geology he had done for fifty years!

JOURNAL OF TRANSACTIONS.

JOURNAL OF THE TRANSACTIONS

OF THE

VICTORIA INSTITUTE,

OR

PHILOSOPHICAL SOCIETY OF GREAT BRITAIN.

FIRST GENERAL MEETING of the MEMBERS and ASSOCIATES of the INSTITUTE, held on 24th May, 1866—*Her Majesty's, Birthday and the Anniversary of the Society's Foundation*,—at 32, Sackville Street, London, W.

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

THE NOBLE CHAIRMAN stated, that this being the First Meeting of the Members and Associates who had united to form the Victoria Institute, there were no previous Minutes to be read. He had much pleasure in taking the Chair on the present occasion, and in seeing so large a meeting assembled for the purpose of formally inaugurating a Society, the importance of which, he thought, could scarcely be over-estimated, the founding of which was only proposed a year ago, and agreed upon at a meeting held in that room, on 16th June, 1865, consisting of scarcely more than twelve of the present members of the Society, which now numbered nearly two hundred. It would be unnecessary for him to make any observations with respect to the objects for which it was established, as they would be fully explained in the inaugural address, which would be read that evening by the Rev. Mr. Mitchell. (Hear, hear.) He rejoiced to learn, from the number of members who had already joined, that the Society promised to be attended with the greatest success, and without any further preface he would call upon the honorary secretary to read the report of the Provisional Committee and Council.

MR. REDDIE (Hon. Secretary), then read the following Report of the Provisional Council :—

*REPORT of the PROVISIONAL COMMITTEE and
COUNCIL of the VICTORIA INSTITUTE, or
Philosophical Society of Great Britain.*

Founding of the Society.

1. Your Committee beg leave to advert very briefly to the origin of the Victoria Institute. On May 24th, 1865, a printed Circular, which has now been in every member's hands, was sent to the newspapers and distributed to various individuals, proposing to found a new Philosophical Society, for the purpose of defending Revealed Truth from unwarranted attacks made upon it in the name of Science. The response to this appeal was so hearty and immediate, that the author of the circular and the friends with whom he had previously consulted were induced, so early as the 10th of June, to issue a second circular, addressed to those who had signified their approval of the founding of the proposed Society, or their desire to co-operate in its formation, requesting them to attend a preliminary meeting on June 16th, to consult together as to the basis upon which the new Society should be founded. At this meeting the Earl of Shaftesbury presided; and certain resolutions having been agreed to respecting the objects of the new Society, they were referred to a sub-committee, consisting of the Rev. Dr. Robinson Thornton, the Rev. A. De La Mare, Captain Fishbourne, R.N., C.B., Captain Francis W. H. Petrie, and Mr. Reddie (with power to add to their number); who were desired to report thereon, and on other matters, to a subsequent meeting, which was held on Thursday, June 22nd. At this meeting the Objects of the Society, terms of membership, &c., as recommended by the Committee, were agreed upon, and the result was made known in a printed Circular (No. 4) dated July, 1865, inviting Vice-Patrons, Members, and Associates to join the Society for the purposes and upon the terms therein set forth.

2. The Committee above referred to added other members to their number from time to time, and was the nucleus of your present Committee, as now organized into the Provisional

Council, whose names are printed in the First List of Foundation Members and Associates, corrected to May 1st, which was sent to all the Members and Associates of the Society upon calling this present meeting.

Members and Associates.

3. Your Committee have to express their regret that various circumstances prevented them from completing the organization of the Society sooner, and obliged them to postpone till to-day the First General Meeting of its Members and Associates. At the same time they would desire to recognize the kind forbearance of the earliest enrolled members of the Society, in making every allowance for this delay, arising from difficulties which are probably always attendant upon new undertakings. There has been a gratifying evidence among the members of a calm confidence in a good cause that would only gather strength by time, and which, therefore, need make no undue haste. If, however, our meetings commence some few months later than was originally expected, your Committee have the satisfaction of being able to congratulate the Society, that its proceedings now commence with, they believe, an unprecedented number of Members and Associates.

4. On the 1st of this month 158 Members had joined, and 21 Associates, making 179 in all, including one Vice-Patron, five Life Members, and one Second-Class Life Associate. Since that date 10 new Members and 3 Associates have joined, making a total of 192 Members and Associates.

Finance.

5. Taking the Members and Associates as in the printed list corrected to the 1st of May, which has been generally circulated, the Income of the Society will stand thus, when all the subscriptions shall have been paid:—

For 5 Life Members	£105	0	0
„ 1 Ditto and Vice-Patron	63	0	0
„ 152 Members, at Two Guineas each	319	4	0
„ 1 Life Associate, 2nd Class	10	10	0
„ 9 1st Class Associates, at Two Guineas each	18	18	0
„ 11 2nd Class Ditto, at One Guinea	11	11	0
	<hr/>		
Over.....	£528	3	0

Brought over £528 3 0

The Expenditure already incurred, chiefly for printing, postage, stationery, and the salary of the paid Secretary for six months, is as follows, viz. :—

Mr. Warrington, for printing, &c.....	£12	11	8	
Mr. Hardwicke, two thousand copies of <i>Scientia Scientiarum</i> , &c.	26	2	8	
Due for 1,000 ditto	6	6	0	
Messrs. Ortner & Houle, for engraving crest, stationery, &c., &c.	4	13	5	
Contingencies, chiefly postage, of the first Interim Secretary.....	16	0	0	}
Contingencies, chiefly postage, of the Honorary Secretary				
Contingencies of Dr. Evans, the present Interim Secretary				
Salary of Do. 6 months, to 30th June next	50	0	0	
Advertising	10	0	0	
Due for printing, &c., &c., probably...	10	0	0	
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Balance in favour of the Society	£392	9	3	

5. The donation of Henry W. Peek, Esq., as Vice-Patron, and the life subscriptions paid up to the 5th of April last, have been invested in Government Stock, in the name of the Trustees. And this course your Committee propose should be followed with all other donations or life subscriptions.

Objects, Constitution, and Bye-laws of the Society.

6. Your Committee have had prepared the draft of a code of Regulations relating to the Objects, Constitution, and Bye-laws of the Society. They do not, however, propose to submit these rules for adoption to the present meeting. They request that they may be allowed to give further consideration to this important matter, after their formal election and confirmation by this meeting as the regularly-constituted Council of the Society. The Objects of the Society having been settled, as well as the general terms upon which the Members and Associates already enrolled have joined the Institute, your Committee are of opinion that on the present

occasion it will be sufficient if they indicate the modifications and additions which they now recommend should be made as regards the contributions and privileges of Members and Associates who may be enrolled in future.

7. They beg leave to recommend :—

I. That the Foundation List of Members and Associates be kept open till 31st December, 1866, and then closed.

II. That all Members whose applications for admission are dated on or after 1st January, 1867, be required to pay an Entrance Donation of *not less than* One Guinea each (the precise amount to be hereafter determined), in addition to their annual subscription of Two Guineas, or their Life composition of Twenty Guineas.

III. That no Entrance Donation be required from Members applying to be enrolled before 31st December, 1866; and that no Entrance Donation be required from Associates, either of the First or Second Class, whether enrolled before or after that date.

IV. That Associates as well as Members shall be entitled to be present at all the General and Ordinary Meetings of the Society, also to state their opinions thereat, and to vote by show of hands; but that when recourse is had to voting by ballot, in order to determine any question, Members only shall be entitled to vote.

V. That Associates of the First Class shall be entitled to all the publications of the Society, the same as Members, including the publications contemplated under Object 6. But that Associates of the Second Class shall only be entitled to the publications referred to in Objects 4 and 5.

VI. That nevertheless the Committee shall have power, when the funds of the Society will admit of it, to issue the other publications of the Society to Associates of the Second Class being ministers of religion, either gratuitously or at as small a charge as the Council may deem proper.

VII. That the first annual contributions of Members and Associates already enrolled, or applying to be enrolled before 31st December next, shall be considered as extending to that date; and that the future annual contributions shall be considered as due in advance on January 1st in every year, or in the case of new Members and Associates upon their election.

VIII. That should Her Most Gracious Majesty the Queen, H.R.H. the Prince of Wales, or other Personage of Royal blood hereafter become Patron, Vice-Patron, or a Member of the Society, none of the regulations relating to donations,

contributions, or subscriptions shall be considered as applicable to such Royal Personages, nor shall they be liable to serve in any office of the Society.

8. Your Committee submit these recommendations for the approval of this General Meeting, in order to serve for their guidance in framing the Regulations and Bye-laws of the Society; which they propose shall be laid before a Special General Meeting of the Members and Associates, for adoption or otherwise, early in the next session, to commence in November.

Conclusion.

9. In conclusion, your Committee beg leave to state that they have considered it undesirable to cumber this Report with the details of their various proceedings, or of the efforts they have made for the proper organization of the Institute, or the advancement of its interests. The present meeting will doubtless be anxious to listen to the Inaugural Address about to be delivered, which will form the real commencement of our public acts as an organized body. The First List of Foundation Members and Associates, enrolled within a year from the first proposal to found this Society, and before it has really done anything, may be taken as a fair augury of future progress, and as a proof that the labours of your Committee have been crowned with some measure of success.

10. Should this Report be adopted,—as your Committee venture to hope:—should their past acts be thereby approved, and their present status confirmed, as the authorized and regularly constituted Council of the Victoria Institute or Philosophical Society of Great Britain, with power to do all they may consider proper for advancing the interests of the Society, and for completing their own constitution as its Council, by adding to their numbers, choosing other or additional Vice-Presidents and Honorary Secretaries, or other officers of the Society; and generally by being authorized to manage its affairs by engaging the services of paid officers or servants, hiring apartments, and making any other arrangements they may deem advisable to promote the objects of the Society; your Committee, as the Council of the Society, will proceed with renewed zeal in this important work, and in enrolling new Vice-Patrons, Members, and Associates, on the terms already set forth.

11. For the short remainder of the present Session, your Committee only propose that a few General Papers shall be read,

as introductory to subjects which come within the province of the Society. Due notice of the titles of these papers, and of the dates upon which they are proposed to be read, will be given. The first will be "*A Sketch of the Existing Relations between Science and Scripture*," by George Warrington, Esq., Member of Council, and will be read on the evening of the 4th of June. Ladies will be admissible at the reading of these General Papers, which will be analogous in character to the Lectures referred to in the 5th Object of the Society.

12. Finally, your Committee most earnestly trust, that all the labours of the important Society which is this day publicly inaugurated, may not only tend to promote the real advancement of a true Science of Nature among mankind; but that, in the words of the motto which your Committee have adopted for the Institute, they may always also be undertaken and prosecuted *ad majorem Dei gloriam*.

By order,

J. REDDIE,

Hon. Sec.

THE REV. HENRY HARE then moved the following Resolution:—

That the Report of the Committee be adopted, printed and circulated; and that the Committee be now constituted as the Council of the Institute, with full power to do all that they may think proper for its management, for the ensuing year.

THORNTON HUNT, Esq., seconded the Resolution, which was carried unanimously.

THE NOBLE PRESIDENT then called upon the REV. WALTER MITCHELL, M.A. (Vice-President), who read the following Inaugural Address:—

MY LORD SHAFTESBURY AND GENTLEMEN,

It is in deference to your expressed wishes, but with a profound sense of my inability to do justice to the subject on which I am called upon to address you, that I venture to inaugurate the proceedings of the VICTORIA INSTITUTE. I feel emboldened, however, by the belief that the objects of this Society are too noble and great in themselves to suffer in any degree from the weakness of their exponent.

No one who watches the expression of thought by the cultivated intellectual classes of this country, through its literature, can deny that the opinion that science and revelation are directly opposed to each other has been spreading with fearful rapidity.

Those who cultivate the dry details of science are a small minority compared with those who pursue the more alluring and pleasing paths of general literature. The majority of those who constitute the reading and thinking class of England agree to accept without much difficulty any opinion or hypothesis dignified by the name of science. They neither feel capable, nor do they care to investigate the pretension of the scientific dogma to be accepted as truth. They regard only the popular reputation of the promulgator as a man of science. "If any new proposition," says the *Saturday Review*, "comes with the authority of an established professor of the science, we accept it with the confidence with which a Roman Catholic might take the decision of the infallible Church." This confession of the *Saturday Review* may be taken as a fair expression of the practice of most of the non-scientific class of Englishmen, and also of those who are mere *dilettanti* cultivators of science.

If men, therefore, who have attained a certain position of rank in the scientific world enter the arena of popular literature or address the thinking world in popular lectures, and boldly maintain that science and Scripture are irreconcilable, their dicta are at once received as if they were founded upon absolute and incontestable demonstration. The foundation of the Victoria Institute is in itself a caution to the unscientific world to pause in the acceptance of such propositions without careful investigation. A body of men who have cultivated, some or other of them, nearly every branch of human knowledge which goes under the vague term of science, have here united themselves in the assertion that, so far as they have investigated the questions of philosophy and science, they have not found the principles of philosophy, or the laws and facts of science, presenting any real discordance with the great truths revealed in Holy Scripture. They go, however, a step further. They are students, both of the book of Nature as displayed in the works of the Creator, and also of that book which they believe to be a revelation of the highest truths by that same Creator to His creature, man. Their faith that these books are by the same Author has been unshaken by their pursuit of knowledge. They hold this faith upon higher principles than those of mere scientific demonstration or mere philosophical induction. They are not afraid that any discord or discrepancy can really be found between true philosophy or sound science and revelation; and therefore they are willing, nay, anxious, to investigate, with care and with that love of truth which lies at the root of their religious principles, all the objections that are urged, either as philosophical or scientific, against the Bible.

Here, however, our opponents may meet us with the objection that we are not free to enter into an unprejudiced discussion of these questions; that we are already pledged to the issue; that we approach the questions debated as advocates rather than calm and dispassionate judges; and, to a certain extent, I am willing to accept this issue. We are not prepared to abandon our faith as Christians; we do not believe that it is necessary to assume the position of Deists, or, as the most advanced advocates of freedom of thought would have us, assume the position of Atheists, in order to discuss calmly and dispassionately the problems of philosophy or the laws and phenomena of the world of sense. As Christians, as honest believers in the Bible as a record of revealed truth, we know that, in the history both of modern philosophy and modern science, avowed Christians have taken no mean or insignificant place. I will go further, and say, that Christians have held the highest place as discoverers of the laws of nature, interpreters of the phenomena of nature, and careful and honest observers of those facts upon which science is based.

We have derived our faith in revealed religion neither from cold philosophical thought nor from the feeble inductions of science, but from the highest source of all truth—the revelation of God to mankind. We regard this faith as His gift, the gift of the Spirit of Truth; and, when we know how distinguished Christians, who have held and do hold this faith, have been in the paths of philosophy and science, we ask why we should not investigate the pretensions of modern philosophers and modern professors of science when they call upon us, as lovers of truth, to abandon our faith. We believe that our honest investigations of these objections will tend to strengthen the faith of those who have not the time or do not possess the necessary scientific education to investigate such questions for themselves.

If asked why the Victoria Institute should be founded for such investigations, I think I could give a very sufficient answer from my own experience. I know no other society or institution where such subjects could be discussed.

A purely theological society would not feel competent to entertain the scientific side of the discussion. A purely scientific society would repudiate the theological aspect. Not long ago I had to address a theological meeting, composed entirely of clergymen, on the very subject of the supposed opposition between science and revelation. As a cultivator of some branches of science, I pointed out that the supposed facts on which the opposition was founded were no facts at all; that they were crude hypotheses, raised without proof and

without demonstration to the rank of natural laws; that a host of facts, many of which I mentioned, were directly opposed to them; that some alleged facts I could demonstrate by plain arithmetic, to go no higher in mathematics, to be false. And how was I met by my rationalistic opponents? That they were incompetent, from their ignorance of science, to enter at all into the scientific view of the question. They regarded authority rather than discussion from abstract principles or the facts and phenomena of nature. That some whom they esteemed as scientific authorities differed from me, and therefore I was told that I must discuss the science of the question, even where science and revelation were supposed to come into collision with each other, before a purely scientific body. These men were in a minority; but, if such a minority could be found among a small body of theologians, I think I could adduce no stronger evidence of the want of such an institution as that we are now inaugurating.

The supposed opposition between science and revelation may be divided into two great divisions,—an opposition of principles; an opposition of facts. This controversy is an old one, and has already been well fought out in the literature of this country. In its old phase this opposition was so completely answered by the advocates of revelation that the controversy for the time ceased with all but the avowed sceptic and infidel. With the progress of science, and metaphysical rather than physical discussion, the old controversy has been revived under a somewhat different aspect; though in reality its true character is scarcely, if at all, altered.

Philosophical principles and assumed facts of new sciences are now once more set in formidable array against the claims of revelation to the acceptance of a well-educated or rational man. The principle of modern rationalism which has been thought by some so destructive to the claims of revelation in the written Word of God, has been imported, as an accepted principle and law of truth, into the realms of purely physical science. A false principle, borrowed as if an accepted truth from science by the purely literary man, after doing its utmost work of destruction in the theological world, has been imported back as if unquestionable into the realms of science.

If I am asked what I mean by this principle of so-called rationalism, I will adopt a definition of one of its advocates. "It is the supremely important fact that the gradual reduction of all phenomena within the sphere of established law carries with it as a consequence the rejection of the miraculous." Now, here we have an old objection in a new dress. We have here an assumption that the progress of modern science

has been such a gradual reduction of all phenomena of nature within the sphere of established law that this principle must be received as a truth. It is, however, but the revival of Hume's celebrated objection to miracles. "A miracle," says Hume, "is a violation of the laws of nature, and a firm and unalterable experience has established these laws: the proof against a miracle, from the very nature of the fact, is as entire as any argument from experience can possibly be imagined." I will not stop here to show that this assumption of Hume's has been proved again and again to involve the very facts which are in dispute. That, if even one miracle has happened, which is the point in discussion, then Hume's proposition must fall to the ground, for it cannot be contrary to experience. Nor need I remark for those so much inclined to bow to the authority of great names, that the progress of the reduction of the phenomena of nature within the sphere of established law between the time when Newton wrote his "Principia" and his "Optics," and that when Hume wrote his famous treatise on Miracles, was not so great as to have any material influence on the important question of the credibility of miracles. Yet Newton, who more than any other man had the most profound conviction of the existence of natural laws, was not compelled on that account to reject his belief in miracles, or that greatest of all miracles the creation of the physical world by an omnipotent Creator, and His support of all things by His ever-watchful domination and providence. Those who try to divorce the conception of a Creator and Ruler of the Universe from our views of the physical world, the world of matter, and would restrict the reception of the marvellous entirely to the spiritual world, evade the example of Newton by the assertion, that he, who made the greatest step ever made by the inductive philosophy, was destitute of its true spirit.

The advance of the inductive philosophy since the days of Newton may have opened up a wider region of law in the physical universe. We know of other forces than those of gravitation and light. But what progress have we made in bringing these within the domain of law expressed in mathematical terms enabling us to anticipate by these laws unknown phenomena and facts of nature? If, therefore, the man who more than any other, by his clear and vigorous intellect, has reduced the widest range of phenomena within the sphere of established law, did not, on that account, feel compelled as a consequence to reject the miraculous, we may well ask why we, as students of Nature's laws, must as a matter of rational necessity be required to do so.

It will be instructive, however, to trace the effect of this

assumed axiom, rejected by Newton, that the reduction of the phenomena of nature to established laws compels the rejection of the miraculous.

What we call a law of nature is nothing more than a general formula enabling us to class together under one head a certain number of observed phenomena. We must not let this term "law" lead us into metaphysical or illogical conclusions. Because we class together a certain number of facts under what we term a law, we have no certainty that that law is a necessary, unalterable, unchangeable power, controlling the observed phenomena. That because the law of gravitation enables us to account for certain motions of the planetary bodies, their satellites and the comets of our system, the proved existence of this law must compel us to believe that it, as well as the bodies it controls, existed through the infinite ages of the past without a creator: a law without a lawgiver, controlling matter without a creator; gravitation being a self-sustaining, self-evolving power of self-existent, uncreated matter. I put this proposition in this startling point of view, because it is precisely the point of view in which it has been imported from the disputes of rationalistic theologians into the domain of science.

Strauss asserts that a miracle is an impossibility, because the "chain of endless causation can never be broken." Now, nothing but infinite experience or infinite observation of all the laws of nature, through an infinite period of time, could prove the assertion that the chain of endless causation can never be broken.

What we call a law of nature is but the observation of a certain number of facts which we class under a certain formula; a certain number of facts, for instance, under the law of gravitation. But gravitation is not, for anything we know, a necessary law, a necessary and invariable property of what we call gravitating matter. Phenomena might present themselves which might refuse to be classed under this law, and we should have to amend it. This has not only been conceded; but the calculating machine, as described by Babbage, gives us a mechanical demonstration that no sequence of phenomena, however great or long observed, can assure us that at any instant the chain of the law may not be broken.

The acceptance of such a position as a "chain of endless causation" must not only destroy the idea of a living and ruling God; but also the existence of man's will, which cannot be exerted without a breach of this chain of endless causation. This "chain of endless causation" was popularized for the purpose of spreading the results of rationalism in this

country by the late Mr. Baden Powell, in his "Christianity without Judaism," "The Order of Nature," and his essay "On the Study of the Evidences of Christianity," in "Essays and Reviews."

Admitting that the allowance of one miracle is as efficient a demolition of the axiom of the "chain of endless causation" as a thousand; that the creation of the universe, or the creation of man, or the creation of any living being must most undoubtedly be regarded as a miracle; that where there is a commencement of the chain of causation, which creation must be, the chain cannot be endless: he therefore strove with all his might to deny a creation. "In Christianity without Judaism," he tells us that the facts of geology compel us "uninterruptedly to extend the domain of natural order through the infinity of past time." "That everything has gone on from one age to another, through the countless periods of past duration to the depths of primeval time, in the same unbroken chain of regular changes;" and, again, that the Biblical account of creation is a parable or fiction designedly untrue. These assertions with respect to creation he repeats again and again in his "Order of Nature;" indeed, it is the dominant thought throughout most of the volume. In "Essays and Reviews," he tells us, "that the simple but grand truth of the law of conservation, and the stability of the heavenly motions, now well understood by all sound cosmical philosophers, is but the type of the universal self-sustaining and self-evolving powers which pervade all nature;" and when we ask whether living beings were created, or whether they have existed in an unbroken endless chain of causation through the infinite ages of the past, he satisfies our curiosity by telling us that "it is now acknowledged, under the high sanction of the name of Owen, that 'creation' is only another name for our ignorance of the mode of production; and it has been the unanswered and unanswerable argument of another reasoner that new species *must* have originated *either* out of their inorganic elements, or out of previously organized forms; either development *or* spontaneous generation *must* be true; while a work has now appeared by a naturalist of the most acknowledged authority, Mr. Darwin's masterly volume on the Origin of Species by the law of 'natural selection,' which now substantiates on undeniable grounds the very principle so long denounced by the first naturalists,—*the origination of new species by natural causes*; a work which must soon bring about an entire revolution of opinion in favour of the *self-evolving powers of nature.*"

Instead, therefore, of creation, Mr. Baden Powell gives us the *self-evolving powers of nature* acting on uncreated matter.

When we ask for proof, we are referred to Mr. Darwin's "Origin of Species by the Law of Natural Selection." Now I will venture to assert that no one can say, after a careful study of Mr. Darwin's work, that he has even claimed to have incontrovertibly proved the existence of his law. At the best it is but an hypothesis, not an established law. Confessedly the majority of known facts in nature are irreconcilable with it. When Mr. Darwin is asked for the proofs of the first steps of his process of animal improvement and transmutation, he refers us to the undiscovered strata of unknown geological periods. Even then he carries his improved law only up to some three or four forms of animal and vegetable life as the points from whence animated nature has sprung, not in an endless, but a finite chain of causation. He gives no law for the appearance of vitality amid inorganic life, and shirks the origin of this as foreign to the question.

Mr. Darwin was an admirer of Mr. Powell, and, doubtless, would willingly follow him as far as he could in his theory of no creation. In the historical sketch prefixed to the third edition of his "Origin of Species," he asserts that "the philosophy of creation has been treated in a masterly manner by the Rev. Baden Powell," and attributes to Mr. Powell the anticipation of much of his own theories. "Nothing," he says, "can be more striking than the manner in which he shows that the introduction of new species is a regular, not a casual, phenomenon; or, as Sir John Herschel expresses it, a natural in contradistinction to a miraculous process." The law of endless causation, which, in Mr. Baden Powell's opinion, is to bring about such an entire revolution of opinion,—the law which is to substitute the self-evolving powers of nature for the power of an omnipotent Creator,—is no other than the "law of the origination of new species by natural causes;" those natural causes being the destruction of weaker races by the stronger in the battle of life. Now this proposition has only to be stated in naked terms to carry with it its own manifest contradiction: The destruction of life in the battle of life necessarily takes for granted the previous existence of life. Therefore this law,—even granting it proved, which it has not been,—does not carry us back to the self-evolving powers of nature for the first production of life. Mr. Darwin himself would seem to repudiate any such deduction from his own law. "A celebrated author and divine," he states, "has written to me that he has gradually learnt to see that it is just as noble a conception of the Deity to believe that He created a few original forms capable of self-development into other and needful forms, as to believe that He required a fresh

act of creation to supply the voids caused by the action of His laws." But this subject is so important, and such a use has been made of Mr. Darwin's theory in the endeavour to evade the idea that the commencement of life, animal or vegetable, must be an act of the Creator, that I may be permitted to examine what Mr. Darwin himself puts forth as the limits of his own theory. "These authors," he says, "seem no more startled at a miraculous act of creation than at an ordinary birth. But do they really believe that at innumerable periods in the earth's history certain elemental atoms have been commanded into living tissues? Do they believe that at each supposed act of creation one individual or many were produced? Were all the infinitely numerous kinds of animals and plants created as eggs, or seed, or as full grown? And in the case of mammals, were they created bearing the false marks of nourishment from the mother's womb? Undoubtedly these same questions cannot be answered by those who, under the present state of science, believe in the creation of a few aboriginal forms, or of some one form of life. It has been asserted by several authors that it is as easy to believe in the creation of a hundred million beings as of one: but Maupertius's philosophical axiom 'of least action' leads the mind more willingly to admit the smaller number; and certainly we ought not to believe that innumerable beings within each great class have been created with plain, but deceptive, marks of descent from a single parent. It may be asked how far I extend the doctrine of the modification of species. The question is difficult to answer, because the more distinct the forms are which we may consider, by so much the arguments fall away in force. But some arguments of the greatest weight extend very far. All the members of whole classes can be connected together by chains of affinities, and all can be classified on the same principle in groups subordinate to groups. Fossil remains sometimes tend to fill up very wide intervals between existing orders. *Organs in a rudimentary condition plainly show that an early progenitor had the organ in a fully developed state*; and this in some instances necessarily implies an enormous amount of modification in the descendants. Throughout whole classes various structures are formed on the same pattern, and at an embryonic age the species closely resemble each other. Therefore I cannot doubt that the theory of descent with modification embraces all the members of the same class. I believe that animals have descended from at most only four or five progenitors, and plants from an equal or lesser number.

"Analogy would lead me one step farther, namely, to the

belief that all animals and plants have descended from one prototype. But analogy may be a deceitful guide. Nevertheless, all living things have much in common—in their chemical composition, their cellular structure, their laws of growth, and their liability to injurious influences. We see this even in so trifling a circumstance as that the same poison often similarly affects plants and animals; or that the poison secreted by the gall-fly produces monstrous growths on the wild rose or oak tree. In all organic beings the union of a male and female elemental cell seems occasionally to be necessary for the production of a new being. In all, as far as is at present known, the germinal vesicle is the same. So that every individual organic being starts from a common origin. If we look even to the two main divisions, namely, to the animal and vegetable kingdoms, certain low forms are so far intermediate in character that naturalists have disputed to which kingdom they should be referred; and, as Professor Asa Gray has remarked, ‘The spores and other reproductive bodies of many of the lower algæ may claim to have first a characteristically animal, and then an unequivocally vegetable existence.’ Therefore on the principle of natural selection with divergence of character, it does not seem incredible that, from some such low and intermediate form, both animals and plants may have been developed; and if we admit this, we must admit that all the organic beings which have ever lived on this earth may have descended from some one primordial form. But this inference is chiefly grounded on analogy, and it is immaterial whether or not it be accepted. The case is different with the members of each great class, as the vertebrata, the articulata, &c.; for here, as has just been remarked, we have in the laws of homology and embryology, &c., distinct evidence that all have descended from a single parent.”

Mr. Darwin, therefore, with every concession that we might make that he had established his law of the origin of species by the law of natural selection, is obliged to lead us back to an origin, to a creation, of animal and vegetable life for which his law supplies no substitute. Mr. Baden Powell’s assumption of Darwin’s law as a proof of the self-evolving uncreated powers of nature, is but a type of the loose, inaccurate mode of reasoning by which our faith in a Creator is sought to be unsettled. Professor Huxley follows in the same manner in his paper “On the Methods and Results of Ethnology,” in the *Fortnightly Review*. He treats the belief that God created Adam and Eve, and that all mankind are descended from them, with lofty philosophical scorn. He calls the theory of Adam’s creation, Adamitic monogenism. He says, “Five-sixths of the public 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." Now, why does Professor Huxley reject this doctrine? Is it because the sciences of physiology and comparative anatomy, which he has cultivated with such success, and with such deserved distinction, compel him to reject the theory of the descent of the human race from a single pair? No. He admits that science presents him with no difficulty in accepting this doctrine. What is it, then, he rejects? Man's creation. And why? Because he considers it unphilosophical to admit the idea of creation; and he thinks Mr. Darwin's law of the origin of species enables him to evade this unphilosophical idea. "The whole tendency," he asserts, "of modern science is to thrust the origination of things further and further into the background; and the chief philosophical objection to Adam being, not his oneness, but the hypothesis of his special creation; the multiplication of that objection tenfold is, whatever it may look, an increase, instead of a diminution, of the difficulties of the case. And as to the second alternative, it may safely be affirmed that, even if the differences between men are specific, they are so small that the assumption of more than one primitive stock for all is altogether superfluous. Surely no one can now be found to assert that any two stocks of mankind differ as much as a chimpanzee and an orang do; still less that they are as unlike as either of these is to any New World Simian? Lastly, the granting of the polygenist premises does not, in the slightest degree, necessitate the polygenist conclusion. Admit that Negroes and Australians, Negritos and Mongols are distinct species, or distinct genera, if you will, and you may yet, with perfect consistency, be the strictest of monogenists, and even believe in Adam and Eve as the primeval parents of mankind. It is to Mr. Darwin we owe this discovery; it is he who, coming forward in the guise of an eclectic philosopher, presents his doctrine as the key to ethnology, and as reconciling and combining all that is good in the Monogenistic and Polygenistic schools. It is true that Mr. Darwin has not, in so many words, applied his views to ethnology; but even he who 'runs and reads' the 'Origin of Species' can hardly fail to do so."

It is by such loose, illogical, unphilosophical reasoning, such acceptance of crude hypotheses as demonstrated laws, that we are to accept the "chain of endless causation" as eliminating even the idea of creation and a Creator from the universe. But this will appear more strongly still if we pass from the origin of vitality on the earth to the origin of the world itself by the self-evolving powers of nature. This leads us up at once to

the Nebular hypothesis. Of unformed star-dust; of a fire mist, revolving fiercely on its axis, slowly cooling and throwing off planets and comets from the refrigerating mass of a sun. But whence this mist, this great heat? Professor Tyndall, in his "Constitution of the Universe," leads us back to "ages ago, when the elementary constituents of our rocks clashed together and produced the motion of heat." But whence, ages ago, the atoms constituting the elementary particles of these rocks? Whence the force that caused them to clash together? He is silent. The chain of endless causation snaps asunder: he confesses that he knows no more of the origin of force than he does of the origin of matter. But where our modern English professors hesitate, Mr. Collingwood has put forth Dr. Louis Büchner's views on "Force and Matter" in an English dress to enable us boldly to elicit truth and to overthrow prejudice. Here, without any shrinking, shall we find the "chain of endless causation" carried to its legitimate conclusions.

Dr. Büchner sets forth in the strongest terms the immortality, indestructibility, infinity, and imperishability of matter and its twin attendant force. He teaches us that matter is not inferior to, but the peer of, spirit. He laughs to scorn not only the idea of a Creator, but a God. "Nature," he tells us, "knows neither a supernatural beginning nor a supernatural continuance. Nature, the all-engendering and all-devouring, is its own beginning and end, birth and death. She produced man by her own power, and takes him again." Nature, not God. He knows no God but man's *self-idealization*. Verily Dr. Büchner would have us eat of the fruit of the tree of knowledge, that we might be as gods. He quotes, with approbation, the saying of Ludwig Feuerbach, "An extraneous and superhuman god is nothing but an extraneous and supernatural self, a subjective being, placed, by transgressing its limits, above the objective nature of man." And how, getting rid of a creator, does he give us the origin of man or vitality on the earth? "There was a time," he asserts, "when the earth—a fiery globe—was not merely incapable of producing living beings, but was hostile to the existence of vegetable and animal organisms. It was only after having cooled down, and after the precipitation of the watery vapours which surrounded it, that the crust of the earth assumed a form which, in its further development, rendered the existence of various organic beings possible."

"The facts of science prove, with considerable certainty, that the organic beings which people the earth owe their origin and propagation solely to the conjoined action of natural forces, and that the gradual change and development of the

surface of the earth are the sole, or at least the chief, cause of the gradual increase of the living world." Here, then, we come to the plain expression that all the beauty, order, and wisdom displayed in God's universe is its own creator, own sustainer; nothing but law, no wisdom, no design. Such empty notions and innocent studies Dr. Büchner leaves to those who delight to contemplate nature rather with the eyes of the feelings than with those of the intellect. Where, then, does the vain endeavour to evade mystery in nature,—for that, and that alone, leads to the denial of the miraculous in nature,—lead us? To the acceptance of something far more unsatisfactory—to the proud reason of man. Well might Dr. Arnold say, "Here is the moral fault of unbelief—that a man can bear to make so great a moral sacrifice as is implied in renouncing God. He makes the greatest moral sacrifice to obtain partial satisfaction to his intellect. A believer ensures the greatest moral perfection, with partial satisfaction to his intellect also; entire satisfaction to the intellect is and can be obtained by neither."

And why, I ask, cannot the believer obtain entire satisfaction for his intellect? Because the finite cannot comprehend the infinite.

We see, therefore, that the rationalistic principle of law without a lawgiver, invented for the purpose of explaining away all that is miraculous, if carried out must lead us to the conclusion, that there is not an intelligent author of nature, and natural governor of the world. This is the position in which modern science is asserted to oppose revelation. We are called upon to reject that which Bishop Butler, in his "Analogy," deemed unnecessary of proof. For he takes it as "proved, that there is an intelligent author of nature, and natural governor of the world. For as there is no presumption against this prior to the proof of it, so it has been often proved with accumulated evidence—from this argument of analogy and final causes; from abstract reasonings; from the most ancient tradition and testimony; and from the general consent of mankind."

The more intimately the laws of nature have been investigated, the more clearly has it been demonstrated that they are not founded on chance. They manifest that they are the arbitrary enactments of a supreme will, and founded on a wisdom which, so far as we can comprehend it, manifests its perfectness. Surely Newton may reasonably be a guide in natural philosophy? We need not fear to follow him lest we be considered unscientific. "Later philosophers," says he, in those remarkable queries he appends to his Optics, "banish the consideration of such a

cause out of natural philosophy, feigning hypotheses for explaining all things mechanically, and referring other causes to metaphysics. Whereas, the main business of natural philosophy is to argue from phenomena without feigning hypotheses, and to deduce causes from effects, till we come to the very first cause, which certainly is not mechanical; and not only to unfold the mechanism of the world, but chiefly to resolve these and suchlike questions. What is there in places almost empty of matter, and whence is it that the sun and planets gravitate towards one another without dense matter between them? Whence is it that Nature doth nothing in vain; and whence arises all that order and beauty which we see in the world? To what end are comets? and whence is it that planets move all one and the same way in orbs concentric, while comets move all manner of ways in orbs very eccentric? and what hinders the fixed stars from falling upon one another? How came the bodies of animals to be contrived with so much art, and for what ends were their several parts? Was the eye contrived without skill in optics, and the ear without knowledge of sounds? How do the motions of the body follow from the will? and whence is the instinct in animals? Is not the sensory of animals that place to which the sensitive substance is present, and into which the sensible species of things are carried through the nerves and brain, that there they may be perceived by their immediate presence to that substance? And these things being rightly despatched, does it not appear from phenomena that there is a being incorporeal, living, intelligent, omnipresent, who in infinite space, as it were in his sensory, sees the things themselves intimately, and thoroughly perceives them, and comprehends them wholly by their immediate presence to himself? Of which things the images only carried through the organs of sense into our little sensoriums, are there seen and beheld by that which in us perceives and thinks. And though every true step made in this philosophy brings us not immediately to the knowledge of the First Cause, yet it brings us nearer to it, and on that account is to be highly valued."

Now, Newton here insists on an axiom as impossible to be evaded as any axiom of mathematical or mechanical science. That there is such an overwhelming evidence of design manifested wherever we can trace the laws of nature; that this design compels us to admit beyond all these laws as their originator and ruler, an all-wise, omnipotent Law-giver, and ever-present Ruler. And this he carries out most fully in his "Principia," where, showing that "the planets and comets will indeed persevere in their orbs by the laws

of gravity, but they could by no means obtain the regular situation of these orbs by those laws at first," he argues that the design manifested in our solar system "could not have its origin from anything else than from the wise conduct and dominion of an intelligent and powerful being;" that this being is the supreme Lord God; that he must have dominion or he could not be the supreme Lord God; "The supreme God is an eternal, infinite, absolutely perfect being, but a being, how perfect soever, *without dominion*, is not Lord God."

The admission of design in the universe thus compelling the admission of a wise designer, we need not be surprised to find those who would eliminate the idea of a Creator, doing all they can to eliminate also the evidence of design. Newton asks, "Was the eye contrived without skill in optics?" Mr. Darwin asserts that his law of "natural selection" shows how the eye was contrived without skill in optics. He makes this the crucial instance by which he tests the soundness of his hypothesis. He admits that if the eye required a contriver skilled in the laws of optics, his theory must fall to the ground; and therefore he uses all his dialectic skill in urging a proposition which seems, he admits on the very face of it, to "be absurd in the highest possible degree," and that "the difficulty of believing that a perfect and complex eye could be formed by natural selection" is insuperable even by our imagination.

Dr. Büchner, who denies the existence of any design throughout the whole domain of nature, hails this answer of Darwin to Newton's query with delight. Now, let us listen patiently to him whom his followers hail as the Newton of the organic world, and see how his law of natural selection is to construct an eye without skill in optics!

"To suppose that the eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest possible degree. When it was first said that the sun stood still and the world turned round, the common sense of mankind declared the doctrine false; but the old saying of *Vox populi, vox Dei*, as every philosopher knows, can never be trusted in science. Reason tells me, that if numerous gradations from a perfect and complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown to exist; if, further, the eye does vary ever so slightly, and the variations be inherited, which is certainly the case;

and if any variation or modification in the organ be ever useful to an animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable by our imagination, can hardly be considered real. How a nerve comes to be sensitive to light, hardly concerns us more than how life itself first originated; but I may remark that several facts make me suspect that nerves sensitive to touch may be made sensitive to light, and likewise to those coarser vibrations of the air which produce sound. In looking for the gradations by which an organ in any species has been perfected, we ought to look exclusively to its lineal ancestors; but this is scarcely ever possible, and we are forced in each case to look to species of the same group, that is to the collateral descendants from the same original parent form, in order to see what gradations are possible, and for the chance of some gradations having been transmitted from the earlier stages of descent, in an unaltered or little altered condition. Amongst existent vertebrata, we find but a small amount of gradation in the structure of the eye; though in the fish amphioxus the eye is an extremely simple condition without a lens; and from fossil species we can learn nothing on this head. In this great class we should probably have to descend far beneath the lowest known fossiliferous stratum to discover the earlier stages by which the eye has been perfected.

“In the great kingdom of the articulata we can start from an optic nerve, simply coated with pigment, which sometimes forms a sort of pupil, but is destitute of a lens or any other optical mechanism. From this rudimentary eye, which can distinguish light from darkness, but nothing else, there is an advance towards perfection along two lines of structure, which Müller thought were fundamentally different; namely,—firstly, stemmata, or the so-called ‘simple eyes,’ which have a lens and cornea; and secondly, ‘compound eyes,’ which seem to act mainly by excluding all the rays from each point of the object viewed; except the pencil that comes in a line perpendicular to the convex retina. In compound eyes besides endless differences in the form, proportion, number, and position of the transparent cones coated by pigment, and which act by exclusion, we have additions of a more or less perfect concentrating apparatus. Thus in the eye of the meloe the facets of the cornea are ‘slightly convex, both externally and internally, that is, lens-shaped.’ In many crustaceans there are two cornea,—the external smooth, and the internal divided into facets—within the substance of which, as Milne Edwards says, ‘renflemens lenticulaires paraissent s’être développés;’

and sometimes these lenses can be detached in a layer distinct from the cornea. The transparent cones coated with pigment, which were supposed by Müller to act solely by excluding divergent pencils of light, usually adhere to the cornea, but not rarely they are separate from it, and have their free ends convex; and in this case they must act as converging lenses. Altogether so diversified is the structure of the compound eyes, that Müller makes three main classes, with no less than seven subdivisions of structure; he makes a fourth main class, namely, 'aggregates' of stemmata; and he adds that 'this is the transition-form between the mosaic-like compound eyes unprovided with a concentrating apparatus, and the organs of vision with such an apparatus.'

"With these facts, here too briefly and imperfectly given, which show how much graduated diversity there is in the eyes of our existing crustaceans, and bearing in mind how small the number of living animals is in proportion to those which have become extinct, I can see no very great difficulty (not more than in the case of many other structures) in believing that natural selection has converted the simple apparatus of an optic nerve merely coated with pigment and invested by transparent membrane, into an optical instrument as perfect as is possessed by any member of the great articulate class.

"He who will go thus far, if he find on finishing this treatise that large bodies of facts, otherwise inexplicable, can be explained by the theory of descent, ought not to hesitate to go further, and to admit that a structure even as perfect as the eye of an eagle might be formed by natural selection, although in his case he does not know any of the transitional grades. His reason ought to conquer his imagination; though I have felt the difficulty far too keenly to be surprised at any degree of hesitation in extending the principle of natural selection to such startling lengths.

"It is scarcely possible to avoid comparing the eye to a telescope. We know that this instrument has been perfected by the long-continued efforts of the highest human intellects; and we naturally infer that the eye has been formed by a somewhat analogous process. But may not this inference be presumptuous? Have we any right to assume that the Creator works by intellectual powers like those of man? If we must compare the eye to an optical instrument, we ought in imagination to take a thick layer of transparent tissue, with spaces filled with fluid, and with a nerve sensitive to light beneath, and then suppose every part of this layer to be continually changing slowly in density, so as to separate into layers of different densities and thicknesses, placed at different distances from

each other, and with the surfaces of each layer slowly changing in form. Further, we must suppose that there is a power (natural selection) always intently watching each slight accidental alteration in the transparent layers; and carefully selecting each alteration which, under varied circumstances, may in any way or in any degree tend to produce a distincter image. We must suppose each new state of the instrument to be multiplied by the million, and each to be preserved till a better be produced, and then the old ones to be destroyed. In living bodies, variation will cause the slight alteration, generation will multiply them almost infinitely, and natural selection will pick out with unerring skill each improvement. Let this process go on for millions on millions of years, and during each year on millions of individuals of many kinds; and may we not believe that a living optical instrument might thus be formed as superior to one of glass, as the works of the Creator are to those of man?

“If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous successive slight modifications, my theory would absolutely break down. But I can find no such case. No doubt, many organs exist of which we do not know the transitional grades, more especially if we look to much-isolated species, round which, according to my theory, there has been much extinction; or, again, if we look to an organ common to all the members of a large class,—for in this latter case the organ must have been first formed at an extremely remote period, since which all the many members of the class have been developed,—and in order to discover the early transitional grades through which the organ has passed, we should have to look to very ancient ancestral forms, long since become extinct.”

Now, after carefully studying Mr. Darwin's own arguments for the formation of the eye without skill in optics, I must confess that they fail to convince me in the slightest degree. They are founded on monstrous assumptions utterly unsupported by fact. They assume that any variation, however slight, of any animal organ can be transmitted by inheritance. That there are no natural limits whatever to this transmission; while all experience and all our knowledge go to prove that there are limits that cannot be passed. That the tendency even of those deviations produced by man's art in the animal and vegetable world, as admitted by Darwin himself, is ever to revert to the type from whence they proceeded rather than to diverge *ad infinitum*. That this law of natural selection does by no means account for myriads of facts in nature directly opposed to it. “Take,” says Sir John Herschel,

“for an instance, the formative *nisus*, which determines the production of a supernumerary finger in the human hand. Here is no gradual change from generation to generation; no first development of a rudimentary joint followed in slow succession after centuries of hereditary improvement, by the others, up to the perfect member: it starts at once into completeness. The change in the *working-plan* of the whole hand has been carried out at once, by a systematic engraftment of blood-vessels and nerves into effective connections with the centres of nutritive, mechanical, and sensitive action in the frame, as if by some preconceived arrangement.”

Again: Mr. Darwin's millions of millions of imperfect microscopes and telescopes, ascending by slow and imperceptible stages from the accidentally exposed nerve of some primeval animal, exist nowhere in fact, but only in his own fertile imagination. He points out eyes among the radiata he calls imperfect. Are they really so? We judge the perfection of an organ not so much by its mechanical structure as its adaptation to the wants of its possessor. For some creatures the simplest form of an organ may be better adapted than the most complicated. Again: if I regard the law of natural selection of accidental varieties propagated by inheritance from an individual as a mathematician; if I regard that law as the producer of so complicated an organ as the eye, with its innumerable contrivances to effect its object, the laws of probability compel me at once to reject such a proposition as monstrous, from its inherent improbability. And this, too, assuming as proved that which so many facts contradict, that any accidental variety can be propagated by inheritance without any limitation.

How is it, we may ask again, that this law of natural selection has been so bountiful as to supply some individuals with almost countless myriads of eyes, and so great a number with only two? How are we to account for this without the intervention of some other law, regulated and fixed by design? But let us view the formation of the eye by this law of natural selection from another aspect. How does it account for the formation of any single existing eye we may select as an example. I know, for instance, that each of my eyes has been elaborated from one fluid—from blood. There was a time when my eyes had no existence. Have they passed through millions of millions of imperfect instruments, correcting their imperfections by the stern law of natural selection upon penalty of loss of existence? No. The marvellous lenses, constructed so as to defy their imitation by human skill, have been formed, without trial and error, on the strictest principles of mathematical

accuracy. They have taken forms which no geometer, no analytical integrater, could divine,—forms which, even arrived at approximately by our imperfect mathematical analysis, we could not imitate mechanically. Possessing, too, just those refractive indices which are adapted, in combination with those forms, to secure a minimum, indeed, for aught I know, a perfect degree of absence of spherical and chromatic aberration. Possessed, again, with an inexplicable power of adapting their form to the perfect vision of a star in infinite space, and to an object removed but a few inches from them. Supplied, again, with a self-acting diaphragm sensitive to light—not for vision, but for contracting and expanding—so as to adapt the rays of light admitted into the marvellous camera obscura in such quantities only as are adapted to secure the proper impression on the retina. Need I refer to the black pigment for absorbing superfluous light; to all the accessories of the wondrous camera obscura; to the muscles which move it with mechanical design and contrivance; to the lids which veil it from light too injurious to be admitted into the dark chamber; to the contrivances for preserving the transparency of the external surface of the transparent cornea with a never-failing supply of moisture?

Where am I to seek for the architects of this wondrous exhibition of skill and contrivance? Is it in the blood corpuscles or in the fluid in which they swim? The blood certainly was the agent by which all this structure was built up, with faultless, unerring accuracy, by no law of natural selection by the destruction of less perfect instruments. If I ask modern physiologists as to the structure of my eye, I am told it is like a fountain, which preserves its general form amid the unceasing motion of the particles which form it. The atoms which form my eye are constantly being laid down and taken up again. Constantly deposited from the vital stream of blood flowing through my body; as constantly taken up again into the general stream. Let this stream stop, and the marvellous structure from that instant commences to fall into irretrievable ruin. Where, I may ask, is the formative *nisus* which erected this skilful structure? Where dwells the constant *formative nisus* which preserves this structure when once it is built up? What architect endows the atoms which constitute the structure with such marvellous powers? Why do the same corpuscles which form the ear, with its marvellous auditory purposes, when they reach another part of the body, become such skilled artists in optical wisdom? Why in one part of the organ form lenses possessed with one refractive index, in another part of another, and then a third, every one mutually adapted amid a

thousand, nay, myriads, of possible different refractive indices? What chemistry could combine the atoms constituting the blood into the differing structures of the eye? If formed, what mechanism could combine these structures with all their marvellous adaptation to the purposes of the eye? Can natural selection, ruled only by the stern necessity of destruction to the imperfect, answer these queries? No. Nor yet will the laws of vitality alone, superadded to the laws of chemical combination of the atoms of matter, answer my questions. My proud intellect can find no rest till it learns the humility necessary for all true knowledge. I must admit that the eye was not formed without skill in optics; that the ear was not formed without knowledge of sounds. Can atoms of matter do all this? What are these atoms? How do they act and react on one another? What are their mutual relations? "These same relations," says Sir J. Herschel, "in which they stand to one another are anything but simple ones. They involve all the 'ologies' and all the 'ometries,' and in these days we know something of what that implies. Their movements, their interchanges, their 'hates and loves,' their 'attractions and repulsions,' their 'correlations,' their what not, are all determined on the very instant. There is no hesitation, no blundering, no trial and error. A problem of dynamics, which would drive Lagrange mad, is solved *instanter*, '*Solvitur ambulando*.' A differential equation which, algebraically written out, would belt the earth, is integrated in an eye-twinkle, and all the numerical calculation worked out in a way to frighten Zerah Colborn, George Bidder, or Jedediah Buxton." What can solve such wonders as these? what account for such relations? "The *presence of MIND* is what solves the whole difficulty, so far, at least, as it brings it within the sphere of our own consciousness, and into conformity of our own experience of *what action is*."

The most profound investigations into the laws and phenomena of nature, aided by all the powers of the human mind, assisted by all we know of human experience, bring us back, not to law, but the mind of the Lawgiver, as the only starting-point, the only-stand point, from which our reason can exercise itself. He that made the eye was skilled in optics. He said, "Let there be light, and there was light." He alone can say, "I form the light and create darkness." "I am the Lord, and there is none else, there is no God beside me. I girded thee, though thou hast not known me." Shall not we say with Job, "Hast thou not poured me out as milk, and curdled me like cheese? Thou hast clothed me with skin and flesh, and hast fenced me with bones and sinews"? Shall we not

confess with David, "Such knowledge is too wonderful for me ; it is high, I cannot attain unto it"? "The darkness hideth not from Thee ; but the night shineth as the day : the darkness and the light are both alike to Thee. For Thou hast possessed my reins : Thou hast covered me in my mother's womb. I will praise Thee ; for I am fearfully and wonderfully made : marvellous are thy works ; and that my soul knoweth right well. My substance was not hid from Thee when I was made in secret, and curiously wrought in the lowest parts of the earth. Thine eyes did see my substance, yet being unperfect ; and in Thy book all my members were written, which in continuance were fashioned, when as yet there was none of them" ?

The assertion "that the gradual reduction of all phenomena within the sphere of established law carries with it as a consequence the rejection of the miraculous," upon which assertion modern rationalism has invaded the domain of theology and natural philosophy, has only to be brought face to face with the highest inductions of modern science to meet its own refutation. We are not required to banish God, to banish a Creator from the physical world, to cultivate with freedom the revelations of modern science. The assumed laws which replace design by rigid fate, crumble before a calm, dispassionate investigation. As men of science, we can say that we believe not only that God created us and all things ; we can confess even with heathen poets of old, "that in Him we live and move and have our being." That no disbelief in the miraculous, no knowledge of correlation of forces, no conservation of *vis vitæ* compels us to deny that "He left not Himself without witness in that He did good, and gave us rain from heaven, filling our hearts with food and gladness." Our philosophy still allows us with simple hearts to pray, "Give us this day our daily bread." We can still believe that no sparrow can fall from heaven without our Heavenly Father's knowledge and will. Nay, the more we know, the more deeply we investigate the phenomena of nature, the more are we compelled to admit our own ignorance. "Hardly do we guess aright at things that are upon earth, and with labour do we find the things that are before us." Laws of nature we confess, with Hooker, have in them "more than men have as yet attained to know, or perhaps ever shall attain, seeing the travail of wading herein is given of God to the sons of men, that perceiving how much the least thing in the world hath in it more than the wisest are able to reach unto, they might by this means learn with humility." Humbly we confess, with Bishop Butler, "other orders of creatures may perhaps be let into the

secret counsels of Heaven, and have the designs and methods of Providence in the creation and government of the world communicated to them, but this does not belong to our rank and condition."

Of one thing I feel the deepest conviction, that nothing man has yet discovered, no length to which science has been pursued, has at all educed any principle diametrically opposed to the truths of religion; any principle like law destroying the idea of creation and design which should lead us to regard Moses in no higher light than a Hebrew Descartes or a Newton.

It is alleged, however, that modern science has produced a great number of facts utterly irreconcilable with revelation. These so-called facts are derived, for the most part, from the sciences of geology, ethnology, anthropology, and philology. Now, I need not detain you by any lengthened argument in opposition to these statements. The able pamphlet entitled "*Scientia Scientiarum*," giving an account of the origin and objects of the Victoria Institute, has so fully entered into this branch of the subject, and is so well known to you, that I need not waste your time by repeating the long array of supposed contradictions between the facts of science and the records of revealed truth which have fallen before a dispassionate review of the progress of science. Revelation has oftentimes suffered much by the over-zeal—laudable though it be in itself—of its defenders accepting crude scientific theories as demonstrated facts. I have watched the progress of modern science with much satisfaction, as I have seen one supposed contradiction of science to revelation after another fall away. The infant sciences in their imperfect stage have presented difficulties to revelation which their advanced progress has of itself removed. The pursuit of this inquiry; the investigation of facts alleged to be in opposition to revelation; the examination of the contradictory and conflicting hypotheses of all the principal "ologies" of the day, is the work to which this Institute proposes to devote itself. I feel no doubt as to the result. I believe the more intimately we study the book of nature, hard as it is to read aright, difficult as its hieroglyphics are to decipher, yet, if we do so in a humble spirit, I doubt not its records will confirm the records of the Bible; in that faith I will venture to conclude my address, in the words of Bishop Butler:—

"Let us adore that infinite wisdom, and power, and goodness, which is above our comprehension. 'To whom hath the root of wisdom been revealed? or who hath known her wise counsels? There is one wise and greatly to be feared; the Lord sitting upon His throne. He created her, and saw her,

and numbered her, and poured her out upon all his works.' If it be thought a considerable thing to be acquainted with a few, a very few, of the effects of infinite power and wisdom, the situation, bigness, and revolution of some of the heavenly bodies, what sentiments should our minds be filled with concerning Him who appointed to each its place, and measure, and sphere of motion, all which are kept with the most uniform constancy? Who 'stretched out the heavens, and telleth the number of the stars, and calleth them all by their names? Who laid the foundations of the earth, who comprehendeth the dust of it in a measure, and weigheth the mountains in scales and the hills in a balance?' And when we have recounted all the appearances which come within our view, we must add, 'Lo, these are parts of His ways; but how little a portion is heard of Him? Canst thou by searching find out God? Canst thou find out the Almighty unto perfection? It is high as Heaven; what canst thou do? Deeper than Hell; what canst thou know?' The conclusion is, that in all lowliness of mind we set lightly by ourselves; that we form our temper to an implicit submission to the Divine Majesty; beget within ourselves an absolute resignation to all the methods of His providence, in His dealings with the children of men; that in the deepest humility of our souls, we prostrate ourselves before Him, and join in that celestial song,—

'Great and marvellous are Thy works,
 Lord God Almighty! Just and true
 Are Thy ways, thou King of saints!
 Who shall not fear thee, O Lord, and
 Glorify thy name.'

Major-General CRAWFORD said, that in rising to move a vote of thanks to the Rev. Mr. Mitchell for his very able and admirable paper, he was fully aware that he was speaking in the presence of a number of gentlemen of high literary attainments and deep scientific knowledge. It was because he could lay claim to no such acquirements that he undertook the duty of moving a vote of thanks to the rev. gentleman who had just sat down. He felt that any person who possessed the power of grappling with such subjects of thought and magnitude, and clearly arranging the interesting facts which were recorded in the paper then read, so as to reduce them to his (General Crawford's) intelligent appreciation, was entitled to his gratitude. He had ever felt convinced that a thorough grasp and mastery of a subject was necessary to simplification. When, then, he looked upon the millions in this country who were upon the same platform as himself as to mental power, and at the thousands who were now busy distilling the poison of doubt and

scepticism amongst them, he could not help rising to express how grateful he felt to the Rev. Mr. Mitchell for the simple and transparent, as well as deep reasoning, which had characterized his opening address. (Applause.) He had thus given a *prestige* to the Society, and developed powers which were essential to dealing with the thinking middle classes. When he thought of the numbers, lay and clerical, who were using the influence which some acquaintance with the theories of science gave them, to create a disbelief in the truths of Christianity, he rejoiced to find that a society had been established whose special object was carefully to examine how far the supposed truths of science had been ascertained. He was convinced that the more light was poured upon the pages, both of nature and of revelation, the more they would be found to be harmoniously at one. (Hear, hear.) It was lamentable to see men vieing with one another who should be first to use the very intellects God had given them, to revive old infidel grounds of objection and undermine the credibility of His Holy Word! A wide sphere of usefulness was before the Society; and he was satisfied that their labours in the cause which they advocated would be productive of the most beneficial results. He hoped they would steadily apply themselves to the work which they had undertaken; but, for the success of their efforts, look to the blessing of Him, in whom, the more his works were studied, the more clearly it became manifest they were "by Him and for Him," in whom we also ourselves "lived, moved, and had our being." He begged to move that the thanks of the meeting be given to the Rev. Mr. Mitchell for his very eloquent and instructive address. (Cheers.)

The Rev. ROBINSON THORNTON, D.D., Head Master of Epsom College, seconded the motion, and said the satisfaction which he felt in doing so was considerably enhanced by the fact of his knowing that the gentleman who read the address was a member of his own profession. He thought the lively gratitude, as well as the formal thanks, of the members of the Society was due to the rev. gentleman. (Hear, hear.) A work which is well begun is half done. (Hear, hear.) And seeing that the work which was undertaken by the Society was so successfully inaugurated, he thought they might consider it was half done already. (Hear, hear.) The great books of nature and revelation had, as it were, been spread out before mankind, and some persons had been scribbling on them. Leaving theological critics to clear away the stains which had been made on the Book of Revelation, it would be the duty of their Society to wipe off the marks from the Book of Nature. He trusted they would be enabled to accomplish the task they had undertaken, and to prove to the world that nothing which was found in that Book was inconsistent with the truth revealed in the other. (Hear, hear.) He had much pleasure in seconding the vote of thanks to the rev. gentleman for the able address which he had delivered, and the courteous but ruthless logic with which he had demolished the arguments of those who were opposed to his views. (Hear, hear.)

The motion was put from the chair, and was carried with applause.

The Rev. Mr. MITCHELL having briefly acknowledged the compliment,

Captain FISHBOURNE rose, and said he had much pleasure in moving that the thanks of the meeting be given to the Earl of Shaftesbury, not only for his kindness in presiding on that occasion, but for the encouragement and support which he had given to the Society from its beginning. A great reluctance was manifested by some persons to take the initiative in matters of that kind, for he who first stepped out became a marked man, and assumed a very great responsibility. Whatever that risk was, the noble Earl incurred it, and thus far put in peril some of his well-earned fame. He thought, therefore, that their best thanks were due to the noble chairman for coming forward as he had done in support of the Society. (Hear, hear.)

The Rev. A. DE LA MARE, in seconding the proposition, said he fully endorsed the observations made by Captain Fishbourne with regard to the debt of gratitude which they owed to the noble Earl for the readiness and earnestness with which he had come forward to assist in the formation of the Society. (Hear, hear.) The extent of that debt could only be rightly estimated by those who had all along co-operated in, and anxiously watched over its rise; and, as one of those, he bore willing testimony to the value of his Lordship's early and continuous services. All knew that the noble Earl's name was connected with very many great and good works; but, amongst them all, he believed that in no greater or better work than that proposed to be effected by the Victoria Institute had his Lordship been engaged, or one which would hereafter more ennoble his name. In his own estimation, this was one of the noblest and holiest works undertaken in this country for a long time. (Hear, hear.) The Society would doubtless have to encounter much opposition and to contend with difficulties of no ordinary character. It was, however, very satisfactory to know that it numbered already amongst its members men fully competent to take part in the work in which the Society was engaged, of which they had had ample proof in the admirable paper to which they had just listened. (Hear, hear.) He would have wished to have offered one or two remarks on the absolute necessity for the formation of the Society they had now inaugurated under such promising circumstances, and the position which they might justifiably expect it hereafter to hold; but the time had arrived when the programme for the day required that they should adjourn to another place, and he would therefore content himself with merely seconding, and he did so with all his heart, the vote of thanks to the noble lord who presided. (Hear, hear.)

The motion was carried by acclamation.

The Earl of SHAFTESBURY, in reply, said that no thanks were due to him for the little services which he had rendered. He had been more than compensated for his attendance at the meeting by the eloquent address which had been delivered. He had been instructed and delighted, and his heart had been cheered, by what he had heard. He had felt very deeply the progress of opinions, against which the arguments of the rev. gentleman were directed, and he had seen how fatally blasting had been their effects upon the mind of the better educated class of society as well as upon the great mass

of the people. And, as the great mass of the people must eventually rule this country, it was for those who desired the happiness and prosperity of these realms, to endeavour to resist the growth of opinions, which, if allowed to be general, would be attended with the most ruinous consequences to society. It had given him great joy of heart to hear the eloquent, noble, and excellent Inaugural Address read by the Rev. Mr. Mitchell, because, as had been observed by a previous speaker, a work well begun was half done. (Hear.) It was a very good beginning, and promised well for the future of the Society. (Hear.) He spoke of the address, not only with regard to the agglomeration of facts which it contained, and the powerful reasoning by which its arguments were enforced, but for its daring boldness. (Hear, hear.) It contained no nonsense nor diplomatic language of any kind, but it went straight forward to the points in dispute, and combated them one after another with a force of logic which was really invincible. (Hear, hear.) It should not be supposed that this Society wished to curb the efforts of science. (Hear, hear.) On the contrary, they desire to give it every encouragement. He wished it to be clearly understood that, the more science was examined, and the deeper men plunged into its depths, and the more facts they elicited on the subject, the more their Society would be gratified. (Hear, hear.) They were quite confident that the Word of God was quite consistent with the truths of science,—that, in fact, the one would be strengthened by a knowledge of the other. He was delighted that the Society had been formed, and he would be very happy to give all the assistance in his power to enable them to carry out the good work which they had undertaken. (Hear, hear.)

This concluded the business of the meeting.

INAUGURAL DINNER.

The Members and Associates, with their friends (numbering sixty-four, besides Ladies), afterwards dined together at Willis's Rooms, to celebrate the inauguration of the Society; the Earl of Shaftesbury, K.G., President, in the Chair, and ROBERT NICHOLAS FOWLER, Esq., Vice-Chairman.

Grace was said by the Rev. Dr. THORNTON; and after dinner a thanksgiving was chanted.

The CHAIRMAN then rose and proposed the toast of "The Queen," and in doing so expressed a hope that her Majesty would some day become the patron of the Society. (Cheers.)

The toast was loyally drunk.

Air.—"God Save the Queen," rendered by a choir of vocalists, with piano-forte accompaniment by Mr Maxwell Müller.

The CHAIRMAN next gave "The Health of the Prince and Princess of Wales, and the rest of the Royal Family." He was sure they were all exceedingly gratified at seeing that his Royal Highness was following in the footsteps of his lamented father, and the encouragement which he extended to literature, science, and art. (Cheers.)

The toast was duly honoured.

Air.—“Hail, Prince of Wales.”

The CHAIRMAN again rose, and proposed the toast of “The Army and Navy and the Volunteers,” with which he coupled the names of General Lawrence and Admiral Halsted.

The toast was drunk with the usual honours.

General LAWRENCE briefly responded on behalf of the Army.

Admiral HALSTED acknowledged the toast on behalf of the Navy, and said he was glad to see a member of the profession to which he belonged (Captain Fishbourne) taking an active part in promoting so useful a society as the Victoria Institute. The officers of the navy would always be found ready to do their duty to their country. (Cheers.)

Mr. WILLIAM McARTHUR proposed the next toast, which he said was one that he was sure would receive at the hands of the company the most hearty and cordial sympathy. It was “The progress of Christianity at home and abroad.” (Hear, hear.) He felt that this was a very inviting theme upon which to speak, but as the toast would be responded to by three distinguished clergymen whose names were well known to the assembly, he thought he would be overstepping his duty if he were to occupy the meeting with any lengthened observations. He might, however, say that the progress of Christianity, whether at home or abroad, was associated with their dearest interests. (Hear, hear.) If England owed to anything her greatness, and her power, and her influence amongst the nations of the world, it was to the progress of Christianity. (Hear, hear.) It was the source of her happiness, and the fountain from which flowed all the prosperity enjoyed by her people. (Hear, hear.) He believed that at the present time there existed in this country more activity, more devotedness, more earnestness, and more zeal in promoting the great cause of Christianity, than at any other period of her history; and while they had to deplore the necessity which existed for their labours, they had to rejoice at the various agencies which were at work in this country for the promotion of the best interests of society at large, by the diffusion of the blessings of our common Christianity. (Hear, hear.) They had also to rejoice at the triumphs of the Gospel in every part of the world, and the great success with which God has been pleased to crown the efforts of the missionaries sent forth from this country. (Hear, hear.) One great fact had been brought out in bold relief by the labours of those who went to preach Christianity, and that was that God had made of one blood all nations of men who dwell on the face of the earth. In every part of the world, whether they went to the polished European or the uncultivated African; whether they went to Asia or America, to the Fejee or the Friendly Islands, it did not matter where, they found Christianity produced the same effect on all. (Hear, hear.) How beneficial, then, was the result of the efforts made to extend it to all parts of the globe! He did not doubt that a cause so noble would always meet with support in this country. (Hear, hear.) He had much pleasure in proposing the toast, with which he would associate the names of the Rev. Dr. Irons, the Rev. Mr. Boyce, and the Rev. Mr. Trestrail.

The toast met with a hearty reception.

The Rev. Dr. IRONS responded:—He said it was usual at meetings of this public kind to propose a toast in connection with the Established Church, and call on some clergyman present to respond to it. There had been on this occasion an intentional departure from that order; and he thought it a wise departure; for they were not met together in the sectional interest of any one portion of the great Christian community. (Hear, hear.) If he had had to return thanks only as a minister of the Church of England, it would have been his duty to imitate the example of preceding speakers, and limit himself to the briefest acknowledgment of their kindness. He should not, however, be fulfilling the purpose for which he had been asked to rise, if he took such a course. The object which they had in view was sacred to all Christians—they desired the “progress of our religion at home and abroad,” and he would be unworthy of the honour they conferred on him, if he treated it lightly. If, indeed, he occupied more of their time than those who had addressed them, he must ask them to attribute it to the nature of the task they had imposed on him. The progress of Christianity was identified with the progress of the well-being of human nature; and although the term “progress” was frequently used in a sense which he should repudiate, he was glad they had adopted the phrase on this occasion, because it had a true meaning of its own, which he would wish, if permitted, to urge on their notice. There were those who ventured to imply that Christianity was even an obstacle to progress. He would not shrink from meeting their charge against our religion. They apparently wished Christianity to undergo some organic change, and regarded all adherence to existing forms as obstructive. In their sense of the word no doubt, then, our Christianity was opposed to progress. We have no idea of our religion so progressing as to be changed into something new; but we believe that its advancement in influence will be a blessing to the world, and wish that its truths may be more fully received, and its precepts more widely practised. And there is a still further sense in which we assert that our religion is essential to all true progress, both intellectual and moral. The modifications of thought which are going on in all subjects may explain my meaning. This is called an age of progress. Thus in politics, we are so changing that it is difficult now to recognize the parties familiar to our fathers fifty years ago. A man calls himself a Conservative—but you really cannot now tell what it is he wishes to conserve. (Hear, hear, and laughter.) Or he calls himself a Radical, and you just perceive that he wishes to root up something, but what, it is impossible to tell. (Laughter.) He calls himself a Liberal, and you are wholly at a loss to understand him—for I suppose we are all in a sense “liberals.” The truth is, that the natural progress of events is unsettling all things. And something analogous to this is going on in religion. Christianity of the kind which prevailed in many quarters half a century since, scarcely is to be found in our days. Then there has been brought to bear on the public mind, both at home and abroad, a disintegrating criticism which tends to destroy the very foundations of our faith. We watch this course of events with anxiety—not for the sake of

the Revelation itself, but for the sake of the untaught multitudes who are injured by the processes of change which they are not competent to deal with. The generality of persons are not educated up to the point where they can satisfactorily grapple with error ; and till they are educated, they will be at the mercy of charlatans in religion, and criticism, and science. As Christians, then, it is our business to promote education, and so promote religious progress in the truest and highest sense. (Hear, hear.) Great changes, too, are constantly going on in science, and the public at large are unable to test those changes, and will be so, until education is far more widely extended. In the mean time it is most necessary that there should be some means of watching the progress of knowledge, and protecting the many from the hasty theories of the few—theories changing every month. The Philosophical Institute to which they belonged would aim constantly at this, in the interest of truth. The Christian knows that his religion has been the fountain of civilization in time past, and doubts not the future. While their principles are indeed immutable,—for “Jesus Christ is the same yesterday, to-day, and for ever,”—their religion has formed the life of nations and generations most wonderfully and variously for 1800 years. The very founding of Christianity was the dawning of a new light on civilization. There never was a period in the world’s progress in which there was so widely spread a scepticism in faith and morals as in the days of Augustus Cæsar. If nothing had been divinely done to arrest the moral decay of the Empire, the ruin must have been total for human nature. If by a stretch of imagination we could conceive what the world would have become, say by the time of Constantine, if Christianity had *not* been at work, we might have some idea of what our religion has done for human progress. It would be surely a frightful contemplation:—a world possessing all the arts of civilization, without *principle*:—it would be a scene well-nigh diabolical ! If some of our men of genius would give us a book delineating “the *possible* fourth century of our era *without* Christianity,” they would be better employed than in writing fancy “lives of Christ.” (Hear.) It was a very wide subject, he would remind them, which he thus glanced at, when he asked them to mark the connection of our religion with all civilization, for some 1,800 years since it began. He could not enlarge on it. He would only recall to them, that in the monastic system of the middle ages—in the practice of the Councils or representative assemblies of the Church—in the preservation of all past literature, Greek and Roman—in the forming of all the educational institutes of the world, Christianity had led, or preserved, the civilization and progress of modern Europe. Then, what were the great missionary efforts of the Church ? Did they not lead the way to the truest progress of the nations—even though we may not attribute to the saintly missionaries all the miracles their historians tell of ? Now, was it not amazing to hear it said, in opposition to all history and fact, that the clergy were natural enemies of progress ? He had spoken of government and law, and literature, but he would say more : he would claim a place for Christianity in the promotion both of science and art also. The great art and science (he would call it) of our own nation—the cotton manufacture of

England—had received its first great impulse from a clergyman, Thomas Cartwright, the inventor of the spinning-jenny. So also of the first applications of steam. Copernicus, too, the glory of our modern astronomy, was a country clergyman; Berkeley, the great teacher of the foundations of our modern optics, was a bishop. But he must not occupy them at greater length, or he might mention that Sir Charles Eastlake attributed to the clergy the best implements of *his* art. He would, then, in conclusion, assert for Christianity its entire fearlessness of the fullest use of reason, and the honest investigations of science. He was glad to hear that same fearlessness avowed by their noble President, at their late meeting in another place. Let the clergy occupy, as hitherto, and with increasing zeal, the field of literature, and they would be able to defend the truth more effectually than by any of the methods of coercion or repression. Even the discipline of the Church had utterly passed away, and could not be relied on for the strife with false teaching or false science. The weapons ready for our use in the world still, are those of Literature: weapons of reason, and faith, and research. Let them be—as they assuredly will be—earnestly used, and he had no fear as to the “progress of Christianity at home and abroad.”—He begged to thank them for the honour they had done him in associating his name with this toast, and the attention and kindness with which they had received what he had said. (Cheers.)

The Rev. Mr. BOYCE also responded to the toast. He said that, as the secretary of one of the largest missionary societies established in this country—the Wesleyan—he could not allow the toast to pass without a few brief observations on the subject to which it referred. About twenty years ago, a Scotch divine characterized the period in which we lived as an age of “little men and little measures.” He was of opinion that the sarcasm was hardly deserved, and that Dr. Chalmers forgot at the time the work which had been doing in extending Christianity. (Hear, hear.) He would call attention for a few moments to what had been done by the Universities’ mission in Central Africa. He was himself a returned missionary from that country, where he had spent fourteen years, and—though a sectarian in a certain sense, but not in his own sense of the term (hear, hear)—he had taken the greatest interest in the Universities’ mission. Though those who were connected with it might differ with him on some ritualistic questions, he felt that they were entitled to his warmest sympathy and respect. (Hear.) He had known Bishop Mackenzie, who was at the head of the mission, to walk some thirty or forty miles a day under the scorching sun of Africa, to preach the Gospel to the poor Africans; and he felt that he was a saint. (Hear, hear.) Let them, therefore, put him down in their calendar as “St. Mackenzie,” and he would be very glad to commemorate the festival. (Hear, hear, and laughter.) He believed the labours of the mission had been attended with the best results; and the example which had been set had a very good effect on other missions in the country, and the best results were produced. (Hear, hear.) There were several missions which had been blessed with very great success, as the Baptist Mission in India, though the dangers to which the missionaries were exposed

were very great. He might also mention the Wesleyan Mission in the Fejee Islands, which was very successful. He thought the instances of self-devotion to which he alluded were sufficient in themselves to vindicate the character of the age from the charge of "littleness" in its men or in their measures. (Hear, hear.) One of the greatest benefits conferred by Christianity was the influence which it exercised on the conduct of the worst savages. It raised them from the most barbarous state to the dignity of manhood, and rendered them susceptible of all the influences of civilization. (Hear, hear.) He had formed the acquaintance of a Kaffir while in Africa, with whom he still kept up a correspondence, and he was one of the noblest specimens of a Christian man which he had ever met with in his life. (Hear, hear.) He concluded by thanking the company for the manner in which they had received the toast.

(The Rev. Mr. TRESTRAIL, whose name was also associated with the toast, was unexpectedly absent.)

The CHAIRMAN then rose and said, the next toast which he had to give was the toast of the evening—"Prosperity to the Victoria Institute." He thought that, with God's blessing, there could be very little doubt of its prosperity, if they were enabled to have a series of papers such as that which they had heard that evening. (Hear.) They would then be provided with such an armoury, in which every weapon both for attack and defence would be found, as would leave them and the great truths of Christianity unharmed in any day of trouble, rebuke, or blasphemy. (Hear, hear.) He gave them the toast, which he thought it unnecessary to recommend to their favourable notice, and, associated with it, he would give them the health of Mr. Alexander M'Arthur and Captain Fishbourne. (Cheers.)

The toast was enthusiastically drunk.

Mr. ALEXANDER M'ARTHUR, in responding, said it was growing late, and as the meeting would be addressed by a number of other gentlemen who could occupy their time more profitably than he could do, he would not detain them with any long remarks. Amongst those who were to speak after him were Mr. Reddie and Captain Fishbourne, who were the originators of the Society. (Hear, hear.) He would not, therefore, trespass on the province of those gentlemen, who could point out the objects of the Society, and explain its usefulness, with much more ability than he was able to bring to bear on the subject. He begged to thank the noble lord who presided for the manner in which he had proposed the toast, and the company for the manner in which it had been received. Speaking for himself personally—and he believed he was also expressing the opinion of every member of the Council—he might state that their inability to commence the regular business of the Society at an earlier period than they had done, had been a source of much regret and disappointment. A variety of circumstances combined to cause the delay. He need not enter into any explanation upon that occasion, further than to say, that many of the circumstances were entirely beyond their controul. He was glad that the operations of the Society had been commenced, and he thought he might congratulate the members and friends of the Institute upon having so good a beginning. He thought he might also

congratulate them upon the statement in the Report with respect to the large number of members who had already joined, and which was almost unprecedented in a new society. He believed, now that the Institute was established, the number of members would go on increasing. (Hear, hear.) No society could have had a more satisfactory "Inaugural Address." He thought the commencement which they had made was excellent—that failure was now next to impossible. A wide field was open to them, and the necessity which existed for some such society as theirs had long been felt. It filled up a gap which had been open between scientific societies, which ignored religion altogether, and theological societies, which did not profess to discuss scientific subjects. He was aware that a number of literary and scientific societies existed in London, all doing good service in their own spheres; but it sometimes happened that questions bearing upon the truths of revelation were under discussion, and many unnecessary accusations were made against it by some who were regarded as scientific men. But gentlemen who attempted to defend revelation were placed at a great disadvantage, because they were obliged to conform to the rules of such societies, and to confine their remarks on the subject under debate to the scientific view of the question. He was not going to say that was wrong—perhaps it was right—but many gentlemen had experienced the difficulty to which he referred. Not long since, during a discussion which took place at the Anthropological Society, an instance of this kind occurred. A paper was read in which most unfounded statements were made with reference to Christian missions and the truths of revelation; but when a gentleman stood up to defend the cause of Christianity, he was told he must confine his observations to such questions as came within the scope of an anthropological debate. It was to meet difficulties of this kind that the Victoria Institute was established. Its chief feature was that it did not confine its discussions to any particular branch of science (hear, hear); and when any fact was brought forward likely to affect the truth of revelation, the members would be at liberty to discuss it in all its bearings. (Hear, hear.) He trusted that no one regarded the Society as being established in opposition to any other scientific institution of the day. (Hear.) They had just drunk prosperity to the Society; but unquestionably a great deal of its prosperity depended upon the support which it received from the gentlemen present, and he trusted that they would all exert themselves to promote its success. (Hear, hear.) It had been admirably begun, and he hoped it would be enabled to carry out its work. One of the objects of the Society was to translate foreign books of a kind which might be beneficially read by Christian readers. This would involve considerable expense, but he did not doubt that the support which would be given to the Society would enable it to effect that object. He trusted they would all endeavour to get as many members as they could, and that at the next annual meeting of the Society it would number a thousand members. (Cheers.)

Captain FISHBOURNE said, he did not know why he should have been selected to respond to the toast of success to the Victoria Institute, as its formation was no more due to him than to other members present. They

were all entitled to credit, more especially so the noble lord in the chair, for coming to the front while so many were hanging back. He must take the liberty of congratulating all upon the success which had attended their inaugural meeting, and to compliment their distinguished Vice-President upon his able paper. As a sailor, he was thankful for the formation of such an institution; not, indeed, that he had met many infidels at sea. They that go down to the sea in ships, they see the wonders of the Lord in the great deep. They have too many hair-breadth escapes not to know that every hair of their head is numbered. Though he had met many infidels on land, he was thankful to say, he had met very few in his travels by sea: a sailor's life did not seem to suit such people—they collapsed in the face of danger, showing themselves to be mere drums. Sailors were a religious people in their way; their superstition, the result of their ignorance, is an acknowledgment of their belief in a God,—indeed, he believed every man's conscience testified to the existence of the Deity; and he could only conceive of those who attacked the truths of revelation, as men who wanted to get rid of the findings of the conscience, by endeavouring to persuade themselves that neither it nor Scripture was correct. It was most natural that such men should ask Christians to give up their Christianity before they entered upon the discussion of science, otherwise they could not reasonably deny miracles; since every Christian was a miracle, and Christianity itself was a standing miracle. It was simply absurd to assert that the teachings of revelation were inconsistent with those of science. For besides the names of Christian men mentioned by our learned Vice-President, who had taken the first rank in the walks of science, I may add Captain Maury; and, as science knows no country, we may claim him as a compatriot, and he, with the modesty of genius, at once acknowledges that the idea of his complete theory of the wind's "circuits" was derived from Holy Writ. Apart from some such intimation, it is not easy to conceive the possibility of his obtaining the necessary amount of facts out of which to have originated the idea, seeing that the facts must more or less have covered the earth from pole to pole and girded the globe. As for the endless ages contended for by geologists, and based upon the slow formation of deltas in rivers, they are the merest theories. If such men had seen the rapid changes that take place in a short time that he had seen, they would not be disposed to place much confidence in such myths. He had seen trees being carried down the rivers, caught, and forming an impediment to the rapidity of the stream, upon which a deposit immediately took place, and islands were formed in a few hours. A change in the direction of the current, or sometimes an increase of its volume, has eaten away these islands, and the deposit takes place at the next obstruction, by which an island is formed with the stratification of the former island inverted. Place one of these geologists to examine one of them, without informing him of their recent origin, and he would, consistently with the basis of these endless ages, pronounce that they had existed for hundreds or thousands of years, as may be. He recollected on one occasion getting aground up a river in a ship he commanded, when the ship was imbedded in a mud dock in a few hours, out

of which she literally had to be dug. Had they had only flint implements, himself and crew might have been exhumed by some future Lyell as pre-Adamite men, though born in the nineteenth century of grace! In the same way he had seen extensive lines of sea-beach altered by changes in the direction of winds and currents; showing how unreliable are the estimates of time founded on sea-beaches. All such conclusions must be fallacious, as they are based upon the assumption that all the conditions under which deposits have been formed are the same now that they were thousands of years since, which, as a matter of fact, is not so, nor could be so. (Hear, hear.)

Mr. R. N. FOWLER then rose, and said he had the honour to propose a toast which needed no words of his to insure it an enthusiastic reception by the company. It was the health of the noble lord who presided. (Cheers.) In every assembly of Englishmen, in every part of the world where patriotism, philanthropy, or Christianity was honoured, the name of the Earl of Shaftesbury would be received with enthusiasm. (Hear, hear.) They all knew the way in which the noble earl had devoted himself to the good of mankind. (Cheers.) Foregoing the highest honours in the gift of the Crown, he had applied himself with an earnest and heroic self-devotion to the promotion of the welfare of the community amongst which he lived, and his labours were chiefly directed to the benefit of the poorest classes of his countrymen. (Hear, hear.) He was identified with every great work of charity or philanthropy in this country, and the best energies of his life were devoted to the cause of ragged schools. (Hear, hear.) The toast of his health would therefore be received with enthusiasm, under whatever circumstances it was proposed to an assembly of Englishmen; but they were met there that evening under peculiar obligations to his lordship. They were assembled to inaugurate one of the most important movements that could be undertaken by any society—a movement to resist the encroachments of scepticism and infidelity on the faith of Christians. (Hear, hear.) The noble earl had kindly given his assistance in the formation of a Society which had for its object a work of so much importance. He had placed himself in the van of the movement, and he was, therefore, entitled to their gratitude. (Hear, hear.) Younger men might have deemed it an honour to take up such a cause and lead it on to success. The noble earl did not look forward to any reward such as that. He had already left the impress of his name on the history of the age (hear, hear); and though the cause which the Society advocated was one in every way worthy of the support of men of rank and intellect, it was from no such motive that the noble lord had come forward to assist it. It was because he felt the permanent importance of the work which the Society was established to promote. (Hear, hear.) Under these circumstances, he felt that when he asked them to drink the health of their noble chairman, they would do so with the heartiest wishes for his happiness and prosperity. (Cheers.)

The toast was drunk amid the most enthusiastic plaudits.

The Noble EARL, in rising to respond, was greeted with renewed cheering. He said he was very much obliged for the kind manner in which they had received the toast. Upon any other occasion it would amount to presump-

tion on his part, to address any observations to a large company of scientific men, such as he saw around him. Had it not been for the peculiar circumstances under which they met that evening, he would have contented himself with acknowledging the toast. He remembered hearing a story at one time of a lady who married her groom, and the poor fellow was so confused that he did not know how to conduct himself. He went to a friend to ask what he should do, and the advice which he received was given in these words—"My dear fellow, dress in black and hold your tongue." (Laughter.) That was precisely the course which he had intended to take that evening. (Laughter.) He had dressed in black, and he should have held his tongue, but that he felt it necessary to say a word or two with regard to their objects, and the light in which he looked upon the foundation of the Institute. The purposes for which it was established were of signal value to all who, like himself, were engaged in numerous important avocations, and had no time to apply themselves to scientific pursuits. (Hear, hear.) The Institute would be of the utmost importance to those who had no means of access to the answers given to the deleterious nonsense published under the name of Science, and who were unable to test for themselves the value of the arguments put forward. It was the object of the founders of the Institute that it should fill up a gap for men of science, and men of principle, and men of intelligence, and men of research, who would watch the various publications as they came out,—some conceived in malignity, some in ignorance, and some in mistaken notions that they were adding to the general science of mankind—and point out where mistakes arose, and put facts in their true light, or at any rate induce people to pause before they pronounced an opinion upon the discovery of anything which seemed to be opposed to the truths of revelation. He recollected, when he was a young man, that points of this kind occasionally arose. A heretical opinion was now and then advanced; but nothing came of it, and it was forgotten. But a very different state of things now existed. The mental activity of the age was now so great, that it gave them no rest; so many new discoveries were now made, that it left them no time to breathe or to look around them; so great was the impatience for novelty which prevailed, that when men fancied they discovered something, nothing satisfied them until they converted it into an Armstrong or a Whitworth gun, and aimed it at revealed truth. It would be the duty of the Institute to ascertain what were facts, or whether there were any facts at all, and to tell the public what ought to be at once rejected, and what ought to be put in quarantine for a time, until it was thoroughly sifted. Above all, the Society must endeavour to watch the dishonest use of statements appearing in scientific works, calculated to raise doubts as to the truth of the Bible; and let the world know when theories, that had been brought to bear with tremendous force upon the teachings of revealed religion, were exploded by more minute inquiry. They had seen great mischief result from the dropping of a word which implied doubt, when no refutation was given by those who heard it; but what were they to think of the evil produced by a work such as *Essays and Reviews*, which had been read by hundreds who still

believe in the statements which it contained, and never heard of their refutation? It would be the business of this Society to lay bare the fallacies of publications of that character, in the manner that had been so ably done in that admirable pamphlet, the *Scientia Scientiarum*. As the author of it said, they must criticise science as they had criticised the Bible. (Hear, hear.) Science was in a perpetual state of development. That which was a "fact" to-day was not a fact to-morrow, and it was as much open to criticism as anything else. What they wanted was a free trade in science. - (Hear.) They wanted those who were engaged in science to carry their inquiries to the utmost extent, and to acquaint the public with the results. Let their Society be a refuge for all the Cassandras of false science,—for those who were never believed, although they always spoke the truth,—an institute for those who come forward to defend the cause of truth from the attacks made upon it. It would thus be the means of enabling many who were now in comparatively obscure positions to resist scientific dictators, and to take a place amongst the greatest and best in the land. (Hear, hear.) He could not help thinking, however, that revealed religion had suffered quite as much from its defenders as from its foes. It oftentimes happened, when they heard of a bone, or a flint, or the tail of a jackdaw (laughter) being picked up on the sea-shore, that many Christian men became so nervously sensitive upon the subject that they tried to distort revelation in order to adapt it to the supposed discovery. But in a short time it turned out that the bone was not a bone, that the flint was not a flint, and the matter was forgotten. But the consciousness remained that revelation could be twisted and turned about to suit every current of scientific opinion, and that science was the great thing to which revelation should be subordinate. But he hoped that nothing would be done to induce the members of this Institute to depart from their belief in the plain, simple, and dignified truths of Holy Writ. He would say, let science have its own way—it was "a chartered libertine"; but to scientific men he would address this one word of exhortation:—Let them say what they liked upon what they supposed to be the difference between the teachings of science and revelation; let them weigh what was weighable, see what was seeable, and try what was triable, but let them not try to put down those who were opposed to them by main force. Let there be an open field, and free use of fair weapons, and he had no doubt as to victory. (Hear, hear.) It was true of Science as it was true of the Gospel, that the more it was discussed the more it would redound to the honour and glory of God. (Hear, hear.)

The Noble Chairman then resigned the Chair to Mr. Fowler—the Vice-Chair being filled by Captain Fishbourne.

Dr. HABERSHON then proposed "The health of the Vice-Patron, Vice-Presidents, and Council of the Society." He said that many had supposed that the Society was opposed to the cultivation of science; but that was a mistake. On the contrary, it desired the advancement of science, and it would be the object of the Society to promote true science in every possible way. But it was opposed to what was merely superficial. Nothing was more patent at the present day, than the way in which pseudo-science was brought

to bear upon the truths of revelation. It endeavoured to destroy the foundation of all Christian belief. But Christianity was founded upon a basis that would endure as long as time and eternity last ; and however it may suffer from attacks made upon it in the name of science, they were well assured that truth must prevail. (Hear, hear.) He fully concurred in the observations of previous speakers, that the more science was investigated the more it would be found to harmonize with the great doctrines of Christianity ; and it would be the mission of their Society to show that no difference existed between them, but that science and revelation were not opposed. He begged to give them the toast, and with it to associate the names of the Rev. Mr. Mitchell, Dr. Burnett, and Mr. Reddie. (Hear, hear.)

The toast was most cordially received.

The Rev. Mr. MITCHELL, in responding, said that having already occupied more of the time of the members than he was entitled to, he would not trouble them again with any observations with respect to the objects of the Society. It would be found that those who were most skilled in science had, in nearly all cases, the most profound sense of the truth of revelation. (Hear, hear.) Amongst others he would mention the name of the late Dr. Whewell, who was one of the most distinguished professors of science in the present age. He begged to thank the company for the manner in which they had received the toast.

Dr. BURNETT also responded to the toast. He said the object of this Society met with his warmest approval, and he regretted that he had not been able from illness to give it that amount of active support to which he felt it was entitled. (Hear, hear.)

Mr. REDDIE, in briefly responding, said the duty devolved upon him of proposing the next toast. The lateness of the hour obliged him to forego the pleasure, if, indeed, it could be called a pleasure, of making a speech. The toast which he had to propose was, however, one which required no advocacy on his part to secure it a cordial reception. It was "The Learned Societies of the kingdom, and the advancement of science, art, and pure literature." He desired to say that this Society was not only not adverse to any of the scientific Societies already established ; but was, in fact, rather dependent upon them. And having obtained from other Societies a number of facts or theories, it would be the duty of the members of the Institute inaugurated that evening to philosophize upon them. (Hear, hear.) No Society of this kind was previously in existence in the metropolis ; and it was one express feature of this Society to discuss those theories which were propounded by men who, in the name of science, questioned the great truths of the Bible. (Hear, hear.) Allusion had been made by Mr. M^rArthur to the difficulty experienced by those who attempted to defend revelation at the meetings of the Anthropological Society ; but it is only fair to say, that the members of that Society may not be to blame on that account. The subject is, in fact, beyond their range, although Anthropology is one of the most comprehensive of studies. Well, it would be a great thing that, in one Society at all events, those questions could be discussed, and full opportunity allowed

to answer the arguments advanced against Scriptural truth. He would allude, for instance, to the nebulous theory advanced in the *Essays and Reviews* against the Mosaic Cosmogony. It was stated by those who upheld that theory, that this universe was originally one great mass of fire. Now, fire, as was very well known, was the great destroyer of life : and, in the face of that fact, it was argued that everything in this world was brought out of that mass of fire, without the aid of a Creator, whose existence was altogether ignored by some of those gentlemen ! He did not think a more stupid notion could be entertained. It was much the same in other matters. They were told by Dr. Colenso last May, in the Anthropological Society, that a universal deluge was an impossibility, while another set of philosophers came forward with a theory that universal floods were a necessity ! (Hear.) Here were most extraordinary liberties taken with two of the four elements of the ancients. Fire, the destroyer of all life, was made out to be the source from which life originally started (laughter) ; and floods, which a learned bishop assured them were an impossibility, were, according to other *savants*, a necessity. (Hear, hear.) Again : there was a uniformitarian theory entertained which was equally absurd, being contrary to such phenomena in nature as the recent sudden eruption of Santorino, and the blazing forth and sudden diminution of a star in *Corona Borealis*, which had occurred within the last few weeks. But there was no Society to take up these general questions. The Victoria Institute would now undertake the task, and he believed it had a very wide field of usefulness before it. (Cheers.) To pass from science to art, he begged to refer to the motto on the title-page of this year's Catalogue of the Royal Academy, in which it is argued that the very existence of beauty in art raises the mind to something beyond the visible. Of course, every rational being must know, that a fine picture or statue could only be produced by intellect and intelligent skill. Well, let us turn from art to nature, to these flowers upon the table,—to say nothing of the magnificent display of floral beauty to be seen at the South Kensington International Exhibition,—and who could doubt that Divine Intelligence was the author of such transcendent beauty ? This is an inviting theme ; but time is short, and art must now be left, to pass on to literature. In a word, then, he would observe that all our philosophizing, whether in science or art, would be all but useless, but for literature, by which knowledge was diffused. He observed that Dr. Gladstone, F.R.S., had gone, whose name he would have wished to couple with Science and the Learned Societies ; Mr. Walton, whose name he would have associated with Art, had also departed ; and even Mr. John Lidgett, who had the toast of the Press assigned to him, had been unable to remain to propose it. He would therefore beg that the toast should be received as including the press, which is a most powerful organ of literature in our day. (Cheers.)

The CHAIRMAN then gave the toast of "The Ladies," which, being duly honoured, was responded to by Mr. F. MERRIOTT.

The proceedings then terminated.

FIRST ORDINARY MEETING, JUNE 4, 1866.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The CHAIRMAN stated, that this being the First Ordinary Meeting of the Institute, there were no previous minutes to be read.

Mr. REDDIE, Honorary Secretary, then announced that the following Foundation Members and Associates had been elected since the 1st of May :—

MEMBERS :—William Anderson, Esq., M.R.C.S.E., Assistant-Surgeon, R.N., *H.M.S. Hector*; Admiral C. R. Drinkwater Bethune, C.B., 4, Cromwell Road, South Kensington, S.W.; Rev. *Sir* T. Eardley Wilmot Blomefield, *Bart.*, M.A. Cantab., Incumbent of All Saints, Pontefract, Yorkshire; O. W. Brierly, Esq., F.R.G.S., 8, Lidlington Place, Oakley Square, Chelsea, S.W.; Montagu Burnett, Esq., M.A. Cantab., Westbrook House, Alton, Hants; James Carlisle, Esq., Merchant, Enfield, Belfast; William Aver Duncan, Esq., Woodlands House, Red Hill; D. D. Dymes, Esq., Mincing Lane, E.C.; John Holms, Esq., 16, Cornwall Gardens, Queen's Gate, W.; William Holms, Esq., 9, Park Circus, Glasgow; D. W. Johnston, Esq., Dalriada, Belfast; Major-General Arthur S. Lawrence, C.B., Clapham Common, S.; Oswald C. Papengouth, Esq., F.R.G.S., Lieutenant Imperial Russian Navy, 46, Russell Square, W.C.; Samuel Petrie, Esq., C.B., 46, Ebury Street, Pimlico, S.W.; Rev. John Scott, Principal of the Wesleyan Training College, Westminster, S.W.

ASSOCIATE, 1ST CLASS :—Miss Johnston, Dalriada, Belfast.

ASSOCIATES, 2ND CLASS :—Rev. Stephen C. Adam, M.A. Cantab., Assoc. Sec. for Irish Church Missions, 5, Clifton Villas, Camden Square, N.W.; Thomas Coghlan, Esq., M.D., Surgeon R.N., *H.M.S. Research*, Chatham; Captain G. G. Cooper Gardiner, R.S.F., 11, Church Street, Westminster, S.W.; Charles Lingen, Esq., M.D., F.R.C.S. Eng., St. Owen Street, Hereford; Edward Oakley Newman, Esq., M.G.A., Oakley Villa, West Wickham, Kent; Rev. John Williams, M.A. Cantab., 11, Mecklenburg Square, W.C.

Mr. WARINGTON then read the following Paper :—

A SKETCH OF THE EXISTING RELATIONS BETWEEN SCRIPTURE AND SCIENCE. By GEORGE WARINGTON, Esq., F.C.S., Author of the Actonian Prize Essay, 1865; The Historic Character of the Pentateuch Vindicated, By a Layman, &c.

THE purpose of the present paper is purely historical. To analyze in detail the various points at issue, or supposed to be at issue, between Scripture and Science; to examine fully, and weigh carefully, the evidence adduced on either side, and so pass judgment fairly and impartially between them, would require both more time than can possibly be allowed to a single paper, and especially far more learning and far deeper research than the writer has at his command. It has been thought, however, that a brief historical outline of the present state of the case, the relations, hostile or otherwise, permanent or passing, which actually exist between Scripture and Science, would form a useful and fitting introduction to that fuller and more particular investigation of the several points in detail, which it is one of the objects of the VICTORIA INSTITUTE to promote. To furnish some such general outline of actual facts, then, without in any way discussing their character or pronouncing upon their worth, is the aim of the present paper.

And to this end it will be convenient to divide the subject into four groups:—

1st. The objections brought against Scripture on the ground of incorrect and misleading descriptions of natural objects and phenomena.

2nd. The objections brought against the Scripture record of certain historical events, on the ground of further information touching these same events, or inconsistent with them, which Science has elucidated.

3rd. The objections brought against a particular class of occurrences narrated in Scripture, Miracles, on the ground of their incongruity with scientific principles.

4th. The objections brought against the dogmatic teaching of Scripture on the ground of its inconsistency with the facts of Nature.

The charges thus urged against Scripture in the name of Science may be briefly summed up, then, as follows:—1st. It is scientifically inaccurate. 2nd. It is historically untrue.

3rd. It is philosophically incredible. 4th. It is theologically erroneous. These it is proposed to review in order; noticing under each head, first, the various forms under which the charge is made, and second, the different lines of defence which the advocates of Scripture are accustomed to adopt, in order to repel the charge or mitigate its force. The kind and amount of agreement, or disagreement, thought on various hands to exist between Scripture and Science, will thus become apparent, and some useful information, it is hoped, be derived as to the extent and nature of the investigations required to set the question at rest.

I. First, then, of the charge of *scientific inaccuracy* in the Scriptural descriptions of natural objects and phenomena. This is founded chiefly upon the language of Scripture in matters of Astronomy, Meteorology, and Natural History. Scripture, it is said, plainly speaks of this earth as the centre of the universe, for whose benefit sun, moon, and stars were created, whose concerns are of paramount or sole importance. It describes the earth as firmly and immovably fixed, established on foundations, and built up with pillars, while about it all the celestial bodies move in their courses. It speaks of heaven as a solid crystal ceiling, having above it vast accumulations of water, to which exit is given now and then by the opening of its windows. It encourages and confirms the notion that the moon has a hurtful influence when shining brightly by night. In one and all of which particulars Science has demonstrated that Scripture is inaccurate, untrue, misleading. Or, to take another set of examples, Scripture represents the ant as storing up food in summer, and sets it before us as an example of wisdom and providence on this very account. It speaks of the ostrich as cruel, and carelessly forsaking its eggs. It distinctly includes the hare and the coney among animals which chew the cud. In every one of which statements, again, careful observation and scientific research have proved beyond a doubt that Scripture is incorrect. Surely, then, if this be so, it must be conceded that the charge in question is well-founded, and Scripture is *scientifically inaccurate*.

Now, to this charge, thus supported, three several replies have been given. In the first place, inasmuch as every one of these alleged scientific errors was at one time or other actually held by expositors of Scripture, and strenuously supported by them on Scriptural grounds, it was but natural that the first impulse should be to deny the facts, and so retort the charge of inaccuracy upon Science. The views attacked were admitted by this school to be fair representa-

tions of Scriptural teaching. The point contested was the right or power of Science to say aught against them. This mode of answer may be regarded as now, however, in several of the instances named entirely obsolete, at least among those who know anything of Science. The advocates of Scripture have been obliged, in dealing with these, to take up other ground.

In the second place, then, not a few of them have passed unhesitatingly to the opposite extreme. These doctrines and observations of Science are, no doubt, they say, most true; but then they are not really inconsistent with Scripture; Scripture properly interpreted teaches precisely the same thing. Make due allowances for poetical and metaphorical expressions, and the employment of simple, every-day phrases descriptive of natural appearances, which are used unhesitatingly by the most scientific still, and the two are found to be, in truth, perfectly at one. Then, enamoured with the prospect thus opened, the upholders of this view have launched forth boldly into general interpretation, and shown, or endeavoured to show, how every allusion to Nature in Scripture is not only harmonious with Science, but, in fact, anticipative of it; how the profoundest truths, which Science has only just revealed, lie there embedded in all their purity and force, needing nothing but impartial and keen-sighted exposition to bring them to light. According to this school, then, Scripture, though not, perhaps, intended primarily to teach Science, is yet scientifically accurate in essence everywhere; the discord between them is only apparent, not real.

But at this a third class gravely shake their heads in ominous doubt. Granted, say they, that, when fairly viewed, many of the objections of Science on this head are unfounded, and that Scripture is not really committed to some of these views which were formerly connected with it, and which Science has overthrown; yet surely there are other of the objections, and especially those referring to Natural History, which cannot be thus answered, at least without a strain upon the plain words of Scripture for which we have no sufficient warrant. Is it not safer, then, to concede that in these, at all events, the allegation is well founded; and rest on our defence rather on this: that such trivial errors have nothing whatever to do with the real worth of Scripture; that scientific accuracy being in no way necessary to the end designed to be attained by Scripture, so on these matters its human writers were left to speak in their ordinary language, and in accordance with the prevalent ideas of their time?

Such are the three lines of reply adopted by advocates of

Scripture in answer to the charge of scientific inaccuracy; the first, as will be seen, admitting the foundation of the charge to the full, but retorting the inference upon the assailant; the second denying the foundation, by modifying the interpretation of Scripture so as to make it harmonize with Science; the third admitting in part both foundation and inference, but regarding the latter as trivial and unimportant.

II. We pass now to the second and far more important group, of objections levelled against certain *historical events* recorded in Scripture, on the ground of further information touching these events, or inconsistent with them, which Science is said to have elucidated. This charge is founded, with very slight exception, upon the contradiction asserted to exist between the statements of the first *eleven chapters* of the book of Genesis and the conclusions of scientific research, more especially in the departments of Geology, Anthropology, Ethnology, and Natural History. It will be convenient, therefore, to review the objections under this head in the order which their connection with these chapters of Genesis naturally suggests.

The Cosmogony, or history of creation contained in Gen. i. ii. 4, furnishes the scientific objector, then, with the following charges:—1st, and chiefly, a stupendous discrepance in regard to *time*; Genesis teaching that the whole work of creation, in respect both to heaven and earth, was performed in the short space of six days; Geology proving incontestibly that it must have occupied a succession of ages altogether surpassing human powers to measure or conceive. 2nd. It is urged, that not only is there this fundamental and insuperable discord between them in regard to time, but there are also certain notable errors in Genesis as to the *order* of creation; in particular, the late position assigned to the creation of the sun, moon, and stars, as subsequent to that of the earth, of light, of the dry land, and of vegetation; also the precedence of plants before fishes and reptiles; both which, it is asserted, are contrary to the plain teaching of Science. Then, 3rd, it is objected, that Genesis is wrong in regard to *manner*, since it speaks of the creation of living things as taking place in single defined groups, consisting (we must suppose) of all the species ever existing belonging to that group; whereas Geology shows us that living things have made their appearance on the earth very gradually, one kind dying out and being superseded by others, and this many times over through enormous periods utterly unlike one another, those living beings which now inhabit the earth being no more than the last group of a long, nay, almost infinite, series. Lastly, some

scientific objectors further add that Genesis is erroneous also in *principle*, inasmuch as it clearly describes the creation of distinct species, and especially asserts most strongly the radical dissimilarity of man from other animals; while Science is ever more and more tending to the conclusion that species are the result, not of creation, but of natural development, variation, and selection; that man is no exception to this, but is, after all, no more than a developed, educated, or selected ape.

To these objections against the Scripture cosmogony, the most diverse replies have been given, according to the taste, prejudice, or predilection of the replicant. They may be classified, however, roughly into the same three groups as those noticed under the first head.

First, we have those who deny the contradictory assertions of Science as untrue. The time, order, manner, and principle of creation, according to these, were, in fact, exactly as Genesis represents; the objections of Science are false and unfounded. The fossil remains on which geologists lay stress are either pure illusions, or the results of the Deluge; the formation of rocks was carried on in a manner and at a speed wholly unlike anything observable at the present day, if, indeed, they were not at once created just as they are, without any process of formation at all; the inferences deduced from the position and order of strata are hazardous and presumptuous; the supposed natural origin of species little, if at all, short of atheistic blasphemy. As in the former case, it is to be noted that this line of answer, at first the most prevalent and popular, is now in regard to the most important objections in question, those, viz., of time and manner, pretty well given up; the intrinsic weakness and uncertainty of the other two (those of order and principle) allowing it there, however, full action still. But with respect to the time and manner of creation, the advocates of Scripture now generally adopt the second line of answer before indicated,—that, namely, of denying the contradiction by modifying the interpretation of Scripture.

This group of replicants is a very large one, and may conveniently be again subdivided into three. The *first* of these subdivisions consists of those who hold that the narrative of Gen. i. is a full, proper, and scientifically accurate account of the creation of the earth, the days spoken of being, not literal days of twenty-four hours each, but vast periods of indefinite duration, corresponding, and meant to correspond, to the periods disclosed by Geology. Some maintain this view by a larger and more comprehensive, but still simple scheme of interpretation, by which the narrative becomes a kind of pictorial

or symbolical representation of the reality, couched in the language of appearances, and so in some respects partial and inadequate, but still, so far as it goes, in perfect accordance with Science. Others, unsatisfied with this, seek by new renderings of the Hebrew text to make the narrative do still more, and not only agree with Science, but anticipate Science, speak in scientific terms, and reveal their own peculiar cosmogonic theories without flaw or difference. Others, proceeding on the same track, but still more daring, reject altogether the received manner of even reading Hebrew, regard the sacred language as a sealed casket of which the key has long been lost, discover the key in their own knowledge of the analogies of language, and of course unlock a hidden treasure of cosmogonic lore which had hitherto lain concealed within. The *second* subdivision of this group consists of those who hold that the days of Genesis are literal days, and assign the ages of Geology to a period between the original creation of the heavens and the earth spoken of in the first verse, and the state of darkness and desolation described in the second. Even these, however, are not by any means agreed among themselves, some regarding the chaos, and subsequent development of order and life, as referring to one particular part only of the earth's surface, a part, as it happens, of which geologists at present know very little; others regarding them as coextensive with the entire globe. Then, as the *third* subdivision, there are yet others who adopt a sort of middle course, agreeing with the first in regarding the six-days' work as descriptive of the whole history of creation, yet refusing with the second to view these days as *intended* to be looked upon as representatives of six gigantic periods. According to these, the cosmogony of Genesis is a poetical sketch of the order and method of creation, cast into the parabolic form of a week's work for the religious instruction of the unscientific people for whom it was primarily intended; accordant, therefore, with Science in its essential principles and broader outlines, but involving of necessity more or less discrepancy in detail and outward form, and in particular being altogether inadequate to convey a scientific view in regard to time, which was regarded as of little importance for the particular purposes in view.

The third main group of replicants—those who concede the contradiction alleged to exist between Scripture and Science but deny its importance—adopt a line not altogether unlike that last described, differing, however, in this: that they ignore or deny the fundamental scientific accuracy which the former lay special stress upon, and ascribe the peculiarities of the nar-

rative rather to the influence of tradition, or the fancy of the writer, than to any real knowledge of the true state of the case. According to these, also, religious instruction was the great object of the cosmogony; and this remaining true, even when the form in which it was conveyed has been proved to be false, the surrender of the latter is a matter of little consequence.

The next section of Genesis to be considered is that containing the history of the Fall. This is said to involve the following contradictions:—1st, in respect to the entrance of suffering and death; Genesis regarding these as the result of the fall of man; Geology teaching plainly that they had existed ages before, and had, in fact, been the rule of creation throughout all time. 2nd, in respect to the curse on the serpent; Genesis describing its crawling habit as the punishment awarded for its crime in tempting Eve; Anatomy and Physiology proving that, on the contrary, it is the inevitable result of its organization; and Geology showing that serpents always had crawled about as at present, hundreds of thousands of years before Adam could have lived upon the earth. 3rd, in respect to the curse on the ground; Genesis regarding the productions of thorns, thistles, &c., as the penalty of Adam's transgression; Science teaching that they are but the normal growth of the ground existing in full vigour for ages previous.

To these objections we have, as before, three several groups of answerers:—

First, those who deny the allegations of Science, who believe that physical suffering and death did come into the world through the Fall, and had not existed there previously; that serpents did then for the first time begin to crawl upon the ground; that thorns and thistles did then for the first time spring up.

Then, second, there are those who admit the allegations, but deny the contradiction. Some seek to explain the difficulties by limiting the suffering and death spoken of to man; by regarding the curse upon the serpent as metaphorical, purporting disgrace and defeat to the spiritual tempter, not physical degradation to the agent; and viewing the production of thorns, &c., either as a greater and more abundant production than heretofore, or as a new thing merely by contrast with the previous experience of Adam in the garden of Eden. Some prefer to get over the second objection by a new rendering of the Hebrew, regarding the tempter as an ourang-outang, or some other species of ape, rather than a serpent; while others, again, interpret the whole narrative as an allegory, written to explain in pictorial and symbolical form the origin

and consequences of human sin, whose expressions must not, therefore, be taken literally.

Thirdly, there are those who admit the contradictions alleged, at least in part, but deny their importance. These also adopt a kind of allegorical interpretation; not, however, like the last mentioned, as the method intended by the writer to be employed, but merely as *our* method of extracting the kernel of truth from that which the writer, guided either by tradition or his own fancy, regarded as true throughout.

The history of the Deluge recorded in Gen. vi.-viii. furnishes the next ground of objection; the Scripture narrative, it is urged, plainly describing a strictly universal flood, which Science as distinctly disproves; 1st, by the phenomena observable in regard to certain volcanic hills in the south of France; 2nd, by the impossibility of the collection and redistribution of all existing species of animals from all parts of the earth; 3rd, by the utter insufficiency of the ark described to accommodate all these, and various difficulties connected with their preservation. Other minor objections of similar character are also urged, which need not be detailed at length.

The answers to these alleged contradictions fall into the same three groups as before:—

First of all, we have those which maintain the view of a universal deluge, by denying the force of the objections; which speak of the evidence derived from the volcanic hills of France as delusive and unsound, and get over the other difficulties by a plentiful assumption of miracles, either in the way of a supernatural gathering and preservation of the animals in question, or of a new creation of large numbers of fresh species in various places after the Deluge. Many new and original scientific theories as to the causes and manner of operation of the flood, harmonizing with its universality, also find ready currency among the controversialists of this school.

Then, Second, we have those answers which concede the justice of the scientific objections, but elude their force by modifying the interpretation of Scripture. These maintain the view that the deluge was only partial, being caused by the depression of the land in one particular portion of the earth's surface; a part, again, as it happens, of which geologists as yet know very little. The majority of these answers still uphold the universality as regards man; a few concede its partiality in this respect also.

While, Thirdly, there are yet other answers which admit the objections altogether, but deny their importance. According to these, the actual deluge was no doubt partial, as respects both animals and man, but was regarded by the writer of the

narrative as universal; whose account is hence fairly open to the scientific objections raised against it, which cannot, however, touch the fundamental spiritual truths which lie within it.

The next class of objections are those concerning Scriptural Ethnology, suggested by the account of the descendants of Noah in Gen. x., and that of the confusion of tongues in the former part of Gen. xi. Here it is urged,—1st, that Scripture is wrong in certain details, as especially the assignment of the Canaanites and Chaldeans to a Hamite origin, whom Philology teaches were Semites; and other similar instances. 2nd, that Scripture is wrong also in its fundamental view, representing the existing diversity of languages as brought about by supernatural interference, instead of as the inevitable result of natural causes. To which, 3rd, some also add a still graver charge, involved, indeed, in previous sections, but most conveniently considered here, that Scripture errs in speaking of all tribes and nations as descended from a common parentage.

The first and third of these objections are at present too much disputed among scientific men themselves for theological opponents to trouble themselves much concerning them, and they are hence generally met in the spirit of the first general group of answers:—your Science is incorrect. In respect to the second objection, however, there are some who prefer to concede the apparently natural origin of languages by altering their interpretation of the Biblical history of Babel. While there are yet others who on all three points are prepared, if necessary, to admit the objections as valid, but deny their importance.

Lastly, the genealogical lists of Gen. v. and xi., defining the interval of time between Adam and Abraham, afford the objector one more weighty charge yet. The Hebrew Scriptures, it is said, by these lists require us to place the creation of man as somewhat less than 6,000 years ago, whereas the evidence derived from the geological position of his implements and bones, and his demonstrated contemporaneousness with animals long extinct, confirmed by the length of time which ethnologists and philologists assert to be necessary for the development of races and languages, goes to prove that he must have existed on the earth for a vastly longer period.

The majority of theological advocates adopt here the first mode of answer, and deny the validity of the scientific argument; some by representing the implements in question as purely natural productions, the human bones as merely

accidentally mingled with those of extinct animals; others preferring to regard both implements and bones as belonging to a race of extinct apes, NOT men; others regarding both indeed as human, but intentionally buried in the places where they are found, in much later times; others admitting the contemporaneousness of the implements and bones with the formations and other remains in connection with which they are found, but contesting the antiquity assigned to these by geologists. The confirmatory arguments from Ethnology and Philology are commonly met by this class of replicants by reference to miraculous agency, or occasionally by the elaboration of counter-evidence.

Under the second head three modes of answer have been adopted. First, it is urged that the Scriptural chronology refers only to the descendants from Adam, while at the same time hints are dropped, and indications given, of another class of men, inferior in character, and stretching back into much earlier times, to whom, no doubt, these implements and bones are to be ascribed. Secondly, stress is laid upon the divergences in these genealogies between the Hebrew text and the Samaritan, the Septuagint version, and the statements of Josephus; some adopting the longer chronology deducible from the last two, some regarding the whole question as in consequence hopelessly uncertain. Thirdly, it is pointed out that each of these genealogies contains exactly *ten* generations,—a number which may perhaps have been regarded as having a mystical significance, to obtain which some of the actual links in the chain were omitted, and so the chronology shortened unnaturally.

Lastly, there are yet other defenders of Scripture who give up the genealogies altogether, regarding them as mere traditions, having no bearing upon spiritual truth, or, at all events, none which is in any way affected by supposing them to be corrupt and defective in their chronological aspect.

III. We pass on now to the third group of objections; those, namely, which are brought against Scripture *miracles*, on the ground of their inconsistency with scientific principles. Particular facts bearing on the miraculous events recorded in Scripture the objector does not here in general produce, or need to produce; his charge refers to the whole class *as a class*, and is based upon the widest of all the inductive conclusions which Science has elucidated—the absolute and unalterable uniformity of the laws of Nature. Here, therefore, we have no longer to deal with detailed interpretations, as in the two former groups, but with general views and principles. The objection in question presents itself in two forms, so different in character

and complexion that it will be advisable to consider them, with their respective answers, quite apart.

The first form of the objection, then, avowedly ignores all considerations of Theology whatever, and deals with the matter on purely naturalistic and physical grounds. Scientific investigation, it is said, plainly shows that every department of Nature is under the control of laws the most exact and inexorable, and, so far as our knowledge can reach, has ever been and must ever be so. The whole course of Nature is a chain of antecedents and consequents bound together by a necessary and absolutely certain connection, entirely beyond the reach of interruption or alteration; every event that happens in Nature is the inevitable result of the laws and properties of matter and force, which can neither be violated, modified, or suspended; and beyond these laws and properties Nature knows no other rule; they are alone and supreme. To assert, therefore, that an event, or series of events, occurred which are contrary to this uniformity, which are not the result of these laws and properties, but opposed to them and incompatible with them, is to assert the occurrence of an impossibility, and is simply absurd.

The answer to this form of the objection is commonly a *reductio ad absurdum*. Plainly and on the surface it denies the existence of God; that is, of a personal Being ruling Nature, possessed of a proper spiritual existence, unlimited supremacy, and WILL. It involves, therefore, either atheism or, which is the same thing in other words, materialistic pantheism. And its consequent absurdity may thus be easily demonstrated. But further; it is said, push the argument home, and it involves also the denial of all spiritual existence whatever. It is certain that man has the power of modifying at his will the course of external Nature, causing things to happen which would not have happened but for his influence and interference. If, then, the principle be sound that every event in Nature is the result solely and absolutely of physical laws and causes, it follows manifestly that this will of man is itself also but a physical cause; that its apparent freedom is purely delusive, it being in reality as rigidly and passively the subject of law as any other cause; that, in fact, he has no more real intelligence or independence than a calculating machine or an automaton. From this barren and repulsive materialistic fatalism most objectors may be expected to shrink instinctively; and, of course, the admission once made, that there are spiritual existences independent of physical law, yet capable of influencing Nature, and the argument for the *impossibility* of miracles from their involving such non-physical agency falls to the ground.

The commoner form of objection, however, evades this answer by adopting a different ground of attack. Granted, it is said, that there is a true personal God, having full and supreme power over Nature, and therefore *able* to suspend, modify, or act independently of, its laws; yet is it *credible* that He should do so? Are not these laws the proper expressions of His Will, ordained and created by Himself with a full knowledge beforehand of the results that must arise from their action; so created as exactly to accomplish the ends which He had in mind and no others, so created also as to be sufficient to accomplish these ends without further extraneous aid or interference? Is not the uniformity of Nature, in fact, the inevitable consequence of the unchangeableness of God, to suppose an alteration in which is hence to suppose a change of mind in God, which is incredible? Man, indeed, may be constantly interfering with Nature; but is not this because Nature is independent of him, and so does not always fit in of itself with his designs, because also his knowledge of it is limited, and his will concerning it variable? Does not, then, the ascription of such interference to God also really imply that he is subject to the like imperfections, that Nature is independent of Him, that His knowledge is limited, and His will variable? While, yet further, have we not in the observed fact of the undeviating uniformity of Nature, and the absolute supremacy of physical laws, even in cases where *we* should have thought a slight alteration would have been productive of immense good, a proof that human reason is altogether incompetent to comprehend the purpose of this iron rule of law, but must be content to receive it simply as a fact, which, however apparently fraught with evils here and there, is certainly in accordance with God's Will, and not, therefore, lightly to be set aside on any grounds of fancied expediency?

To this objection, thus set forth, there are, as before, three distinct lines of reply:—

First, there are those who deny the scientific premiss of the objection, that Nature is thus inexorably uniform and subject to law. According to some, this premiss is unsound, because, after all, the idea of uniformity is merely the impression which a more or less extended experience of past uniformity has made upon the imagination, whereby we instinctively conclude that it will continue for the future, and, in fact, always; which kind of instinctive conclusion has been proved, however, over and over again, to be in particular cases fallacious and misleading, and therefore may be so in the present case also. This answer, pushed to its extremest limit, puts the improbability of a miracle on exactly the same footing as the impro-

bability of any other non-habitual event,—the mere number of chances *à priori* against its occurrence,—an improbability which entirely vanishes on the production of any ordinarily credible testimony. Stated more cautiously, the miracle is ranked with events new and strange, wonders inexplicable and improbable, alike after their occurrence as before, and therefore requiring more than ordinary evidence on its behalf, but still involving nothing intrinsically incredible. Others, again, attack the scientific premiss on the ground that the laws and causes referred to are purely hypothetical, mere possible explanations which Science has devised, which may, however, just as likely be erroneous, and on which it is illogical, therefore, to build any argument of moment. How do we know that there may not be other and truer explanations, equally accordant with natural phenomena, and not inconsistent with miracles?

Then, Secondly, there are those who admit the scientific premiss, but deny the inference; who admit that Nature is uniform and subject to law, but deny that miracles are therefore incredible; for, say they, miracles have to do with something which is beyond and above physical nature,—the soul of man. Man, it is argued, has put himself out of harmony with Nature; his free-will, acting in opposition to the will of God, has produced discord and rebellion where was meant to be concord and subjection; and the course of Nature being thus disturbed in its relation to man, it is plainly by no means improbable, but rather probable, that in God's dealings with man He should find it necessary to modify that course in other respects also. In particular, it is urged, man has by this evil action of his free-will put himself out of communion with God, to a great extent silenced the revelation of God existing in his own conscience, and blinded his eyes to that discoverable in Nature. For his recovery and reformation there is needed, therefore, other and clearer revelation than these two, to which his attention shall be attracted, and his submission secured, by evidence of God's action and presence other than that existent in Nature or himself; in a word, by miracles. However incredible, then, a miracle may be, viewed merely in itself, as a part of the course of Nature; it is perfectly credible, nay, probable, when viewed in connection with its purpose, as having respect to one who is out of harmony with Nature, and whom the uniformity of Nature has ceased to affect as an evidence of God's existence. So far the advocates who adopt this line of answer are pretty well agreed, differing only in form or mode of statement; but here two notable differences between them come into view. In the first place, there is a difference as to the *character* of miracles. Some, who

look chiefly at the impression produced by miracles on man, and regard the order of Nature as created by God indeed, but now practically independent of Him, speaking of miracles as *higher* manifestations of His presence, because proofs of His supremacy over Nature. Others, on the contrary, who look rather at the Divine attribute of unchangeableness, and regard the order of Nature as the true and proper expression of His living presence, speaking of them as *lower* manifestations, condescensions, in which God has stooped to act for awhile after the imperfect manner of man, as elsewhere to adopt man's language and man's form, that man might learn to recognize Him the easier and better. Then, in the second place, there is a difference as to the *agency* involved in miracles. Some regarding them as wrought by God directly, without the intervention of natural forces or laws. Others regarding them as wrought through the instrumentality of these, merely specially controlled and adjusted for the particular end in view.

But, Thirdly, there are yet others who admit both the premiss and inference of the objection, but deny their importance. According to these, it is quite true that no miracles properly so called ever happened or could happen; but still events happened which were *thought* to be miraculous, impressions were created on the mind which were *believed* to be produced by miracles, and by these certain spiritual ends were attained. What matter, then, if we reject the means, so long as we preserve the end? What matter if that which men of old regarded as a miraculous act of God, we regard as purely natural, so long as we both recognize God's hand there? What matter if we reject the miraculous evidence of doctrines, on account of which men of old believed in them, so long as we hold the doctrines themselves? Why trouble about the particular channel through which truth comes, so long as both are drinking of the same fountain-head?

IV. We now pass to consider the fourth and last group of objections; those, namely, which are brought against the dogmatic teaching of Scripture on the ground of its inconsistency with the facts of Nature. Some of these, as, for example, the pre-eminence which Scripture assigns to man in the history of the world, and the assertion that all things were created and are still actively superintended by a personal God, who has the power of dispensing with, and controuling, natural laws, have been already touched upon. Of the rest, two only need here receive especial mention, as the most notorious and oftenest urged. In the first place, then, it is objected that Scripture represents the whole of creation as "very good," the product of unmixed beneficence; whereas, in fact, Nature is full

of things which are not good in any proper sense of the word, as, for instance, the preying of one set of creatures upon another; the ferocity and malignant cruelty of certain animals; the occurrence of earthquakes, hurricanes, droughts, &c.; the existence of deserts, inhospitable climes, and such-like. In the second place, it is objected that, on the contrary, the whole of Nature, man included, are so perfectly in accordance with law and goodness properly conceived, that the Scriptural notions of the fall of man, and the present subjection of creation to vanity (*i.e.*, apparent imperfection and purposelessness), are incredible and untrue.

Of course these two objections are mutually contradictory, and might safely be left to settle the matter under dispute between themselves, without theological interference. The importance of the questions raised has caused, however, the adoption of a more active course, with again the usual diversity of opinion and method. Thus, some deny the first objection *in toto*, and maintain that Nature is still in all respects "very good," the only exception being fallen man. Others admit this objection, but deny that it applies to Scripture, arguing that the expressions in question refer to the world before the Fall, and regarding all evils existing in Nature now as the results of the Fall. Others, taking a middle course, allow a certain element of truth in both objections, but deny their extremes. According to these, the world is indeed, in one aspect, full of imperfection, albeit in another full of tokens of perfection; and this just because it is in a transition state, is slowly growing into completeness and beauty, and, like all God's works of this kind, does so through much apparent, and for the time being real, imperfection and evil. It is only when looked back upon in its entirety from the stand-point of its accomplished end, say these, that it can be expected to appear reasonable and good in every item. Meanwhile, sufficient evidence of present goodness is given to furnish a firm foundation, both for confidence as to the present, and hope as to the future.

In drawing this sketch of the existing relations between Scripture and Science to a close, two notes of explanation must be added to prevent misunderstanding concerning it. 1st. It is by no means to be regarded as complete, either as concerns the objections or the answers; several of the less notorious and important of the former having been omitted for the sake of brevity, while in respect to the latter an immense number of minute diversities and shades of difference have been passed over without notice, to avoid having to enter too much into details. 2nd. In gathering up the answers under the first three

heads into corresponding and symmetrical groups, it is in no way intended to imply that the answerers themselves may be arranged in the same way, it frequently happening that, even in the case of a single objection, part of the answer actually rendered belongs to one group and part to another. The grouping has respect solely to the matter and spirit of the answers, not at all to the method of the answerers. It is partly on this account, and partly for other reasons sufficiently apparent, that in no case have the names of the parties holding them been attached to either objections or answers.

But now, these being the facts of the case, what are we to learn from them? The first impression which a review like that just completed makes upon the mind is probably in most cases a pleasing one. It is pleasant to know that so many and seemingly insuperable objections have called forth so varied and powerful a list of answers; and the conclusion may, and no doubt will, be drawn by many that, with such a host of defenders, the assault of Science upon Scripture cannot but be triumphantly repelled. A deeper view, however, raises feelings of a very different kind. True, the defenders of Scripture are numerous and zealous, but they are a motley and discordant set, at war among themselves as fiercely as with the enemy,—to a great extent mutually destructive; a large proportion of them, therefore, certainly in the wrong in the defence they make, and so a source of weakness rather than strength. It behoves the advocates of Scripture to consider this well. We hear much now-a-days of the contradictory hypotheses of Science, of the constant flux of opinions in the scientific world, of the evil of hasty assumptions and biased interpretations of phenomena, and the consequent futility of objections founded upon such a basis; and no doubt there is much truth and justice in all this. But it were well for all such criticizers of Science first of all to look at home. Are there no contradictory hypotheses among the defenders of Scripture? Is there no flux of opinion in orthodox views? Are there no hasty assumptions, no biased interpretations, which theological advocates are guilty of? Ay, truly, and that to a far greater degree, and of a kind far more inexcusable. Does the gradual unfolding of new facts cause scientific theories to be perpetually changing, and allow for the time being of the existence of many conflicting hypotheses? Well, be it remembered that every one of these theories and hypotheses has its advocates and representatives also among the defenders of Scripture; while over and above these there are a large number of fresh theories held by such, founded on fancies and not facts. It may be said, however, that to expect scientific unity among

theologians is unreasonable; it is not their proper subject, nor can they give to it the amount of study which it needs. If this be so, surely it were better if they left it alone; but, passing this by, at least then we may ask, and reasonably, for theological unity.

Alas for the cause, here is, if possible, even greater discordance than in matters of Science. Take the case of Biblical exegesis. Here is a book, written in plain and simple style, which has been in the hands of theologians complete for nigh 1800 years, and on which they have bestowed the most unremitting study; where no new facts can ever be rising up to disconcert past conclusions; where, therefore, if anywhere, unanimity would seem to be inevitable, and diversity of opinion be most inexplicable and criminal, and yet in so simple a matter as whether, in this book, the word "day" always means a period of twenty-four hours, or whether certain phrases in a straightforward narrative necessarily denote universality or not,—in such simple matters as these the world of theologians is at open war with itself. Verily, if they dwell in such extremely friable residences themselves, they should beware how they throw stones at their neighbours. But even this is not the worst. One would have thought that, however much interpretations might differ, at least when it came to questions of principle and fundamental doctrine, theologians would be at one. But no; much as they have read and studied their Bible, much as they have written about it, they have not been able even to settle the prime question in the entire controversy:—what is the real issue at stake? Some tell us that, if the objections of Science are carried home, the Divine authority of Scripture is at an end, some that it is merely rendered a little more doubtful, some that it is not touched in the least. Certainly there is no discord among men of Science that can be compared to this.

What, then, is to be done? It is said, that, to get rid of the changeableness and unsoundness of Science, we must cast theories and prejudices on one side, and give ourselves to a closer and more impartial investigation of facts. Very good; and precisely so must we do, only to a far greater extent, to get rid of the changeableness and unsoundness of our theological defence. It is not enough for the advocate of Scripture to scrutinize severely the facts and conclusions of Science; he has need to do so indeed, but much more has he need to scrutinize the assertions and arguments of current theology and exegesis. It will not do for him in these matters, even so much as in those, to trust to his own notions, or the notions of this writer or that writer; he must set himself earnestly to

search for facts, resolutely resolve to base his interpretation of Scripture on facts, and nothing else,—facts weighed with rigour, and reasoned on with strict impartiality. So in like manner with his view of the authority and character of Scripture, to base this, not on his ideas of what it *ought* to be, but on what facts warrant him in believing that it *is*. Of course such investigation requires the expenditure of much laborious study, the possession of a calm and carefully-suspended judgment, the submission to much misunderstanding, obloquy, and reproach; but there is no royal road to truth, and the lovers of truth must not begrudge the toil and pain involved in its acquirement. To such investigation, then, such discarding of theories, such laying aside of prejudices, such keen and unbiased search for truth, whatever it may be, and wherever found, let the members of the VICTORIA INSTITUTE devote themselves, heart and soul, and assuredly some steps will be taken to the final peaceful settlement of this unhappy controversy.

THE CHAIRMAN.—The pleasing duty of proposing a vote of thanks to Mr. Warrington, for his very able and comprehensive paper, devolves upon me. I think it a most suitable inauguration of the regular proceedings of the Society, as it reviews the whole question of the existing relations between Scripture and Science. Some may consider the mode of treatment is somewhat indefinite, as the author has set forth no views of his own, but has contented himself with a *résumé* of both sides of the controversy. He has set forth very clearly the objections urged against Scripture, and the answers to them hitherto published, without himself drawing any conclusions. Such a mode of treating the subject most convincingly illustrates the value of such a Society as the Victoria Institute. If the supposed discrepancies between Science and Scripture are to be removed, we must not look so much to individual answerers, as to the agency of a society which seeks to unite men distinguished for an acquaintance with the various branches of science and those skilled in theology. Such men meeting together from time to time, freely to discuss the controverted questions, will be most likely to indicate the proper answers to be made to the objectors. To the mere scholar unacquainted with science, as well as the great mass of people who have neither the time nor the ability to investigate these important questions for themselves, the work undertaken by the Victoria Institute will be of the greatest importance; and I have no doubt it will be well performed. It has been suggested that the paper just read to a certain extent invites discussion; I shall therefore be glad to hear any observations which any gentleman may be disposed to make upon it.

Mr. ROBERT BAXTER.—I think the paper just read is evidently one upon which Mr. Warrington has bestowed great pains, and shown in its production very great ability. (Hear, hear.) He has dealt with his subject in a very

comprehensive manner ; and his classification of the objections raised against the truth of the Scriptures and the answers which they had received, was calculated to bring the whole matter clearly before the mind. But at the same time I think the discussion opened by Mr. Warington is not by any means satisfactory, unless it is further pursued. In the shape in which it comes before us on this occasion, it seems to be merely the beginning of a discussion upon the questions under consideration, and is a paper which ought not to appear in its present shape in the publications of this Society and not until the arguments have been sufficiently pursued. I am sure we are all deeply indebted to Mr. Warington (hear, hear) ; but at the same time I think the value of the paper would be greatly enhanced if the author would pursue the subject further, so as to enable those who read it to know to what conclusions his inquiries tended. (Hear, hear.) I would respectfully suggest that the paper should for the present be withheld ; and would say in conclusion that it affords me very great pleasure to second the vote of thanks which has been proposed by the Chairman. (Hear, hear.)

Mr. REDDIE.—I agree in many respects with Mr. Baxter's remarks ; but I must observe that Mr. Warington could scarcely have argued out the numerous questions he had necessarily touched upon, in giving a sketch of the various alleged contradictions between Scripture and Science. Thoroughly to discuss these questions would in fact be our work probably for years to come ; and it would require a whole series of papers, to enable us to settle even a tithe of the points to which Mr. Warington had referred. In my opinion, however, it might be advantageous if he would add, by way of notes, some indication of who are the authors of the various opinions, whether scientific or theoretical, which he had quoted, that we might know more definitely what they had advanced, and the grounds upon which they held their views. It had been a matter of much anxiety to those who originated this Society, to have it clearly defined what we were going to do, and what we were not going to do ; and it may be considered as settled, that we ought not to enter upon what are strictly questions of scriptural exegesis. Such were rather matters for theologians, and not subjects for discussion at these meetings. There is one remark near the conclusion of Mr. Warington's paper which I must notice. He observes that such a review as he had given us was calculated to produce a pleasing impression on the mind ! Now I venture to think it must rather have an opposite effect. Mr. Warington had, no doubt, carved out our work for us, and had shown that the task we had undertaken was no light one. But it appears to me that it is very unsatisfactory, either that there should be so many contradictions in "Science," or so many contradictory "interpretations" of Scripture. I would wish, however, to call the attention of the author of the paper to the fact, that differences in the interpretation of Scripture existed long before any attacks were made upon it in the name of Science ; and I cannot agree with Mr. Warington in thinking either that the Bible is so very easy a book to understand, or that a different understanding of obscure passages is so very inexcusable or blameworthy. We must remember that, besides not having the *origines* of Scripture at all,

there may be errors in translation or transcription, and modes of expression unusual to us as moderns reading the oldest book in the world. What we wish to do, by means of the Victoria Institute, is to reduce to some extent the causes of such differences. We wish to get rid of, or at least to lessen, those arising from what we believe to be unwarranted attacks made upon the Bible on scientific grounds; but it is no part of our programme to go into minute questions of Scriptural exegesis, as to the precise meaning of passages about which theologians themselves did not agree. At present I can attempt no more than to allude to a few of the alleged scientific objections to Scripture. Now, although a good deal had been heard from Dr. Colenso and the authors of the *Essays and Reviews*, besides others, of such objections, I am not aware that any one among these authors had committed himself to the extraordinary statement Mr. Warrington gives, that the earth, according to the Scriptures, is "built up with pillars." I should therefore like to know who has ever really said so. I am aware there is a verse in the 75th Psalm to this effect: "The earth is weak and all the inhabitants thereof; I bear up the pillars of it;" but I never heard that any Jew or Christian had deduced from this, either that Scripture taught that the earth was literally supported upon pillars, or that the Psalmist held them up! The text, in fact (as a mere glance at the context would show), relates entirely to the moral government of the world. We all know, of course, of the heathen fable of the earth being borne by Atlas on his back, but Scripture is totally innocent of all such nonsense; while in it we find the expression, that "God hangs the earth upon nothing." Mr. C. W. Goodwin, indeed, in his notorious Essay on the Mosaic Cosmogony, had referred to a verse of Scripture in which he fancied the world was alluded to as fixed, because of the words "the world cannot or shall not be moved." That is found both in the 93rd and 96th Psalms; but it must be remembered that in the 99th Psalm, the words "let the earth be moved" also occur, which passage in the Prayer-book version is translated "be the earth never so quiet;" and the Hebrew word translated "world" in all these places is *tevel* (not *arets*), and obviously refers to the world of people, and not to the earth or the physical world at all.* If rightly interpreted, according to the context and their obvious sense even in English, it would be readily seen that they were allusions to the fixedness or disturbance of the moral laws of the world, and had nothing to do with any physical theories of the earth or cosmos. But there is really no question of interpretation, properly speaking, involved in such simple passages, otherwise

* By reference merely to the English Bible it will be seen, from the heading, that when it was translated, long before these scientific difficulties were invented, the 93rd Psalm was considered as relating to "The majesty, power, and holiness of Christ's kingdom," and not to the physical world. In the 96th Psalm, also, the context is so plain, that no schoolboy ought to mistake its meaning:—

"O worship the Lord in the beauty of holiness: fear before Him all the earth.

"Say among the heathen, that the Lord reigneth; the world also shall be established that it shall not be moved: He shall judge the people righteously."

they would not come properly within our consideration. When we have criticised and carefully examined the supposed teachings of science, and have shown that the objections to Scripture resting upon them are without foundation, it will be time enough to discuss, if then necessary, the exegetical question. Besides, the statement as to the earth being built up literally with pillars is one which I cannot conceive any man would gravely adopt; and, if not, there is really nothing for us, as a scientific society, to examine with reference to that notion. It is also well known that Mr. Goodwin had committed a great blunder in alluding to the Bible as teaching that the firmament is something fixed and solid. He had overlooked even the marginal reading in our English Bibles, where the word (translated "firmament" in the text) is rendered "expansion." It may also be considered as an interesting fact that Sir Matthew Hale, in his work on *The Origin of Mankind* (written about 200 years ago), had specially noticed this rendering of the Hebrew word *rakia*, or *rakah*, as properly meaning "expansion." Moreover, leaving out everything like critical exegesis or interpretation, we must remember that in another verse of *Genesis* we have the "open firmament of Heaven" spoken of, in which the birds were to fly; and this precludes all idea of anything solid having been intended by the use of the word "firmament." Only the sense of an open expanse (*expansionem*, as in the Vulgate), is consistent with the plain and obvious meaning of the Scripture narrative. The idea of the crystalline spheres was purely heathen, and among them it was a *quasi*-scientific notion; but it is an idea for which no sanction whatever could be found in the Bible. It is, however, somewhat remarkable that modern science has actually revived this notion. In the latest Blue Book published under the auspices of the late Admiral Fitzroy, there is a quotation from the late Sir John Lubbock, F.R.S., which I beg leave to read. Admiral Fitzroy says:—"Poisson, in his 'Treatise on Heat,' assumed the excessive cold of space has a condensing effect on air, causing it to become viscous; and a very eminent mathematician [Sir John Lubbock] lately wrote to me, saying that he inclined to a similar view, if not to a belief in its actual *congelation!*" "*Frozen air* around our atmosphere!" exclaims Admiral Fitzroy; so we find here the old and exploded scientific notion of crystalline solid spheres again revived in our day, and not repudiated even by such an authority as the lamented Admiral Fitzroy. There are a series of other questions alluded to in the paper which I do not think could ever come within the investigations of this Society. For instance, the allusion to the serpent and the temptation in Eden. There is really no question as to the present adaptability of the serpent to crawling; and I never heard of any one who held, that for a long period before the fall of Adam, there was a race of serpents who naturally walked and talked. (Laughter.) It was out of the question to think of testing the record of the supernatural state of things in Eden—when God himself is spoken of as "walking in the garden," and talking with man—by any scientific investigation of the things in nature now. But it must be remembered that in the Scriptural story, taking it as it is, there is no warrant for the imagined long periods before man's fall, which have

been mixed up in the paper with this question about the serpent. Besides, the words "upon thy belly shalt thou go" might perhaps be as truly rendered "as upon thy belly thou goest, so dust shalt thou eat all the days of thy life," meaning (like the cognate scriptural phrase, "thine enemies shall lick the dust,") that the serpent would ever after be abhorred of mankind, as we know is the fact. But this is rather again matter of exegesis than a question for us to deal with. Then with respect to the hare and the coney : it is not at all certain that these are the animals alluded to in the original Hebrew. Neither is it quite certain that the hare does not chew the cud, though now it would not be classed with the "ruminant animals," according to modern definition, having four stomachs. These nice modern definitions, now recognized, were, of course, not invented when Moses wrote. I remember an analogous circumstance, also, which will illustrate what I mean. In a paper read before the Royal Society a year or two ago, Mr. Flower accused Professor Owen of being ignorant of some nice distinction as to the parts of a monkey's brain, and founded his accusation upon a quotation from a work of the learned Professor upon Zoological classification, where certainly the distinction in question was not noticed. But Professor Owen gave an unanswerable reply to that accusation, by explaining that in a work on Zoology he had not thought it necessary to allude to so minute a particular, and by referring to another work of his, published thirty-seven years before (and from which Mr. Flower had himself quoted), in which the distinction in question was plainly recognized. Now, we could not look for nice distinctions of a technical or scientific kind—and still less for modern distinctions—in the brief allusions to such things in Scripture. There could be no question that the hare would not by us be classed among the "ruminant animals," as now defined. But I am not at all sure that, nevertheless, the hare may not chew the cud. At all events, we are not certain that it is the hare which is alluded to ; and this is really a question of exegesis. It had been stated by Mr. Warrington that many of the objections, whether scientific or otherwise against Scripture, had been given up—

Mr. WARRINGTON.—I never stated that any objections of science had been given up ; but that particular lines of defence are now no longer adopted.

Mr. REDDIE.—That answers my argument just as well. I wish to call attention to the fact that, although the paper purports to deal with "the existing relations between Scripture and Science," it also notices objections, or answers, now given up. But there is one scientific objection, so-called, to which Mr. Warrington makes no allusion in his paper, although, only a few years ago, it was, I may say, put forward as the grand and principal scientific objection to the Mosaic Cosmogony. I allude to the nebular theory of Laplace. It is one of those scientific hypotheses with which Mr. Warrington is very well acquainted ; for, though he may not have adopted it as actually true, he has made full use of it in his well-known *Actonian Prize Essay*, as at least a probable hypothesis. Its omission from his paper now, is, therefore, the best proof of its having been quite "given up," in his opinion, as a scientific objection to Scripture. Now, according to that theory, the world originally

started from out of a blazing fire-mist. Yet, what could be more absurd than that an intense heat, with which life was totally incompatible, should be made the hypothetical beginning of all life! Some had, no doubt, adopted the nebular hypothesis who were not atheists; and they might have no difficulty in afterwards supposing that life might be, notwithstanding, produced by the Deity. But Laplace himself and others, who excluded God from their thoughts, put this forth as a "natural" origin of the world. Let us, then, contrast this theory with the analogous belief of Christians, that the world would be hereafter destroyed by fire. The one theory begins the world, the other ends it, with fire. But the Christians don't profess to prove this as science. With us it is a matter of faith. We find it revealed in Scripture; and with us it is a perfectly rational belief, as it is based upon faith in the power of God to re-create the world so destroyed. Not so, with the atheistical theory of the origin of the world from fire, and without supernatural power. There is no sense in which that could be adopted by any reasonable being. I think, if we were told who were the authors of some of the extraordinary views brought out in Mr. Warington's paper, it would be of great service for our future discussions. Adverting to the notion derived from Scripture as to the earth being "the centre of the universe, for whose benefit sun, moon and stars were created," I may observe that the late Dr. Whewell, in his essay *On the Plurality of Worlds*, has argued that, if the earth be not the literal centre of our system on the Copernican hypothesis, it is, at all events, the centre of life and of interest on the Christian theory. But there have been a great many changes in astronomical science since Copernicus wrote. New facts are being every day discovered; and it would be our duty to investigate and see whether our old theories were consistent with this increased knowledge of the facts of Nature. The world offers to us the same wide field for inquiry as it did to Copernicus or Kepler; and the only object we ought to have in view is to arrive at the truth, whether it accords with current theories or not. (Hear, hear.)

DR. GLADSTONE.—As discussion has been invited by the Chairman, I would ask permission to say a few words, not so much upon the paper which has been read as upon the speeches which followed it. As to the paper itself, I may say I agreed with every word of it. I think it is exactly the kind of paper with which the proceedings of the Society should be opened. What we require at the outset is an outline of the present state of the relations between Scripture and Science, which would enable us to understand the nature of the work which was before us, rather than a paper which would attempt to settle the questions upon which issue is taken, and upon which, if we were to discuss them, we should be likely very soon to get at loggerheads. (Hear, hear.) One thing with regard to the paper with which I have been struck is its comprehensiveness; and yet the subject is more comprehensive still. When Mr. Warington was speaking of the various objections advanced against the Scriptures, and the replies which had been given, a great many occurred to me which are not mentioned in the paper. But, of course, Mr. Warington, in grouping together the various objections and answers, was

obliged to omit much. Thus he had touched very lightly on the question of the uniformity of God's mode of action in this world, and the efficacy of prayer. With reference to the suggestion of Mr. Baxter that, on the publication of the paper, Mr. Warington should enter more minutely into the subject, and argue out the various questions to which he referred, it appears to me that it is objectionable, principally on the ground that it is clearly impossible. What did Mr. Baxter want? Was it the answers which the essayist considered satisfactory? If so, I think Mr. Warington would decline to point them out. Was it, then, the answers which the Council might consider satisfactory, or the members? I think that, among the Council, Mr. Baxter would find the representatives of the three great classes of replicants to which Mr. Warington referred; and that, if they undertook to point out the answers which ought to be given to the scientific objections urged against the Scriptures, it would result in an internecine war. My friend, Mr. Reddie, has also expressed a wish that the authors of the several objections and replies should be named. I confess that I rather admired Mr. Warington for having omitted all names. I am afraid we are all too apt in this world to be led by public opinion and the weight of great names; and I think, therefore, that, with respect to the objections to Scripture, and the replies which they had received, it is far better in this Institute to have as little to do with names as possible. I think it is sufficient for us that the objections have been raised; and it will be our duty, without inquiring the names of the authors, to show that they have no solid foundation. Allusion has been made by Mr. Reddie to the Serpent. I am inclined to believe I could convince him that there is a little more written about the Serpent than he seemed to think. While Mr. Reddie was speaking upon the subject there was recalled to my mind a picture which I have at home of a great dragon which walked the earth at first on four feet; a second view of it showed that it had dropped its two front legs; and in a third view it appeared as crawling on its belly along the ground. (Laughter.)

MR. REDDIE.—I should be inclined to ask who was the author of that strange picture. (Hear.)

DR. GLADSTONE.—He was a man very eminent in science in his time, and he lived about one hundred and fifty years ago. (Hear, hear.) It is not, however, my intention to occupy the meeting with any lengthened remarks. I think it is most important that we should consider all those questions which have been raised by Mr. Warington. I hope to see a still larger scientific element introduced into the Society, and that it may also include within its ranks a large number of men distinguished in theology and literature, who would especially attend to the exegetical part of the work, and to the interpretation of the various passages of Scripture which were supposed to come into collision with the discoveries of Science. I do not look with any doubt as to the result; for I am convinced that the Word of God will continue to show itself impregnable, by withstanding every attack that may be made upon it. (Hear, hear.)

REV. DUNBAR HEATH.—As I am not a member of the Institute, I feel

some delicacy in rising to address the meeting, but it has been intimated to me that I should be at liberty to make a few remarks upon the paper, and I shall do so with the permission of the Chairman. Speaking as an outsider, I would merely state what my opinion is with regard to the objects of the Society. I do not know how you will get on with the task which you have undertaken ; but I may be allowed to say that, in my opinion, the question of the interpretation to be put upon the Scriptures should not be excluded from your discussions. From what was stated by the essayist it appears that a great deal of latitude is allowed to orthodox Christians with regard to this question. Few of them are found to agree as to the interpretation which ought to be put upon different parts of the Scripture, and many of them rejected altogether a great deal of its obvious meaning. It strikes me, however, that the real difficulty connected with the question of interpretation is not so much the apparent contradictions between Scripture and Science, as the contradictions in the Scriptural narrative itself—

MR. REDDIE rose to order.—That question does not come within the scope of the objects of the Victoria Institute. And now we are not assembled to discuss the principles of the Society, but to discuss the paper which has been read.

MR. HEATH.—I was merely expressing my views upon the subject, but I will not enter into any discussion which does not come properly before the meeting. I will not, therefore, occupy you with any further remarks.

MR. PERCY BUNTING.—I cannot pretend to any special scientific knowledge ; but I am, nevertheless, very glad to be able to join in the vote of thanks which has been proposed to the author of the paper. I think that in laying before the members a plain statement of the various questions which would come under their consideration, without leading them to any fixed conclusions, or bringing before them the conclusions which he may have arrived at himself, Mr. Warrington has done all he undertook to do, and has contributed a really valuable paper to the publications of the Society. I only wish that, in the future papers which may be read, those questions which have been touched upon by Mr. Warrington could be taken up systematically and discussed in the order in which he has arranged them. I do not know whether the Council have at hand a sufficient number of men ready to undertake that duty ; but, if they have, it would be very desirable if this suggestion were carried out. Our best thanks are due to Mr. Warrington for the way in which he has brought the whole subject before us, and has grouped together the various objections against the Scripture, and the answers which they have drawn forth. I confess, however, that several of the topics discussed in the paper appear to me to involve questions of exegesis. I do not exactly see how we can get out of the difficulties in which we are placed if we exclude the exegetical question. Whether the animal mentioned in Leviticus is the hare or not, or whether the Hebrew word does not mean some other animal, appear to me to be distinctly questions of exegesis. It appears to me that the Society

should not be confined merely to particular departments of Science, but that it must allow discussions upon every question which affects the truth of revelation, and be prepared to take up all questions of that character exactly at the point where they have been left off by other societies, and determine, if it can, how far the conclusions to which they are supposed to tend conflict with Scripture. All the other learned societies decline to entertain the question of interpretation. It must be taken up by some one, and I think it is especially the work of this Society. It will be our duty when an apparent contradiction is pointed out in Scripture to deal with it. We have plenty of theologians amongst us, and must not shrink from the difficulty of the task.

THE CHAIRMAN.—I am sure the vote of thanks to Mr. Warrington will be readily concurred in by the meeting. It would be quite impossible to discuss such an extensive subject in detail. There is one point, however, in which I would differ from our Honorary Secretary, and that is with respect to the question of exegesis. I do not see how we can exclude it from our discussions. We have not only to determine whether an objection is really scientific; but, if so, whether it is contrary to a fair interpretation of the Word of God. I have used the phrase *really scientific* advisedly, because nothing can be more vague than the application of the word scientific. We shall have to determine what is and what is not scientific. By real science I mean that which is established by perfect demonstration, not that based merely upon hypothesis. When we arrive at the real science, we shall then have to determine whether it is contrary to the Word of God. This can only be done by a fair appeal to the original language of the Scriptures. As an illustration of what I mean, I would only refer to the ant laying up a store of food in summer, and the hare chewing the cud, brought forward by Mr. Warrington. He adduced these as two instances in which the Scriptures were objected to as scientifically inaccurate, and stated that the defenders of the Scriptures had been obliged to take other ground than that of maintaining their accuracy. Now here I am prepared to join issue. First with respect to the Ant. Scientific naturalists, with great boldness, have declared that Solomon was mistaken as to the habits of the ant;—that it does not lay up a winter store like the bee; that he mistook the pupa of the ant for grains of wheat (a pardonable error), and that on this account he stated what was not scientifically accurate. Now, I might be disposed to question whether the matter could be determined by the negative kind of evidence used by our naturalists. The various tribes of ants differ as much in their instincts as do the various tribes of the bee. And he must be a bold man who would predicate, from what he knew of one tribe, what might be the strange instincts of another. I might venture to ask the naturalist, what he knew of the instincts of the ant in Palestine? But I need not confine myself to mere conjecture that Solomon was scientifically correct; for what was lately considered highly improbable by the naturalist, becomes by the advance of the study of Natural History probable in the highest degree. I can appeal on this subject to the high authority of Mr. Darwin as a naturalist. That gentleman

read an abstract before the Linnaean Society, in 1861, of a paper by Dr. Lincecum, describing what he calls the "Agricultural Ant." This ant is a native of Texas. Not only does it lay up a store of seed, but it cultivates it. It plants a crop of peculiar grass in a circular space round its mound. It prepares the ground, sows the seed, weeds the crop, harvests it when ripe, carefully winnowing the grain, and then stores it up for use. The grain is a kind of miniature rice. In wet weather the stores get damp, and the grain becomes liable to sprout, but the ants take advantage of the first fine day to bring out the damp and damaged grain, expose it to the sun till it is dry, then they carry it back and pack away all the sound seeds, leaving those that had sprouted to waste. I quote the abstract of this paper from Wood's *Homes without Hands*. Now, I would venture to remind you that we have here the observations of a scientific naturalist founded upon twelve years' careful watching of the habits of this species of ant. Ignorant as we confessedly are of the Natural History of Palestine, I think no naturalist will be forced by his science now to maintain that Solomon was necessarily ignorant of the habits of the animal he described. So much for the ant. The case of the hare chewing the cud gives me a still better illustration of the method of dealing with these controversies. Dr. Colenso has lately given great prominence to this subject, asserting that, if Moses as a lawgiver made a scientific blunder with respect to the hare, he could not be inspired. Now, this is one of those questions in which I think we may invoke the aid of exegesis. Does Moses assert that the hare chews the cud? Is it certain that our translators have correctly interpreted the word used by Moses as the hare? Now, to go no farther back than the Septuagint translation of the Old Testament, made some two or three centuries before Christ by Alexandrine Jews, I think we may there discover a proof that at that period there was considerable doubt as to the identity of the animal spoken of by Moses. The Hebrew word *Arnebeth*, which our translators interpret the hare, occurs but twice in the Old Testament: Lev. xi. 6, and Deut. xiv. 7. In both these texts the *Arnebeth* is associated with two other animals as forbidden food, the camel, and one called in Hebrew the *Shaphan*, because, though they chew the cud, they divide not the hoof. Now, the *Shaphan* our translators have construed as the coney, or rabbit, while many of the copies of the Septuagint read the *χοιρογρόλλιος*, or hedgehog. Beside these two passages of Scripture, we find the *Shaphan* mentioned in two other places, in Psalm civ. 18, and in Proverbs xxx. 26. Now, that there was great uncertainty with regard to the Septuagint translation of the word *Shaphan*, we find proof in the fact of the various readings of that translation. While many copies of the Septuagint give us *χοιρογρόλλιος*, others render the word *Shaphan* by *λαγών*, a hare. Still further, to show the uncertainty as to the translation of the words *Arnebeth* and *Shaphan*, the Greek renderings of these words are interchanged in the various readings of the Septuagint. While the Septuagint, therefore, throws considerable doubt on its own renderings of the words *Arnebeth* and *Shaphan*, comparative philology gives little or no aid to our researches. From exegetical considerations alone,

therefore, we might protest against any charge of scientific inaccuracy being brought against the Old Testament Scriptures, where the rendering of the Hebrew name of the animal in question was evidently doubtful, long before Natural History was cultivated as a science. Supposing, however, we admit, for the sake of argument, that the *Arnebeth* is the hare, can we still maintain that the hare does not chew the cud? Since the hare makes a motion like chewing the cud, it has been supposed that Moses made the mistake that the hare did chew the cud, while in reality it does not. Has this been demonstrated? Naturalists have found it convenient, in forming an artificial arrangement of animals, to constitute a class called the *Ruminantia*. All these animals have four stomachs, and all chew the cud. This is one of the best marked divisions of animals naturalists have devised. The camel, though presenting some anomalies when compared with the other Ruminantia, belongs to this class. But does it follow that all animals which have not four stomachs do not chew the cud; do not, in other words, regurgitate their food habitually, for the purpose of completing its mastication? I think not. Indeed, I am prepared to bring proof to the contrary. I have already referred to the word *Shaphan*, translated in our version of the Bible *coney*. If I refer to the article *Coney* in "Smith's Dictionary of the Bible," I find the writer of the article showing that, in all probability, the animal corresponding to the Hebrew word is the *Hyrax Syriacus*, an animal abundant in Syria, and corresponding in all its habits to the Scriptural description of the *Shaphan*, except chewing the cud. Now I can adduce undesigned testimony to the fact that the *Hyrax* does chew the cud, though it does not belong to the order *ruminantia*. The *Hyrax* is a most puzzling creature to the scientific naturalist; he hardly knows where to class it. Resembling the rabbit so closely as to be popularly called the rock rabbit,* the naturalist classes it with the rhinoceros tribe. Mr. Hennah, as stated in the transactions of the Zoological Society of London, shot many of the Cape *Hyrax* in the Cape of Good Hope. He found that the stomachs of those he shot were always much distended with food scarcely masticated. Moreover, he tamed a couple of these little creatures, and he makes this assertion: "I have also heard it chewing its food by night, when everything has been quiet, and after going into its sleeping apartment." We have also the authority of Cuvier for maintaining that the Cape *Hyrax* is of the same species as the *Hyrax Syriacus*. Surely, then, we have undesigned testimony to the fact, that an animal not belonging to the order *ruminantia* regurgitates imperfectly-masticated food for the purpose of completely masticating it. But we can refer to human ruminants. If you take up most works on physiology you will find an article on human rumination. The cases of individuals posses-

* This popular name for the *Hyrax* is most important, in connection with the two passages of Scripture in which the "coney" is partially described. For instance, in the *Psalms* (civ. 18), we have, "The high hills are a refuge for the wild goats, and the rocks for the conies;" and in *Proverbs* (xxx. 26), "The conies are but a feeble folk, yet make they their houses in the rocks." The conies referred to in these passages are evidently "rock rabbits;" and, if so, this almost settles the question.

sing and habitually exercising this power are by no means rare. It is attested by some of the greatest physiologists. We cannot ask the ox or the sheep whether rumination is a voluntary or involuntary action, but we may the human ruminant. This, therefore, is a question on which we may appeal from the mere systematic naturalist—who tries to discover anatomical considerations for the convenient and systematic classification of animals—to the physiologist and the careful observer of nature. The physiologist admits that animals not of the order ruminantia do chew the cud. A careful observer who tamed the Hyrax found that it did chew the cud. Cowper, the poet, kept tamed hares, and he, no incompetent observer, asserted that his hares did chew the cud. Surely we need not, therefore, feel ourselves obliged to condemn the writings of Moses as scientifically inaccurate, even though we should admit that *arnebeth* is rightly translated the hare. The question of exegesis I think will also come forcibly before us on geological questions. Theologians have been taunted for adapting their exegesis of Scripture to suit the hypotheses of geological science, I think most unfairly. The meaning of the term translated “day” in the first chapter of Genesis was a matter of discussion among the ancient fathers of the Church on philological grounds, long before such a science as geology was thought of. An interpretation of the word “day” was taken from these theologians by some of our most eminent geological authorities, because they thought it favoured their hypotheses. Now that these hypotheses seem to be untenable, the scientific objector turns upon the defender of Scripture and asks him, why he uses an interpretation lately so strongly insisted upon by the scientific geologist. Upon this question I cannot now enter. I think now the theologian has a right, before he attempts to answer the objections urged from geology, to require the geologist to give a demonstrative proof for his assertions. I know no science more remote from an exact science than that of geology—no science the hypotheses of which are so fluctuating. Hardly a geological hypothesis now maintained is much more than ten years old. I have investigated most of the proofs formerly urged for the great antiquity of the fossiliferous strata of the earth. I have found scarcely one which has not been contradicted by more recent observations. Whatever we may say in favour of theological dogmas, we cannot permit dogmatism in the world of science. There everything must stand or fall by the test of rigid proof and demonstration. Without further trespassing on your time, I am sure you will all cordially unite with me in a vote of thanks to Mr. Warington for his interesting paper, and for the vigorous manner in which he has dealt with the question to which he has applied himself.

The vote of thanks having been carried by acclamation,

Mr. WARINGTON, in acknowledging the compliment, said—If I had closely adhered to the rules of the Society, as laid down in print, I believe the question of exegesis would not have come within the scope of the discussion; but I felt that it would be absolutely impossible to deal with the subject without some reference to exegesis. I have quoted no objection whatever against the Scriptures which I have not found in print, but I did not give

the names of any of the objectors, because, had I done so, it is ten to one that they would think themselves mis-represented, and the Society would be involved in a discussion foreign to the objects which we have in view. With respect to the observations of the Chairman, I must say that I was not aware that the scientific accuracy of the statements in the Bible with respect to the ant was still maintained, and I must so far qualify that passage in the paper. So far as I had previously heard, no one had ventured to dispute the facts as I stated them. I knew, indeed, that an attempt had been made to prove that the hare and coney were not the animals alluded to, but I was not prepared to hear it stated that the ant gathered in food for winter. The authors from whom I quoted found their objections upon a careful observation, not only of the habits of the ants in England, but in Palestine. With respect to the translation of the Septuagint, it was plain that the transcribers were aware that the hare and the coney did not chew the cud, for they inserted the word "not" in the passage, though it clearly did not belong to it, and destroyed the sense *in toto*—

The CHAIRMAN.—I confess I was not aware of that fact before.

Mr. WARINGTON.—If the chairman will examine the text* he will find that the word "not" has been inserted. With these observations, I will only thank you for the kind attention which you have given to the paper, and I hope that it may prove in some respects beneficial to the cause which we have all at heart. (Applause.)

The CHAIRMAN then adjourned the meeting to the 18th of June.

* Vatican MS.

ORDINARY MEETING, JUNE 18, 1866.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous meeting were read and confirmed.

The following Paper was then read by MONTAGU BURNETT, Esq., M.A., in the absence of his father :—

ON THE DIFFERENCE BETWEEN THE SCOPE OF SCIENCE AND THAT OF REVELATION AS STANDARDS OF TRUTH. By CHARLES MOUNTFORD BURNETT, Esq., M.D., Vice-President.

NOTHING would appear to be more reasonable or more just than that the natural mind of man, that mind which was made to contemplate every visible object we behold around us, should be adapted and fitted for that purpose with the highest degree of accuracy ; so that precision and perfection should be in its ultimate sense the end to be obtained.

We have, accordingly, provided for this purpose, both external and internal organs of sense, which, when applied to the objects around, cannot fail to convince us, that they have been furnished with a view to ascertaining the more intricate nature, or the more obscure characters of those objects ; by which we have put into our possession an instrument that conveys to us with assurance doubly sure, that we cannot be mistaken when they undertake to inform us on such matters. So that while our outward senses are engaged to put before us within a prescribed range all that really comprises the outward world, we are enabled with our inward faculties to compare, to reason upon, and to bring to bear the order and the regularity, as well as the beauty and perfection of that work which is set in our midst, apparently for the express purpose of our guidance and contemplation.

The more we ponder upon this magnificent work, the more we become impressed with the sublimity and grandeur of its design ; so that before we ascend to those surer and higher

tests which are to convince us still more assuredly that a profound design, an unvarying precision, marks the movements with which this globe performs its daily evolutions; the more certain are we, that one great Artificer made it what it is, and stamped it with laws which cause every part to be dependent on the rest; and thus we have a proof that one Mind and one Will gave it a real existence.

But could this Being have determined that any other result but truth should issue from the contemplation of such a work? Could any uncertainty be made to proceed out of a work which, on every side, bespeaks not merely magnificence and beauty, but regularity and order.

Surely we could not decide, with the reasoning powers we possess, that this fair and beauteous work was made to mislead and misinform man, *that one* of all the denizens of the earth who alone is able to be convinced that a perfect God made the heavens and the earth, and all things therein, with a marvellous wisdom.

Can we then be surprised that man should believe that he beholds in this work the finger of an unerring and perfect God, and that it should be set for his natural belief in the greatness and unchangeableness of that God?

Can we be surprised that with such faculties as enable him to do it, man should have power to link together the worlds that float in the heavens around him, or to discover the laws by which those worlds are moved, or to note the revolutions which they were made to observe?

Can we be surprised that as man's knowledge of one law was succeeded by that of another, and that as his apprehension of those laws became more certain, more cumulative in character, that he became less disposed to give them up as a standard of truth, as a foundation on which to erect a chronicle of time and of events, to which he could look backwards or forwards with security and confidence? And before we take upon ourselves the authority of answering these questions, we must state at once, that with regard to the work in question, there cannot be any doubt abstractedly of the correctness and invariableness of this standard. It is not, therefore, on the side of the standard of Truth itself, that there is any shortcoming in its ability to furnish it, but the imperfection is on the side of man. Fallen from his original perfection, he fails to bear morally that relation to the natural creation which he did before the fall, and therefore his impaired faculties have failed to justify his reliance upon them as a standard of Truth.

We have not only the experience of ages to prove this, but

it is confirmed by Revelation, another standard of Truth given to man after his fall, by the same Being who established the first standard, after man was in a state which shut out from him the possibility of his reaching all the knowledge necessary for his eternal salvation.

Every believer knows that "the world by nature knew not God," and that we cannot by this means find Him out to perfection.

"Canst thou by searching find out God? Canst thou find out the Almighty to perfection? It is high as heaven, what canst thou do? deeper than hell, what canst thou know?" Yet that man in his natural state had every inducement to believe that by the light of nature, when unassisted by any other standard of truth, by which he was to arrive at a higher fuller meaning of the word, I must deny.

If in this belief he was otherwise to be instructed, if he was to learn that up to a certain point only his conclusions might be right, and that wisdom, order, and unchangeableness were in this direction to be the only evidences which natural philosophy would afford him in finding out the ways of God; it is no discredit to him that he had overrated this standard as an evidence of truth, and had given it a power of unfolding more definite and important truths which it really had no means of accomplishing. This fact has never been placed before the mind of the natural philosopher in its true light, but too often opprobrium and contempt have taken the place of that reasoning which it was in the power of their opponents to use with so much success. If the natural philosopher were ever to be convinced that he had at this point taken a devious path, it would have to be accomplished only through a well-considered and well-conducted argument, too sound to be refuted, and too unmistakable to need any mixture of ridicule or abuse. For if we know our adversary is in error, this calls the more strongly on our part for forbearance and patience, but above all for circumspection, lest in our zeal to correct others, upon so difficult a question, where faith plays so important a part, we display a mind and a temper which badly recommend the truth, and are totally at variance with that far higher knowledge which we profess to believe in, but which, by our want of charity, we have failed to recommend to others.

But now, for the sake of argument, I will ask you hypothetically to believe, that no other knowledge but that which we derive from nature, has been placed within our reach; and that man has been provided with no other source whence to discover the truth of his real destiny. Let us, for the sake of preserving the hypothesis, suppose him to proceed to investi-

gate all that he can see around him in the earth and in the heavens. Feeling sure that truth can only be arrived at through this one channel, he spares no research, and is neglectful of no means likely to make his conclusions certain, and his inferences not to be disputed. He weighs these things in the balance of induction, and he tests them there, by their conformity to those laws which he has now discovered to be unchangeable. He penetrates the *crust* of the earth, and the very first object that presents itself to his mind, is one that, while it confirms the conjectures which he has already arrived at, by seeing that both man and animals are subject to death, presents also a difficulty which he is unable to explain by any law within his reach ; for the difficulty is opposed to the careful and regular computation of time. He finds, for example, that not only whole genera and species of the living creation have been entombed in the earth, but that genera and species, not now forming any part of the living creation, have also been buried there. And from the space and order and other characteristics which these remains exhibit there, he gathers that the living creation was not the first creation, but only one of a series which have followed each other in succession during countless ages of the world. He discovers, further, that these acts of creative power were manifested by slow and varied degrees, so that they took many thousands of years for their completion. Further, he discovers that man was created at a comparatively recent period of the earth, only parallel with those animals we now see alive upon its surface. And the truth of all these deductions rests alone upon the position of these remains in a certain relation to others, and in such order, that the inference cannot otherwise be drawn, than that they occupied in time a regular and independent place in the order and sequence of creation. That is, he recognizes several distinct creations, which had no more connection with the one that went before, than what was to be implied in the supposed fitness of each for a condition of things then existing on the earth, which had not previously existed.

That these difficulties, unfolded by the investigation of the earth, as the natural philosopher explored her interior for the discovery of truth, ought to have led him to conclusions so vast and so important, with greater caution, can only fairly be admitted. They should have led him to examine the grounds on which he sought to establish so wide and so high a standard of truth, upon a basis so limited and unsustained. Whereas, a fair amount of reasoning should have satisfied the natural philosopher, who joined in this hypothesis, that no such inference could justly be drawn ; that because a large portion

of the animal creation, found buried in the earth had become extinct, therefore that portion had preceded the present creation, as a separate and consecutive act of the Creator.

The legitimate inference to be drawn from these facts by natural philosophy alone, as an unquestionable evidence of truth, was simply this; viz., that from some cause not capable of being found out by this channel, death had at some time been introduced into the world.

But the knowledge of natural philosophy had previously carried human investigation further than this, in the examination of the laws that govern the heavenly bodies, though no attempt was made to show natural philosophers, by this means, that they were able to satisfy their minds of more than of the existence of a God, and of the wisdom and power He had displayed.

So much, therefore, of the truth they had attained, and so far their views were opposed to none who call themselves true philosophers. So far, we presume, no one desires to subtract from Natural Philosophy, that which she has so patiently and triumphantly earned, by the most painstaking and diligent perseverance. For she has rolled away a great stone from that aperture whence light came to us in the darker ages of the world; and if she could have increased that light by means within her reach, she would have done so heartily and earnestly. It should ever then be remembered that it was not her wilful fault that she could not do more, but her very pardonable error, that she attempted to do too much. But after Newton's death, naturalists began to claim for natural science in general more than she was able to tell us. As a great naturalist said, "We admire the power by which the human mind has measured the motions of the celestial bodies, which nature seemed for ever to have concealed from our view. Genius and science have burst the limits of space, and observations explained by just reasoning have unveiled the mechanism of the world."* Here the wise philosopher should have stopped; and even in this position greater humility would have become him better. Truly it was a great achievement to be able, thus far, to advance in the confirmation of truth, though a more perfect knowledge even in this direction has proved, that the unveiling of the mechanism of the heavens to man in his present state was not incompatible with calculations which assure us, that though there was no doubt of the invariableness of that Being who made them, yet there was a doubt of those who reduced that invariableness to figures.

* Cuvier's *Theory of the Earth*, translated by Professor Jamieson.

When, therefore, this great philosopher went on to say, "Would it not also be glorious for man to burst the limits of time, and, by means of observations, to ascertain the history of this world, and the succession of events which preceded the birth of the human race?" then I could no longer follow him, though he were a great philosopher; being assured that while the fact of many events in the history of the earth may be proved by the investigation of its structure, and many of the laws by which its movements are governed, though not explained with the most undeviating accuracy, may nevertheless prove sufficiently correct to convince us that they are in themselves invariable; yet when past or future time came to be judged of by this method of induction, and we proceed to dogmatize upon our power to compute it, through the agency of rocks or bones, or other things unfolded to us by exploring the interior of the earth, we can then no longer trace any connection between the things stated and the supposed proofs which were adduced to show that the right conclusion was in this way to be inferred.

We can judge of time imperfectly by the laws of induction. Time stands in relation to geological events very much in the same position as death. When it is used to explain causes that are not reducible to those laws, it is simply impossible. Even when we judge of time nearer to us, there is a difficulty in computing it, if it do not come within the range of those laws; if, for instance, we judge of the operation of time, as we judge of it surrounded by light and air, or by things not surrounded by these elements. Some time ago, the cities Herculaneum and Pompeii were discovered. They had been more than 2,000 years, as it were, hermetically sealed from these agencies. What was the consequence? The oil was found *still* in the lamp, the wine still in the bottle, the colours were preserved on the walls, and no change had passed over the most delicate substances, though all this time had elapsed since they took up that position in which they were to be preserved unchanged through so long a lapse of time. To use the language of a classical writer, we may say here, "Time has had its wings petrified in the midst of its flight."

But to take an instance from some geological example. Take a common rounded flint from the sea-shore. We behold it, even and water-worn; we observe it so hard, almost incapable of being scratched by the sharpest instrument, that an immense period of time must have elapsed to produce any effect upon so hard a surface, by the common friction it is exposed to at the present time. Probably it would take many thousand years to produce such an effect as that before

us, yet who can say it was not produced in five minutes of our time without a miracle. If the stone was worn before it was hardened, it certainly could be done in five minutes, and what is there to show that the hardness preceded or followed the friction?

So that when we seek to deduce conclusions which we think are borne out in the same direction, without calculating the changed differences of the two cases, we not only exceed the limits of truth, to which inductive philosophy is entitled to bear them, but we place ourselves at once in a formidable attitude with respect to an entirely different source of truth, from which was to be drawn, nothing that natural philosophy had not advanced up to a certain point. For each source had equally affirmed the existence of one God, and that that God was infinite in power, and unchangeable in purpose. But here, it would have been well if Natural Philosophy had paused. The standard of truth to which we now appeal, confirmed, as we have said before, all that Natural Philosophy had asserted up to a *given point*, beyond which she was unable to give any right inferences or deductions. This higher and more detailed standard of truth was Revelation.

But, as some would say, what is Revelation that we should believe her statements before the evidence of our senses? Here we must answer, that Revelation is a message expressly sent from God to man for his direction and instruction in those things which closely concern his eternal destiny, and which he could not have known in any other way. This is a very vital point, requiring to be kept steadily in the mind, especially in these times; for if there were any way besides Revelation that could have informed us that death had been brought into the world by sin, then we should have had more reason to believe that Revelation was unnecessary. But Revelation was no other than the Spirit of God speaking through men of every rank of life, and its claims to our belief rested on many infallible proofs. Thus, it was quoted on many occasions by the Saviour of the world whom it first made known to man. It made assertions which most accurately came to pass as it had said; and, moreover, it challenged the whole world to disprove a single statement that it made. But besides this, it made another claim upon our belief still more remarkable; for it made statements which were contrary to our natural belief, so astonishing, that if some of the most remarkable had not already come to pass, we might have disbelieved them altogether.

But, in order that we might not do so, we should notice with attention the course she has pursued. She had at this point

to take up a chain which natural philosophy was unable to link together or to find; in other words, to make statements which could not even be guessed at, or carried out by natural philosophy alone; as there was no necessary induction that could certainly follow the announcement of the facts which natural philosophy thought she was able to make. Let me make this clearer by example: the fact that death was to be announced from the earliest period to which geology really could point, showed this truth; viz., that while Revelation would not contradict natural philosophy as far as the *certainty* of this fact went, that death had come into the world; at this point she takes it upon herself, if we may so say she takes it out of the hands of induction, *i. e.* out of the hands of geology, and at once proceeds to give the reason *why* death came into the world,—viz., as the consequence of sin; and *when* it came into the world,—viz., as the consequence of *Adam's* sin.

Natural philosophers here, very unwisely, advanced beyond the confines of that science which they undertook to unfold. They told us that it was in order that other creatures might take the place of those that had died, that death was brought into the world.

But if this was the truth, then it must be seen by all, that Revelation and Natural Science are *not* agreed upon this point; and which of the two standards of truth has most claim on our belief, no one, I think, can doubt, after what has been said. It must be clear to any one, that the connection between the *fact of death* and *its true cause* was not likely to be found buried in the strata of the earth; and though it is not necessary to enter here into all the important circumstances that render it essential to his eternal safety that man should know that the sin of Adam was the cause of death; yet we may say here, that it was the peculiar feature of the truths conveyed through Revelation that they were not written in the Book of Nature. The Book of Nature confirmed the fact, and there stopped; the Book of Revelation went on to explain the cause of that fact.

The position, therefore, that Revelation took up was, to say the least, a very remarkable one, for it not only confirmed what natural philosophy had discovered, as far as the simple facts were concerned, but it proceeded to unfold in detail the particulars of a wide scheme of divine purpose, which was to influence and regulate the future history of the world, though all that it stated on this point was before unknown. The veracity of what was advanced, claimed our highest attention, and commanded at once our respect and belief. And here I must mention a circumstance which, to me, is

as unaccountable as any of the difficulties which natural philosophy has to contend with, in undertaking to unfold a system of truth which is to apply accurately to the most minute events, past, present, and future, connected with the destiny of this world. If this Revelation had been the mere invention of man, if its natural evidence were dead against the probability of its truth, how do we get over this difficulty, that it holds to this day higher grounds than any other evidence we can advance; and in this position, what folly is it to suppose that it does so by putting forth a reasoning that is not even parallel with, but below, the reasoning of man? And what makes the position of this reasoning so conflicting is, when we ask where was the necessity of God's revealing to man that which was already to be found in the evidences of the natural world? We oblige ourselves to believe, when we take up such a position, that He who offers himself as our Divine instructor, is capable of committing an act of supererogation, that at once places Him below His reasoning creatures. If there were nothing more to tell us than we might naturally discern with the aid of those faculties we already possess, for the investigation of the physical world around us, where was the need of a higher and super-natural method of conveying those truths to our minds, which Revelation alone undertook to make known to us?

This argument forces us to respect the authority of Revelation without cavil. But I said that it staked its veracity upon grounds which one falsehood would have been sufficient to overthrow. It had asserted that not one statement should fail of all that it had advanced. This was, indeed, a bold assertion, if it was not to come from a standard of truth higher than natural philosophy. But the marvel still increases. It proceeded at once to break new ground, to ride over, as it were, the prejudices and assertions of all who pioneered in the path of truth. For it at once showed that geology had not the most distant conception of the *cause of death*, and without foundation had stated what was not the truth.

If we are attentive to compare the statement of Revelation, as to the case of the six days' creation offered there for our belief, we shall at once be struck with the unique and wonderful explanation which is there given of it without reserve.

And if we place this alongside of the statement offered by geologists, we must indeed be astonished at the inexplicable difficulty, the irreconcilable assertions which we here meet with. Thus, while the one makes no hesitation, no explanation, in affirming, what perhaps was the least likely thing ever to enter the mind, viz., that in six natural days of

twenty-four hours, the Lord made this earth, and all that in it is; the natural philosopher asserts that the world was not made for many thousand years.

So that, while both authorities are able to confirm one another in the great fact that all things were created with the knowledge and power of an infinite God, both were not capable of giving a minute explanation of the *manner* and the *time* in which this event was completed.

And there was ample reason to show why inductive philosophy was unable to furnish this more detailed explanation, and why nothing less than divine inspiration could do so.

The creation having at first been made perfect, it was, after a certain period, to become so far interrupted, as that a large portion of the then living part should be destroyed by water. This was a catastrophe not reasonably to be inferred or expected. There was nothing in the chain of perfect creation to lead to or to link this event with anything that had gone before, without the aid of Revelation to guide us. It formed no part, it was not in fulfilment, of any of those laws which had been attached to creation at the time it was originally formed. It was even brought about by means that were not only independent of those laws, but that actually defied them. As if to show us that, as creation was first brought into existence before those laws were made which were destined to regulate it, so here, by the same Power, the earth could be destroyed without making any appeal to those laws which were given to it for its continuance.

As, in the first instance, all things were made by *miraculous* and *supernatural* power, before those laws were brought into action which were to guide them, so, when the time came that the creatures were to be destroyed which were upon its surface, their destruction was effected by *supernatural* means; and, as such, they could furnish no more evidence as found in the earth, how or when the Deluge occurred, than they could tell us *how* the earth was formed in six days.

There was nothing in the bowels of the earth to satisfy man of the reason of this catastrophe, and without Revelation we should be ignorant of its causes at this time, though we might see and adduce abundant evidences of the fact having taken place.

It was not necessary to show that that act of creative power, which marked the operations of the Divine hand in the six days' creation, was an operation so strictly limited that man could not contemplate God in the capacity of a natural Creator subsequent to those six days.

But, as we limit these higher truths to the light of Revela-

tion alone, it becomes us to be very careful how we make that Revelation say what, perhaps, it did not say. This is a difficulty with which the Biblical student will often have to deal, and if he is just, he will give to the natural philosopher all the advantage to which he is entitled, when we oblige him to receive authority so high, and so unique, injured and misinterpreted as it is, or at any rate not rendered clear, and without doubt, in many passages that are now even obscure in the present day. A great responsibility rests on those that have made the word of God say what it does not say. For instance, it is all-important, if we want to conduct this argument with due justice to both sides, that we decide, more correctly than has hitherto been done, what was really comprehended in the six days of the living creation mentioned in Genesis; and that obliges us to say, that neither the original Hebrew in Genesis, nor natural philosophy compels us to understand that every creature we now find on the earth had its exact counterpart in that six days' creation.

But I have made an assertion which I can hardly expect those who have not been able yet to believe it, will receive without some further proof. Indeed there would be no necessity that I should occupy your time in this place and upon this occasion, if my arguments were *exclusively* to be drawn from the proofs of the supernatural source from which Revelation derives her authority. It would be unreasonable to expect this; and charity alone, which makes allowance for all those who differ from ourselves, obliges me to give a reason for what I state, in language which is nearer to the arguments taken up by those who differ from myself. It is only fair, therefore, that I draw my argument from geological sources. Thus, geologists are very confident in their assertion that more than one independent creation has passed out of the hands of the Creator. They are persuaded that they see marks in the fossils that have been entombed in the earth, distinct enough in their character to justify them in drawing the inference that they were separate and independent acts of creation—separate as regards time and general external appearance; and I wish it to be noticed that it is not a consequence that, because great stress is thrown upon the expression "very good," as applied by God himself to that creation in Genesis mentioned in the six days, therefore all the animals that we see *now alive* necessarily constituted part of that creation.

The term "very good" cannot be a term taken in the abstract, but must necessarily form a proper relation to the time and circumstances of that creation to which it applied. In this sense, that creation which was so described by its

Creator (by one who is Himself perfect), could have no fault, or disjointed appearance, palpable to fallen man. But it is not therefore a consequence that God might not have created animals *at a subsequent period*, such, *e. g.*, as after the Deluge, which then would form a better and closer relationship to the changed circumstances that had just taken place. The point here most to be attended to is, that no living creation *preceded* the one in question. The error of geologists has been the mixing up of the cause of the destruction of the present creation, mentioned in Revelation, with other causes which they suppose preceded it. They erroneously assume that death preceded the creation in Genesis; and therefore they deny that all the ravages caused by death could have proceeded from the one deluge mentioned in Genesis. But there is more difficulty here in believing that all the evidences of destruction of life which we discover buried in the earth proceeded from different and successive causes, than there is in believing and proving that death proceeded from one cause, as stated in Genesis.

If we proceed to investigate and to compare the remains of fossil animals of all kinds that have ever been exhumed from the earth, we shall find that there is no exception to this rule: that independently of the marks of design which identify them as the work of the same God, there are other marks upon them which show that they filled up places that must otherwise have been vacant in that creation which was pronounced by God to be "very good."

And as we know that many parts of that creation have become extinct, that some hundreds of its higher species, and four-fifths of its lower species have disappeared (for though these may not be all extinct, yet we have never seen them alive, and only some of them in a fossil state), we are sure there must be found in the earth many animals, the representatives of which are not now seen amongst the living parts; yet amongst none of them could it be said from their appearance that they had no connection, and were totally isolated from the living creations supposed to precede the one mentioned in Genesis. Everything that has been discovered in the earth, only serves to make more perfect that living creation which, as far as we know of its disjointed character, occupies the earth at the present time.

It is in this way that we are indebted to geology for instructing us more minutely as to what the creation must have been at the time when it received the title of "very good," when it came forth from the hands of the Creator. And but for the discoveries of geology, we should have had a less

detailed idea of the extent of the disruption which has taken place in that creation which we now behold. For the most delicate and perishable organizations—particularly in the lower species—have been preserved so beautifully and wonderfully, that we could not have known of their existence at all, but for the care which has been taken of them in the bowels of the earth.

Yet with all that the earth can disclose, and calculating every known species or individual that has ever been discovered, there are still many difficulties to be explained and many links to be repaired, from those animals that have been entombed, before we can presume to say that we have in our possession, before our eyes, that *one* creation which drew forth from its Creator those memorable words, "And God saw everything that He had made, and behold it was very good." If we go into the most extensive collection of recent and fossil remains of animals, if we study the national museums in this department of history, we must see directly that all our power to reach anything like perfection in this direction has failed; that often the chain, or the circle, has been lost, and we cannot trace it.

The very infirmity of our mode of grouping the animal creation together, shows the failure which must attend the effort of any finite being to study to perfection the work of an Infinite God. But the great difficulty we have of arriving at the truth of what constitutes the *living* creation, is not confined to the impossibility of determining all the genera and species which have become extinct. Another difficulty arises from our inability to form a true classification, even of what is before us. If we attempt to make a chain, we cannot do so without losing the most correct idea we can possibly have of the living creation. That Being who made that creation is Eternal. He has neither beginning nor end. This idea much better expresses the living natural creation by a circle, having neither beginning nor end, in which you can take no part or individual of that circle, and say one part was higher than the other.

This is just the course which the Eternal Being has pursued in the living creation; He has made that creation up of an infinite variety of circles, some larger, some smaller. In this way we see animals linked together, not as it were by a long pendent chain, but by a circle; so that in many particulars which characterize the individual, the more prominent parts of an animal are linked by a resemblance, more or less close, to some others. But nomenclators have, in many instances, strung animals together by a single link, which of course gives

but one character by which they may be distinguished, and consequently we must see how impossible it will be to complete the circle of which such animals formed a part.

We have said that there is the greatest reason to infer and to believe, that no creation, in which was the breath of life, took place before the six days mentioned in Genesis. And we ground this belief on the assertion of Revelation that by man sin, and consequently death, came into the world. Inductive science says, No—death was in the world before man sinned, because death was in the world before man was created. Which of these assertions is true? and which is most to be believed?

The assertion of inductive science *claims* to be believed on the ground of proof by natural investigation; whereas Revelation does not even attempt to show that there is any *inductive* proof that man's sin was the cause of death. Her assertion upon this point, is without explanation of any cause of this kind whatever. We are therefore driven to inquire, whether the inductive method will bear out the natural philosopher; viz., whether there is any connection between the *event* of the Deluge, which they admit, and the *cause*, which they state as capable of proof from *induction*.

This is the point mainly at issue; and as it is entirely different from Revelation, it becomes natural philosophy, in the first place, to prove that she can, by induction, show that death was in the world before man sinned.

Bearing this in mind, that if natural philosophy could show by ocular and inductive proof, that death was an event which took place before the six days of Genesis, we should still doubt it; not merely because it was not true, but because Revelation had said differently, and that upon grounds that I have shown cannot possibly be disproved, but which bear, nevertheless, no relation by induction.

Now, therefore, it is my place to show that it is impossible by the inductive method to prove the *cause* why death came into the world. I must prove this before I can expect those who say that they can adduce such evidence, to alter their mind, and admit it is possible they were wrong. Let us, first, suppose that the sin of Adam, which brought death into the world, was the first and only cause of that occurrence. This will show that by the inductive method we cannot find the cause of death by examining the earth. We should expect to see some proofs by which all the genera and species which are entombed in the earth, might be identified in some unmistakable manner with those now living. This it is important to show, because, if only an individual is found now in our seas,

or in any other position on the earth, and that individual may be identified with living species, and we find in the supposed oldest formation which geology has assigned, a similar individual, or species, or family to which it is undoubtedly allied with the living creation, this at once shows that when this oldest formation took place, its animal contents were deposited at the same time, and *in* those animal contents one being found that is identical with the living creation by such a connection as I have just named, the conclusion follows, that they were both created at the same time, or, in other words, that creation which was at first formed, is the same in type as that which now exists.

The difficulty to prove this is not so great as it would appear. The circumstance of finding many species in the supposed older formations of the earth which we do not find now alive, only proves that some of that creation, of which man formed part, has become extinct, and this is very naturally to be inferred from the altered condition of the earth (which marked it) before and after the great deluge. A very large portion we know has passed away in that catastrophe, which extinguished so many. There is reason to suppose the extinction of species to have occurred to the greatest extent in marine animals; we are not surprised to find in the strata of the earth many genera and species strictly confined to the ocean are now found buried in the earth within our reach. As a matter of course, when the Deluge came, many of the animals that were destroyed took a position more or less attractive than others, from their having increased so much more between the time of their creation and extinction; for, as a rule, we may determine that the higher the position the animal took in the living creation, the more scarce it was, and the less the number of that animal likely to be found; so that for one higher and warm-blooded animal we should expect, as the natural evidence of such a catastrophe, countless thousands in the earth of the lower animals, such as the Mollusca. On this account we shall take our example from those that are found fossil in greatest abundance.

It cannot, therefore, be a surprise to any one that such a species as *Terebratula*, among these last, should be represented by mountain-masses. Nor would it be at all unaccountable, if not one of these *Terebratulæ* should be found alive at the present time; for we have evidence enough to show that when the Deluge came, many parts of the earth were so much disturbed as to engulf mountain-masses of those creatures that were then living in the seas, so effectually, as that not one living individual may have been preserved; yet this is not to

say that the whole earth was alike so engulfed. The evidence of some districts helps to show that much less fearfully disturbing causes might have occurred there than elsewhere.

I, however, for a long time, thought that that species, the *Terebratula*, as a distinct species (varieties of which, amounting to more than two hundred, occupy a place in almost every stratum which geology has successively marked), was really extinct, till I had four individuals by accident brought to me by an old friend, whose brother, the late Captain J. M. R. Ince, R.N., had dredged them up in the harbour of Port Jackson. It is difficult, at the present time, to bring this fact so clearly before the mind of the general public as that they can understand its merits, as a proof of what is here brought forward. It needs some knowledge of the particular subject to enter into the value of this proof. Thus, *Terebratula* may be asserted to have been long known to exist, not by this term, because there was a slight difference in the hinge which justified its being recognized by a different name; but, nevertheless, so closely related to it that it really becomes a wider argument to show that species and varieties of many shells in a fossil state are closely identified with the living specimens. This convinced me of this fact; viz., that regardless of the small number, I could not avoid coming to this conclusion, that the *Terebratula* as a species was that which formed part of the present creation, and, therefore, the present living creation was in type the same when that destruction came and placed them where they are in the earth, as we find them now. I have chosen this species, because it is found in so many strata of the earth, in some of the supposed oldest. The circumstance, then, of finding a variety of this species of shell now living, proves that the type of the first creation is the same as that now in existence, *modified only by causes which led to an alteration in the earth's surface, and the changes incident to those alterations which took place on its surface.* But this kind of evidence that the same living creation existed, altered and modified to suit the changes effected upon the surface of the earth since that creation was formed, can be afforded by other species.

Thus the *Trigonia*, which, particularly on account of its antiquated appearance, was thought to be extinct as a species, till some years ago they fished up one valve of a variety of this species, called *Trigonia pectinata*. So unexpected a friend received more than ordinary attention; immediately it sold for £20; but, as time passed on, more of this variety were found; and of course, as they became less rare, their value was reduced, a fate that sometimes awaits the very highest genus.

It is sufficient for our purpose, though, to know that, old as the species appeared to be, there was enough of it left to show that the same genus marked the present creation with some of the oldest in the earth; for geologists show that this species, in many varieties, is found in the lower oolite. Now, it is impossible that any one can mistake the hinge of the *Trigonia pectinata* (the part from which the shell is named) for any other; it is unique in appearance; and we have nothing that approaches it nearer than the *Castalia ambigua*, which is a different genus.

The same mysterious circumstance appears to mark the chambered shells, better known to some of us by the title of Ammonite, which is the name which distinguishes some of the varieties. For a long time this was considered to be an extinct species, till the *Spirula Peronii* made its appearance, and then the whole of that large species of animals—of which from nearly the oldest formation, geologically speaking, vast numbers of fossil varieties are taken—was united to the present species, whose characters could not be mistaken. These examples, though only three in number, are as good as a thousand for our purpose.

But I will bring forward another kind of proof to show, that other unmistakable signs still exist in the present living creation, to mark them as the same creation as geologists suppose came into existence before the six days mentioned in Genesis. There are three or four species which belong to the Mollusca, such as the *Voluta*, *Fusus*, *Pyrula*, and *Bulimus*, where we have a departure from the usual course of construction in the shell, which, I believe, cannot be explained, and, what is singular to notice, it is confined to these varieties. This alteration is no other than a complete perversion of the natural aperture of the shell, so that, while thousands of species of univalve shells have the aperture invariably to the right, these four varieties have it turned to the left.

Remarkable as this circumstance is in itself, it is of singular importance that it should be noticed here, for the very same peculiarity is to be observed in the fossil varieties of the same species, with the exception of *Bulimus*, which is not found in a fossil state. When we find peculiarities which mark the living and extinct parts of the creation with such a very close identity as this, I think we may say there is no higher proof that the time which marked the commencement of one part of creation still existing, was the time that marked the commencement of that part that has become extinct.

Having thus proved that the identity of the living and extinct animals have too close an analogy to admit of their

forming two distinct acts of creation, let us now try to prove, in the second place, the impossibility of making two creations out of what we possess; for if death must have attacked both, we must either suppose that there were two different causes for death, or else we must suppose that the same cause affected both. Now, if we analyze this, we find that we shall get no nearer to the point at issue, by multiplying creations. By the inductive method, it will be at once seen that we cannot prove what was the cause of death any better by multiplying or separating the six days' creation, and so trying to show that they were separate acts.

If we look into the earth, we shall at once see we have no connecting point to lead us to suppose that death proceeded from the sin of Adam, any more because we suppose that there were more creations than one. It was not making the arguments of geologists stronger, or nearer the inductive proof (which is the only proof they have any right to handle), to say there were successive creations.

When we know that natural philosophers have not hesitated to place somewhere in the present *classification* of animals, as far as our present knowledge goes, a variety or an individual, which we find in a fossil state, and which has not been found alive, we have a sufficient proof that naturalists do not discover in those animals that are extinct, such signs of separation as to justify the idea that therefore they are a different creation; although we cannot, with all the additions which geology makes to the creation now in existence, put together any other than a disjointed and imperfect creation.

Why we should be required under such circumstances to make two or three separate creations, when we cannot perfect the one that has been broken, seems to me, not only to be a gratuitous, but a marvellous act. For though we have so many animals in a fossil state, yet we could not possibly affirm that they give us any good reason for believing that they formed a different creation. As far as they go, they all lock into the creation now in existence. And we say this very advisedly, for most of us know how very little beyond the mere outside of the creation now in existence we are able to reach. Even those who make investigations of comparative anatomy their daily study, know little, comparatively speaking, of by far the larger part of the inhabitants of the ocean. Until Professor Owen showed up the anatomy of the *Nautilus Pompilius*, no one seems to have had an opportunity of examining this animal since the time of Aristotle.

To show that there were more creations than one, geologists

tried to prove that when the first animals died, man was not upon the earth. But this supposed fact, often attempted to be proved, has never advanced so far as to give satisfaction to geologists alone, and if tried by the light of Revelation, it is entirely subverted. We have the bones of man that have been found in the caves of the oldest formations in which geologists find the remains of creatures that must have had life, mixed up with the bones of extinct animals, carnivora of so devouring a character, that it would be impossible he could have long continued a denizen of the earth, had he not been destroyed in the Deluge, and certainly it is impossible that man could have spread over the earth at the same time that they existed.

But one perfect creation is announced in Scripture. This, I think, geology cannot disprove, however men may differ in the questions without the aid of Revelation, how or when those parts of that creation became extinct, or how, or when, it became necessary to develop by some laws inherent in the particular animal, other parts of the same creation adapted to a later period. For this creation, which was pronounced so perfect, very soon came partly to destruction, and that from a cause which no one could have discovered simply by exploring the interior of the earth.

Revelation was, therefore, at once needed to tell us that that cause was man's sin and fall, and that death was denounced upon every living creature then in existence, on account of his sin. So that, after this statement in the sacred narrative, we are prepared for the still more awful and direful description of the universal destruction of every living thing by water, wherein was the breath of life, except those which were appointed to be preserved. And this catastrophe took place, as you all know, at the Deluge. At this event, a large portion of those animals which, in their original formation, when blended with the rest, formed one perfect and unbroken chain or circle, was entirely swept away from the face of the earth. They therefore became extinct. The varied forms and habits of these now extinct races, having been adapted to the state of the earth before the Deluge, rendered it necessary that at that catastrophe some of the animals should be exterminated. The food having been changed on which animals were to subsist, made it indispensable that several of the larger flesh-eating animals should be extinguished as well as those species they fed on. This appears to be very naturally accounted for, if, as we find was the case, man was to occupy a wider surface upon the earth after this event.

I wish here to allude to a circumstance which has doubtless

puzzled many a mind that may not have been disposed to regard the truths of Revelation with any disposition to doubt. We have been told unmistakably there that the cause of death was man's sin; and it is clear that an indispensable condition, as well as the justice, of this belief was, that no interruption should have completely severed the race of Adam from the living man that occupied the earth after the Deluge.

Accordingly, we find in the Mosaic account of the diluvial destruction, there is a means furnished, which at once inseparably connects the whole race of man, from the time of the fall to the present day.

I want here to correct an error which many believers have fallen into in company with geologists, and which calls for some of that charity which, I have before said, is especially required in all those who attempt to combat a vexed question like that before us.

This difficulty appears to have arisen out of a circumstance which believers may not have suspected to exist. It is connected with the construction and position of the words in the original Hebrew, which first announce the Deluge. It is there first expressed in these words: "Of every living thing of all flesh, pairs of every sort shalt thou bring into the ark, to keep them alive with thee." Now it is to be observed that this command, "every living thing," seems to be an universal expression. Accordingly, without any knowledge of this fact, that in the Hebrew, as well as in other languages, it is not at all uncommon to announce the fact of a subject in general or universal terms, but that afterwards, in continuing the subject, as it becomes more special, those terms are qualified by the context. This is the case in the instance before us; for in the next chapter we find, as the particulars become more minutely stated, that the clean and the unclean animals are now distinguished; so that we find seven, and not two, formed the numbers of some of the animals that were taken into the ark. The clean and the unclean beasts, being all that were named. This is important to be noticed, because, by correcting it, we shall remove the doubts of many over the popular idea, that the Scripture warrants the inference that two of every sort of all living flesh was commanded to be brought into the ark. And it is so important that we should be correct upon this point, that I shall not apologize for adding in this place the Scripture authority, which makes it certain that the word "all" is not used in an universal sense in many parts of Scripture, and that it is customary there to use universal terms with limited significations. This fact is well known to

many divines. Thus, we find the word used in 1 Cor. xiii. cannot be used but in a limited sense.

Our Lord himself said: "All things which I have heard of my Father, I have made known unto you." Here it is evident that the term is not to be understood universally, but restrictively. So, in the vision of St. Peter, he beheld "a certain vessel wherein were all manner of four-footed beasts of the earth, and wild beasts and creeping things, and fowls of the air." It is not necessary to suppose that the animals here were, zoologically and numerically, all the living creation, but only a variety sufficiently great for the selection that Peter was called upon to make. Besides, Peter afterwards qualifies it in chap. xi. 6, in which the word "*all*" is left out altogether. "I considered," he says, "and saw fourfooted beasts of the earth, and wild beasts, and creeping things, and fowls of the air." We have another example where an universal term could not have any other than a limited sense. Obadiah says to Elijah, "As the Lord thy God liveth, there is no nation or kingdom whither my lord hath not sent to seek thee."

But there is no instance we could mention, perhaps, which bears so closely upon our present subject, while it will, I hope, help to make it more definite and clear, as the word *day*, which, whether in its wider or more limited sense, is so differently rendered in different places, as thereby to lead to the most painful doubts. If geologists had always borne in mind *this fact*, that whenever the word *day* was limited in its sense, to mean only twenty-four hours, that limitation is always borne out by the context,—the words evening and morning, or some like expression, being invariably added,—they would have been unmistakably sure, that in rendering the six days of creation in Genesis i. the words evening and morning take it quite out of our power to attach the more lengthened period to the word *day* in this place.

The words of Scripture do not oblige us to understand that every variety of living creature at the time of the Deluge was necessarily taken by Noah into the ark, though all flesh wherein was the breath of life at that time perished. And if it were possible for such a thing to have taken place, we should actually have attributed to God an unnecessary act. For, while there was an unerring design in not breaking the moral chain which was to link the existing *man* with the old *Adam*, there could be no such necessity for linking the *brute* creation—those animals which were unable to see the cause which brought their existence to an end.

It seems, therefore, that the idea of taking animals into the

ark for any other purpose than the accommodation of man, and to preserve seed alive for his comfort, places a gratuitous restraint upon our creed, and causes many to believe that those things which really are stated for our belief have a meaning attached to them which Scripture does not warrant.

The introduction of the ark in the position that it takes in the Mosaic account justifies us in saying that, while it was only there for man's accommodation and comfort, without which he could not have existed or continued on the earth, it brings him inseparably and morally in contact with those parents that first brought him into existence upon the earth, and identifies him immediately with the punishment that had been denounced upon his progenitors; thereby showing the imperative necessity there is for man's believing that the sin of Adam was the only cause which led to the death of any creature, and that, therefore, without this cause, there would have been no death. The ark, therefore, placed where it is in the Mosaic account, not only shows the justice and consistency of God in uniting in this way by blood relationship the antediluvial with the post-diluvial man, but it still further verifies the truth of the Scriptures, that for man's sin, and for no other cause, death first came into the world, at the time stated by the Prophet.

The CHAIRMAN.—It is my pleasing duty to ask you to tender your most grateful thanks to Dr. Burnett for the admirable paper just read, which has lost none of its force from the manner in which it has been read by Mr. Montagu Burnett. I feel that this paper is one which requires attentive study. Though it may appear contrary to the popular views of geology, I believe it to be most accordant with the recent progress of that science. I venture to characterize it as a far-sighted paper,—one which could only have been written by a person thoroughly conversant with geological progress, while it is penetrated by a profound reverence for revealed truth. Dr. Burnett has not shrunk from any of the difficulties of the question. He has shown that geology has made no discoveries inconsistent with Revelation, while he has also shown that it has not yet developed itself into a perfect science. The popular theory among geologists a few years since—a theory retained in many modern text-books—was to ascribe the fossil remains of certain strata to different successive creations; the plants and animals of one creation being destroyed by some cataclysm before those of the succeeding creation made their appearance. This theory is now for the most part abandoned as inconsistent with the facts accumulated within the last few years. The tendency is to abandon it altogether, and to admit one creation only. It is true that some would spread this creation over a large period, and that most still require millions or billions of years for the formation of

the various strata of the earth yet explored. When we ask, however, for demonstrative proof that these strata could not have been formed in any shorter space of time, we are met, not with proof, but the mere assertion that they cannot be conceived to have been formed in a lesser space of time. When instead of mere assertion, we find attempted proof, from the rate of the deposition of mud in deltas, the gradual upheaval of strata in certain periods of time, the formation of coral reefs, &c., we find the assumed data of calculation altogether upset by other data obtained from a more careful survey of the phenomena relied upon. Dr. Burnett treats the subject from another point of view; from a wide range of induction, he argues, from the unity of plan, anatomically and physiologically considered, of all the fossil remains of the earth yet discovered, for one, not many successive creations. Natural history has only been studied with anything like scientific accuracy for less than a couple of centuries; yet within that time we know races of animals have become extinct. One picture and a few bones in the British Museum and Oxford, are all that we now possess as records of the Dodo. We cannot therefore argue, that because an animal has become extinct, it belongs to a former creation. Only some two specimens of the eucrinite, so abundant in fossil strata, have yet been dredged from the bottom of the sea, yet there may be zones of animal life, in which it may still exist in great abundance, in the vast unexplored beds of the ocean. I do not think that geologists need complain if we call their science an imperfect one. It is yet in its infancy. The first meeting of the British Association gave a gold medal to William Smith, the father of English geology,—so called, because he first pointed out the identification of strata, not by their mineralogical character, but by their fossil remains. Hasty generalization and reasoning on the contents of these strata led to the successive-creation theory, a theory opposed entirely to the analogy of the present distribution of creatures on the earth. As an example: had Australia been submerged, and its present fauna been embedded in sand, clay, or calcareous matter, and then raised again, that fauna would certainly a few years since have been classed as a fauna of great geological antiquity. Geology, as a science, is one of the most difficult and intricate man has undertaken to explore. We need not be surprised if its progress be slow. The presumed great and vast antiquity of its many strata has not been proved; the progress of facts tends rather to disprove it. In this, geology seems to be passing through the same phase which other sciences have done. We hear little now of the vast antiquity of Chinese civilization, though some would still maintain a fabulous antiquity for ancient Egyptian civilization. We may doubt, with Sir G. Lewis, whether much real progress has been made in deciphering Egyptian hieroglyphics; but analogy with the ideographic writing of the Chinese would lead us to suppose that foreign names at least were represented by phonetic characters. In this we may credit hieroglyphists, when they decipher the names of foreign rulers of Egypt. Judged in this manner, the vaunted antiquity of the Zodiac of Denderah, assumed from astronomical considerations, collapsed into that of comparatively modern times, by the discovery of its dedication to a

Roman emperor. I am sure you will not feel less indebted to Dr. Burnett for the great mass of information he has given us in his paper, than gratified by the noble love of truth which pervades it from beginning to end. (Hear, hear.)

Captain FISHBOURNE.—I was very much struck by the observations which Dr. Burnett has made with respect to the disorganization of the human mind which had resulted from the fall of Adam. Those who disputed the truth of the events related in the Bible, ignore the fact that something had taken place with respect to the mind of man which constantly caused him to run contrary to his whole reason. How was this accounted for? The opposition of science to revelation appeared to him to proceed in a great measure from ignorance on the part of those who raised the objections—ignorance of science and ignorance of Scripture. An instance of that was afforded in the objection to the passage in the Bible with regard to the serpent. Here was a very complex question, a very difficult passage; and the scientific man putting his own construction upon it, and bringing in his science to his aid, rushed at once to the conclusion that the Scripture was all wrong. He did not descend to the question of exegesis; he read the passage in the sense which he thought proper to put upon it himself, and, without waiting for further inquiry, he pronounced it to be all wrong. He added, that having examined the serpent, he found that it was never adapted for walking; but he had no right to presume that the serpent had walked. There was not a word in the text about its having been previously erect. But he assumed too much, and he failed to give any proof in support of his assumption. It would be necessary for him first to prove that there was a pre-Adamite serpent; secondly, that the interpretation which he put upon the passage in the Scripture was the correct one; and thirdly, that the curse pronounced by God had reference to the serpent, and not to the devil. But instead of doing that, what did the scientific man do? Why, he simply told them he had examined the physical organs of the serpent, and found that serpents never walked. He might as well have examined the dumb ass of Balaam, and told them it did not speak. (Hear.) He passed entirely out of his province when he entered into these questions;—he was not in a position to deal with them. They were things supernatural, which he could not investigate. With a miracle once granted, they could afford to make the man of science a present of all such arguments. (Hear, hear.) Now, it was only necessary to observe the effect which Christianity produced on those who practised its teachings, in order to be convinced of its truth. With such demonstrative evidence in favour of the Scriptures, I think we have very good grounds for not accepting the deductions of simple reason, when we find them in opposition to the doctrines taught by the Bible. But what was the position which men of science took up with regard to this question? They said, "Oh, you have so many different forms of belief. When you are as much agreed on the subject of religion as we are with regard to science, we will be prepared to listen to you." This was the most monstrous assertion I ever heard in my life. What is the act? Let us take, for instance, the Apostles' Creed: Christians of all ages,

and of nearly every denomination, had agreed to that ; and I ask those who taunted them with their disagreement, to produce so many articles of scientific faith, which they would all adopt (hear), or which they had ever adopted, for one century. (Hear, hear.) Nay, I challenge men of science to produce such a confession of faith in the truths of science, as is contained in the Apostles' Creed, upon which they were agreed at the present moment, or upon which they had agreed even for the last ten years. (Hear, hear.) When they have done that, it would be time enough to taunt Christians with their differences of opinion on matters of faith. (Hear, hear.)

Mr. INCE.—It was not my intention to take any part in the discussion ; but I desire to mention a remarkable circumstance which, perhaps, no one else in the room is aware of, and that is, that within the last few days some twenty specimens of terebratulæ have been found in this country, off Skye. On the previous Friday night I had the pleasure of examining one, and when I took it into my hand it was still alive, though just dying. I think it important to mention this fact as bearing out the arguments of Dr. Burnett, to whom our best thanks are due for the very valuable paper he has contributed.

Mr. WARINGTON.—In the few remarks which I shall make upon the paper, I shall occupy as little time as possible. It struck me that the paper was one which, if any sceptic had been present, would have afforded him an opportunity for very severe criticism. It appears to me that there is one radical fault in Dr. Burnett's argument, and a very radical fault it is. The absence of Dr. Burnett would make one loath to speak of it in a critical manner ; but it seems to me as if he had overlooked what the true mode of reasoning is by which any science obtains its conclusions. He admits that scientific induction in geology is just and right up to a certain point ; but he argues that it is presumptuous to go one step further. He admitted that geology was right in saying that the remains of veritable animals had been found in the earth, which animals certainly died ; but he contended that it was presumption on the part of geologists to say that those animals died before Adam was created. But the kind of reasoning by which geologists arrived at the one fact was precisely identical in principle with the kind of reasoning by which they arrived at the other. The difference was merely in degree. How was it, when a bone was discovered in the earth, that they were able to say that it was the bone of an animal ? Was it possible to give mathematical proof of it ? It was certainly impossible ; no one could tell whether it was the bone of an animal or not, except by analogy. They were enabled to recognize it as a bone, from its resemblance in form to the bones of animals with which they were acquainted ; but that was all the proof that could be given, and they had no other grounds for arriving at the conclusion that it was a bone. It was quite possible that there might be such a structure unconnected with a living animal, and that there might be such a form unconnected with life ; but inasmuch as no human being had ever known of such a thing, it was taken as proof that the structure was a bone, and that the bone was the bone of a living animal which had died. It was a proof which rested solely

upon analogy; and while Dr. Burnett admitted that the geologists were right in their reasoning so far, he asserted that they were not justified in further assuming, upon the same evidence, that those animals existed at a very remote period. But what was the evidence upon which geologists based their conclusions? They found a bone incased in a certain rock, and they asked themselves the question how it had become incased there. I will take, for instance, the case of a bone found imbedded in sandstone. How did it get there? the geologist asked. It could not be supposed that it was purposely buried there. It was therefore very plain that the animal must have died in that position, and that the rock must have accumulated round it in process of time. The animal must have died amongst loose sand, and the sand having accumulated round it, gradually became hard, until it formed sandstone. This was the kind of reasoning adopted by geologists. I am not going to say that the conclusion is right or wrong. But it is a mode of reasoning which is entirely based upon analogy; and until the facts were otherwise accounted for, geologists had clearly as much right to assume that the bone had been in the rock for a long period, as they had in the first instance to assume that it was a bone at all. Therefore it strikes me that the argument of Dr. Burnett was open to objection on this ground. It appears to me that if the reasoning of geologists was just in the first instance, it was no presumption on their part to take the further step, unless it could be shown that the evidence upon which they based their conclusions was insufficient. I will take the case which has been instanced by Dr. Burnett himself,—the case of the flint pebbles. It is found that pebbles are round, and geologists conclude that they are made round by the action of running water. Here, again, they were reasoning from analogy; for they found that pebbles exposed to the action of water are made round, and they had therefore concluded that round pebbles must have been at some time or other exposed to the action of such water. And they further asserted that if pebbles had been made round by the action of water, the process must have occupied so much time. I think this is a very fair assumption, and until those who hold a different opinion are able to disprove it by facts, they have no right to complain of the views advanced by geologists. I am not going to say that geologists are right or wrong, but I certainly think that Dr. Burnett had found fault with them unjustly; because they were not making hypotheses, but were reasoning from facts, as far as they knew them. What they want, if they were wrong, is more facts to set them right. Until those facts were added, it was useless to argue that geologists had no grounds for the conclusions which they arrived at. I have only one more observation to make. I think it is rather a grave assumption on the part of Dr. Burnett to say that there was no death in the world before the fall of man. It is contrary to the opinion of a very large proportion of the best scholars of the present day, including those who were most opposed to the innovations of science, and to me it appears to be very dangerous ground to take. I have also a word to add with regard to the remarks which had fallen from one of the speakers who preceded me. I think that Captain Fishbourne

was a little unjust to men of science who objected to the Scriptures, when he stated that they put their own interpretation upon them. To a certain extent that observation may be true; but so far as I know of scientific objectors, they quoted the interpretations which had been received as orthodox, and then proceeded to show that, according to the teaching of science, these could not be true. They do not put an interpretation on the passage themselves, but they take the commonly received interpretations, and endeavour to show that in that sense the Bible is inconsistent with the truths of science, and calculated to mislead. How far they had succeeded is a question into which I am not now prepared to enter; but I think it right that their objections should be fairly stated, in order that they might be fairly met. (Hear, hear.)

DR. GLADSTONE.—There are one or two things in the paper upon which I should like to make a few observations; but I feel, like Mr. Warrington, some delicacy in doing so in the absence of Dr. Burnett. My first objection is to the title of the paper. I cannot see why the subject treated by Dr. Burnett is called "A Comparison between Science and Revelation, as Standards of Truth." I think those two terms are incompatible. The term science is very indefinite; it might mean natural science, or theological science, or metaphysical science, or political science. But when we come to the essay itself, I find it commences very properly with the statement that God created the entire world, and that the evidence of His power and wisdom is to be found in all His works. It is further laid down, that having created the world, God had revealed himself to man, whom He had also created to inhabit that world. Now I can understand a comparison between these two things as standards of truth—a comparison between Nature and Revelation. Both manifest, though in different ways, that God who was their great Author. But I do not understand how science can be regarded as a standard of truth. Science is simply a knowledge acquired by man from what he observes in Nature or Revelation; but the deductions of man, whether in natural or theological science, can in neither the one case nor the other be regarded as standards of truth. I think it should have been more clearly shown in the paper that the science spoken of meant natural science, and that natural science meant the deductions of man from the facts which he observed in Nature. But while the facts of Nature are perfectly true, and while Revelation, coming as it did from God, must also be true, the deductions of man from the facts of Nature might be far indeed from the truth, just as his deductions from the words of Revelation might be very far from being true. (Hear, hear.) I was very much struck with the observations in the paper upon which Capt. Fishbourne had remarked. I do not think there can be any doubt as to the disorganization of man's reason. He is constantly falling into all kinds of errors. It should be borne in mind, too, that this disorganization prevails to a far greater extent in things spiritual than in purely temporal matters. Far greater danger therefore exists of men being led away by false theories with respect to the words of God in Revelation, than by false theories with respect to the facts of nature. I am not going to enter into the theological question; but

I will say that nowhere in Genesis can I find it stated that the death of animals depended upon the fall of man. I remember that this is stated in Milton ; but I do not recollect any passage in the Bible itself by which the assumption could be maintained. It contained no reference whatever to the cause of the death of animals. I know very well that theologians are divided upon the point ; but I will not go further into that question. I would, however, remark that in my opinion the present existence of the Terebratula has really very little bearing upon the subject under discussion. There are many other arguments for the antiquity of fossiliferous strata to which Dr. Burnett had not alluded. There can be no doubt of the apparent succession of species in rock after rock as they are dug up out of the earth. Attempts had been made by geologists to determine by mathematical calculation the length of time which had elapsed since the animals found in these rocks had died ; but the more they applied mathematics to the solution of the problem, the longer the periods became. I cannot sit down without making one further remark. I think that Capt. Fishbourne was rather hard upon men of science when he spoke of them as rejecting Revelation, and as believing less in the Bible than other people. Now, I know a number of scientific men, and I am nearly always amongst them ; and, from my experience of them, I do not believe the charge of Capt. Fishbourne is well founded. (Hear, hear.) I do not think science induces a man to believe or disbelieve in Revelation. A man's faith had its origin in far higher teaching. (Hear, hear.) I think it is therefore very unwise to put forth such statements. I do not believe, as a rule, that men of science are opposed to Revelation. If it were a fact that men, by their study of science, were led away from a belief in the Bible, it would be the most cogent argument that could be urged against the truth of Christianity ; but I do not believe any such argument can be used. Among men of science there are doubtless individuals who do not believe in revealed truth ; but it is the same in every other profession on the face of the earth. (Hear, hear.) I am certain that great harm would be done to young minds if the statement that science was opposed to Revelation were to go forth, and I feel it to be my duty to correct it. (Hear, hear.)

Rev. J. B. OWEN.—However we may differ with respect to the views contained in the paper, we shall all agree to the vote of thanks which has been proposed to the author. (Hear, hear.) I think our thanks are also due to those gentlemen who have spoken upon the paper, for the observations which they have made. I fully concur in the remarks which have been made by Dr. Gladstone with respect to some apparent deficiencies in the line of argument pursued by Dr. Burnett, and it occurs to me, that if Dr. Gladstone would favour us with a paper remedying the defects which he has pointed out, he would confer a very valuable service upon the Society. (Hear, hear.) I am sure that a paper on this subject from one whose deep scientific research is only equalled by the soundness of his religious views, and the catholicity of his sentiments, would be listened to with very great interest (hear, hear) ; and, with Dr. Burnett on the one hand and Dr. Gladstone on the

other, I think we might be assured that, between two such able and intelligent witnesses, every word of the truth would be established. (Hear, hear.) Notwithstanding any minor defects, I think the paper a very admirable one. This is an age in which a vast amount of attention is given to geology. A great deal more attention was now paid to the earth, than to the heavens. In former times astronomy was the science which chiefly attracted man's attention, and we all know the series of blunders they had fallen into with respect to it till the time of Copernicus; and that it is the scientific glory of England to have produced the system of Sir Isaac Newton. It now appears that astronomy is given up in favour of geology. But it strikes me that we have not reached that position in respect of geology which we have attained in astronomy. Geology wants its Newton. We want some great mind, who, by a careful investigation of the crust of the earth, will arrive at a series of definite conclusions upon which he could base a true system. With respect to other remarks, I will only say that, in my opinion, it is of the utmost importance that, in a society like ours, we should have all sorts of relevant observations. (Hear, hear.) The only things which should be excluded from our discussion are noise, and nonsense, and abuse. As long as what is stated is expressed civilly, and has any scientific basis to support it, there should be no objection to it. We profess to stand upon a foundation which, like the kingdom of the Redeemer, can not be shaken, and therefore we can afford to listen to all kinds of suggestions, and discuss them as the Lord Jesus did constantly, while on earth, in a calm and temperate spirit. The more we imitate His example in this Society, the more we shall show ourselves consistent disciples and sincere believers in the grand truths which He came on earth to proclaim,—namely, the truths which God had revealed to man, and which it is our object in this Society to defend. (Hear, hear.) I think we shall be able to maintain our position against attacks of every kind. And I can far easier believe that there is no God, than believe that a God existed and never revealed himself. I do not understand how any one could believe in God, and deny that He had revealed Himself to the creatures whom He had made. It is quite as monstrous an hypothesis as to suppose that the father of a family loving his children would never reveal himself to them in his paternal relations. It is such a hypothesis as could not stand for a moment. It is absurd. It is our belief that the Bible is His revelation, and though we may not be able always to reconcile the statements which it contains with certain phenomena in Nature, it is our duty to wait and study, and not take for granted that they never can be reconciled. The institution of such a society as this is worthy of London, the great metropolis of Christendom. Let us only have a few more papers such as that read this evening, and a few more discussions such as have followed, and I am satisfied that a great deal of good will be done. We should be very glad on all occasions to hear the opinions of men who do not agree with us. We would perhaps be able to lead them gradually to our way of thinking; but I hope, at all events, that no one who listens to our

discussions will ever be allowed an opportunity of saying that they were not pervaded by the spirit of charity, and of true Christian gentlemen, which was the spirit of the Lord Jesus Christ himself. (Hear.)

Mr. REDDIE.—Had it not been now so late, I should have ventured to make a few remarks upon Dr. Burnett's paper. But at this hour I feel I must confine my observations to answering some of the criticisms of former speakers. I must first notice the remarks of Dr. Gladstone, who has rather taken Captain Fishbourne to task, as if he had invented the cry that science is opposed to Scripture. I would beg Dr. Gladstone to recall to mind the very history and origin of this Society. It is surely notorious that an alleged contradiction between science and Scripture had been publicly put forward and thrown at Christians, which had made it necessary that they should defend themselves. This charge was certainly raised by our opponents, more especially of late in the *Essays and Reviews*; and it had been publicly repeated since by Dr. Temple, Dr. Colenso, and others. It may be said that these writers are not men of science, which we may admit; but the arguments which they have advanced second-hand are based upon the opinions of certain reputed men of science. I do not, however, for a moment mean to say either that science, or that all men of science, are opposed to Revelation. The very institution of this Society is in itself a protest against any such notion. And when my friend Captain Fishbourne or I have alluded to "men of science" as opposed to the Scriptures, we do not of course mean *all* men of science. We do not, for instance, include Dr. Gladstone himself, any more than we would include our most worthy and thoroughly scientific Chairman. I think we ought all to feel much indebted to Dr. Burnett for his paper. I hope, with the Rev. Mr. Owen, that it will give rise to at least one paper from Dr. Gladstone himself, and to a great many others. (Hear.) With reference to Mr. Warington's criticisms, I think he has made a mistake as regards Dr. Burnett's arguments, which bear upon the difference *in scope* between Scripture and science. Dr. Gladstone has also fallen into the same mistake; for in quoting, in order to criticise, the title of the paper, he overlooked the words "in scope," which form the real key-note to its meaning. Dr. Burnett argued, for instance, that Scripture professed to reveal the cause of death coming into the world, while science and observation could only possibly discover the fact of death, but could not ever get at its cause. That is certainly true, whether we regard it as of much consequence or not. But I am inclined to agree with our Chairman, that this argument is worthy of deep consideration, with all that flows from it. When Dr. Burnett, however, comes to what we call scientific proofs, he does not object to them in principle, as appears to have been supposed by Mr. Warington. He admits the method, but he does not admit particular proofs in certain cases to be satisfactory. Take, for instance, Mr. Warington's argument as regards the so-called rolled pebbles and their assumed great age—

The CHAIRMAN.—I think there is some misapprehension with regard to Dr. Burnett's allusion to flint pebbles. It is hardly fair, perhaps, to criticise very severely a mere illustration. A very faulty illustration may be

taken without at all weakening the force of the argument it has been chosen to illustrate. Flint pebbles are very much softer when dug out of the chalk than they afterwards become when exposed to the sun and air. Even in their hardest condition, a few days' rolling by a stream, or by the action of waves in contact with each other, is all that is required to give them a rounded form and water-worn appearance.

Mr. REDDIE.—I had only a few observations to offer with regard to Mr. Warington's argument as to the pebbles, and they were rather in support of Dr. Burnett's conclusions. I venture to deny that there is proof that round pebbles are always "rolled," as has been too generally assumed. I find in gravel a vast number, perhaps a majority, of pebbles that have been originally formed in a round shape, with a centre or nucleus, and layers, as it were, all round, like miniature strata. Some pebbles, no doubt, have had their corners rubbed off by rolling; but others, and perhaps most of them, have as evidently been originally crystallized and formed in the round form in which they are found. Then it has been said by Mr. Warington that the presence of a bone, or other animal remains, found embedded in strata, proves that death must have existed for ages in the world—

Mr. WARINGTON.—I wish to state that I have expressed no opinion as to whether the conclusions arrived at by geologists are just or unjust. I have simply referred to the kind of argument used by geological sceptics to support their conclusions.

The CHAIRMAN.—So far as I understood Mr. Warington, he did not adopt the arguments which he used. He had simply stated that the sceptic, if he had been present, might have argued that way.

Mr. REDDIE.—It appears to me that it is of no consequence whether the arguments advanced by Mr. Warington are adopted by him or not. Having been advanced by him in discussion, whether as his own or as those of an imaginary sceptic, I think they ought to be answered. When a theory is brought forward by geologists, from which certain deductions are drawn contrary to the teaching of Revelation, we are not only entitled, but bound to examine the evidence by which it is supported. Now what proof do geologists give of the antiquity of the sedimentary rocks? The arguments formerly used in support of the long periods which must have elapsed from the creation have recently been changed. Dr. Burnett has presented us with some new facts and arguments against the theory of distinct creations; but in Sir Charles Lyell's latest work on the *Antiquity of Man*, he had not attempted to maintain them, or rather he had plainly given them up. And now I have in my hand an extract from an able review of Sir William Logan's *Geological Survey of Canada*, which appeared in *The Times* of the 21st of October, 1864, in which the reviewer observes, with special reference to those assumed immense geological periods, as to which Mr. Warington—or his "sceptic"—are so positive, that, "in order to expose the fallacy of such an argument, it would only be necessary to appeal to a few of those Canadian geological monuments, the true interpretation of which, we believe, will establish the fact

that the element of time has very little share in the alteration and crystallization of the sedimentary rocks." (Hear, hear.) I quote this to show that (as our Chairman has said) the tendency of the latest scientific conclusions is to reverse not only the theory of distinct creations, but also that of the long geological periods which Dr. Gladstone and Mr. Warington have both so confidently appealed to. But these are questions we shall have to investigate. We are yet but a young society, and perhaps we have all been too eager to dispose of such large questions off-hand, in the course of the two discussions which as yet are all we have had. I, for one, do not admit that these long periods and the great antiquity of the sedimentary rocks have been proved. Dr. Burnett has furnished us with some fresh matter for consideration;* but his paper must not be considered as having even attempted to settle so large a question. It is to be hoped that it will lead to other papers, in which the various points raised by him will be more minutely discussed. It was, in fact, with that object that these introductory papers had been written and read as a commencement of our Transactions.

The Rev. Dr. IRONS.—While there are some things in the paper to which we might demur, I feel that Dr. Burnett is not the less entitled to our most cordial thanks. I should like to know whether it is probable that the paper will come on for discussion at another meeting. I think it would be desirable that an opportunity should be given us to discuss it at some future time, after we have read and weighed its contents. And I think that nothing is more essential to the character of the Institute as a philosophical Society, than that we should eschew all unnecessary bickering between science and religion. We are here engaged in the pursuit of truth, and our duty is to examine the arguments of those who are opposed to us, and to eliminate as much as possible all merely controversial disputes. (Hear.)

Mr. BURNETT.—I should like to say a few words before the meeting closes, upon the observations which have been made. Of course the paper was intended to meet with criticism. My father would have been very much disappointed if it had not been criticised; and I am glad to find that it has given rise to as much discussion as if he had been present. With respect to the critical objections of Mr. Warington, I have only to say that my father is perfectly aware of the defects of his paper, but his illness had prevented him from producing a more complete essay at present. (Hear, hear.) I beg to thank the meeting for the kind manner in which it has listened to me, and for the cordial vote of thanks which has been passed for my father's paper. (Hear.)

The CHAIRMAN then adjourned the meeting.

* Some of his arguments are similar in character to those so ably put forward in *Omphalos* by our Vice-President, Mr. Gosse. For instance, if we admit creation at all, say of a tree or an animal, it is evident that such tree or animal would appear as if it had *slowly grown in time* to be what it is, which appearance would, in the case supposed, be deceptive. This is a difficulty which inductive science must face. Whereas, if men deny creation, they are then involved in greater difficulties of another kind.

ORDINARY MEETING, JULY 2, 1866.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous meeting were read and confirmed.

MR. REDDIE, Hon. Sec., then announced that the following Foundation Members and Associates had been elected since the 4th of June :—

MEMBERS.—Rev. Edward Auriol, M.A., Prebendary of St. Paul's, Rector of St. Dunstan's in the West, 35, Mecklenburg Square; Rev. J. Stevenson Blackwood, D.D., LL.D., Middleton Tyas, Yorkshire; Rev. W. Weldon Champneys, M.A. (late Fellow of Brasenose College, Oxford), Canon of St. Paul's, 31, Gordon Square; Robert Hardwicke, Esq., F.L.S., Publisher, 192, Piccadilly; John Napier, Esq., Shipbuilder, Saughfield House, Glasgow; Robert Napier, Esq., Shipbuilder, Glasgow, West Shandon, Dumbartonshire; Rev. William Pennefather, B.A., 2, Mildmay Road; John Shields, Esq., Church Street, Durham; William Cave Thomas, Esq., Historical Painter, 49, Torrington Square; Rev. B. W. S. Vallack, B.A. Oxon, St. Budeaux's Vicarage, near Plymouth; C. W. H. Wyman, Esq., 53, St. John's Park, Upper Holloway.

ASSOCIATES, 2ND CLASS :—Rev. S. Skrine, M.A., Southborough, Tunbridge Wells; Rev. W. Webster, M.A. (late Fellow of Queen's College, Cambridge), 3, Park Villas West, Richmond, Surrey.

The HONORARY SECRETARY also announced that Mr. Edward J. Morshead had been elected a member of the Council, and had accepted the Office of Honorary Foreign Secretary; and that the Council had appointed Mr. Charles H. Hilton Stewart as Clerk to the Society,—the temporary engagement made with Dr. Evans having ended.

It was also announced that the following books and pamphlets had been presented to the Society :—

Modern Scepticism and Modern Science. By J. R. Young, Esq., M.V.I., formerly Professor of Mathematics, Belfast College. *From the Author.*

The Inspiration of Moses proved, &c. By the Rev. James Ivory Holmes, M.A., Associate V.I. *From the Author.*

A Plain old Indian's Solution of some of Bishop Colenso's Difficulties. By John Stalkartt, Esq., M.V.I. *From the Author.*

Omphalos : An Attempt to Untie the Geological Knot. By Philip Henry Gosse, Esq., F.R.S., Vice-President V.I. *From the Author.*

Man : His true Nature and Ministry. From the French of De Saint-Martin. Translated by E. B. Penney, Esq., M.V.I. *From the Translator.*

Theosophic Correspondence of St. Martin and the Baron de Liebestorf.

From the same.

The Conformation of the Material by the Spiritual, and Holiness of Beauty. By W. Cave Thomas, Esq., M.V.I. *From the Author.*

The Biblical Antiquity of Man ; or, Man not older than the Adamic Creation. By the Rev. S. Lucas, F.G.S. *From Alexander McArthur, Esq., M.V.I.*

The Rev. Dr. THORNTON then read the following Paper :—

ON COMPARATIVE PHILOLOGY, WITH REFERENCE TO THE THEORIES OF MAN'S ORIGIN. By the REV. ROBINSON THORNTON, D.D., Head Master of Epsom College.

IT may seem presumptuous to commence my task with a criticism of a term which is universally employed by scholars ; but I cannot help expressing some regret at the title I am compelled to use. The word *philology* is, to my mind, inexpressive, and therefore unfortunate. According to analogy, it must signify “*the science of friends,*” not “*the science of human speech.*” Nor, if we look to the ordinary classical meaning of the Greek, shall we find it more appropriate. The word *φιλόλογος* is used by Plato to signify “fond of learned discussion ;” Isocrates employs *φιλολογία* in the abstract sense of fondness for such discussion ; while in Plutarch and Athenæus the word sometimes means “talkative,” sometimes “fond of historical and scholastic pursuits” —in short, what we should express by “a literary man.” The ancient Greeks, with whom it was not common to know any language but their own—who seem to have been, in fact, slaves to their own rich and varied tongue—had no idea of a science of speech. Cratylus is by no means an anticipator of Rask and Bopp, of Grimm and Müller. The science is one of modern days : it is not a century old. Linguists there may have been, like Charles V., or Mithridates, who could converse with most of their subjects in their own tongue ; linguists like Hickes, who drew up regular grammars, in

the old Priscianic form, of old and little-known dialects. But all these, with a vast amount of linguistic and grammatical lore, were scarcely scientific. A good many of them were rather inclined to believe Greek and Hebrew to be the parents of languages, and to consider Latin to be a derivative from Greek, Arabic an impure form of Hebrew, and Turkish and Persian both barbarous corruptions of Arabic. The comparative science of language, the methodical classification of dialects, is one of our own days: the name we require for it is *Glossology*, or *Dialectology*, the science of tongues or dialects: and one regrets that a word so inappropriate as *Philology* should have received the sanction of usage. No philosopher would dare, of course, to violate the rule of Bacon (de Aug. Sc., iii. 4): "Nobis decretum manet, antiquitatem comitari usque ad aras, atque vocabula antiqua retinere, quanquam sensum eorum et definitiones sæpius immutemus." But let us hope the "vocabulum" is not yet so "antiquum" as to be unchangeable. The German "*Sprachkunde*" is excellent, but "*speech-cunning*" would be uncouth to our ears, might perhaps mean *Rhetoric*, or the *art of eloquence*, and would be at variance with our rule (the rule of Linnæus) to employ no scientific names but those derived from the Greek. Perhaps "Dialectology" may eventually obtain favour. It will have the virtue (which "Philology" has not) of really meaning what it stands for. Though "verba notionum tesserae sunt," Bacon did not mean that the counter was to be stamped with the externals of another *notio* than the one it represented.

If we picture to ourselves a man with a keen ear and an observant mind, standing in some open spot in the great fair of Nijni Novgorod, we can imagine what a host of subjects for thought must be aroused and enter that mind, from the varied sounds which would strike that ear. The soft but sibilant Russ, the softer and less sibilant Servian, the harsher Bulgarian, the easy-flowing Osmanli, the rougher and more diversified Turkoman, Bashkir, and Mongol; the grunting Chinese, the guttural Arabic, the elegant and stately Persian, perhaps the strange Circassian, Georgian, Ossetic, the ear-breaking Pushtoo, mingled possibly with some sonorous tongue from the south of the Himalaya, and with the strongly accentuated dialects of Latins or Germans from the West, would meet in his sensorium with an apparently unmeaning tumult. And yet it would be clear, on reflection, that this was no *tumult*, nor yet *unmeaning*. Those varying sounds might all be observed to vary according to some law, and to recur at certain intervals; each set

of sounds would be found to have its peculiar character, distinguishing it from other sets of sounds; and the character and laws of variation of one set would be found to approximate more or less to those of some of the other sets, and to differ more or less notably from those of others. And it would soon occur to a thoughtful mind that those various sets of sounds might be grouped, and the groups subdivided with reference to the greater or less similarity of their character and laws. Such grouping would be a "Philology," or Dialectology. What we have fancied as presenting itself to the mind of our thinker at Novgorod, has occurred to the minds of men who have observed the similarities and differences of the various modes of communication by articulate sounds in use among mankind; and the result has been that science of classification of languages which we term Comparative Philology.

Philologers have as yet definitely pointed out only certain great families of languages, which they distinguish from one another mainly by their grammatical characteristics.

1. The simply monosyllabic, in which one word of one syllable stands for one idea, and these words are never altered, but relation is expressed by their arrangement in order in the sentence. The type of these is the Chinese.

2. Those in which relation is expressed by attaching to the original root a number of monosyllabic or dissyllabic suffixes, the root remaining almost or entirely unchanged. These are termed agglutinative, and the family is usually named Turanian. The type of them is the Turkish.

3. Those which express relation by a system of prefixes and suffixes, joined to a root mostly monosyllabic, but variable in form. These are termed Hamitic, and their type is the Coptic. The family seems to extend through the whole of Africa; but as the great majority of these modern African tongues are entirely without literature, and none are written, their classification is by no means easy, nor has the task yet been carried very far.

4. Those which express relation by a system of suffixes almost entirely monosyllabic, and a very few prefixes, joined to a root normally dissyllabic, and very slightly variable. These are termed Shemitic, and their type is Arabic or Hebrew.

5. Those in which relation is expressed by variations in the middle or ending of a root primarily monosyllabic, but derivatively polysyllabic. These are called Aryan, and the type of the family, a very large and varied one, is Sanskrit.

6. To these we may add the family of languages spoken in the islands of the Pacific. They have not yet been regularly

classified; and some are of opinion that they may be considered as offshoots of the Malay, which is itself (they imagine) to be referred to the Aryan family. The peculiarity of these languages is that the words and their inflective particles are **simple syllables**, consisting of a consonant and vowel, or in some cases of a single vowel. They might be termed polysyllabic.

7. The languages of Northern America are characterized by the same colligation of syllables; but as the syllables are compound, and the whole system of colligation more complicated, some incline to group them with the Turanian or agglutinative, some to consider them a special family, the polysynthetic.

We have here, then, seven families of human speech; or, to reduce them to the very lowest number, by classing the Polynesian with Aryan, the Shemitic with Hamitic, and the American with Turanian—at least four different forms of language.

But the clear statement of Scripture is that there was a time when “all the earth was one lip, one set-of-words” (I translate Gen. xi. 1, literally). Their vocabulary and their pronunciation were the same.

Here the opponents of Scripture join issue. They tell us that, do what we will, we cannot avoid the conclusion that the various families of languages, be they seven or four, or any ultimate number, exhibit such specific differences that they cannot have been developed from one original; that, in fact, the diversity of human speech is as good and convincing an argument in favour of the polygenist hypothesis as the diversity of human physiology.

But this is rather a violent assumption. What proof is there that the differences in human languages, great as they are now, are so essential that they may not be explained by the disturbing and disorganizing causes which are at work even amongst ourselves, and are productive of speedy effects where there is no written literature to give fixity to the vocabulary and grammatical forms? Granted that Chinese and Sanskrit, Siamese and Gaelic, Finnish and Kafir, are so utterly and entirely dissimilar now, that we can scarcely imagine the human being who has learnt the one acquiring the power of using the other, that dissimilarity is not other in *kind*, it is only greater in *degree*, than the difference between a page of the Saxon Chronicle and a page of the *Times*; or to use a still better illustration, than that between an upnekhat of the Zend-Avesta and a division of the Shah-Nameh, or a proclamation by the present Shah of Persia, between the Dutch Bible and Ulfilas.

The disturbing forces which act upon language are in the main the following;—I postpone, of course designedly, that supernatural disturbing force which *we* of this Institute believe to have been injected into humanity in the plain of Babel; and to have been, temporarily and in part, lulled in the early days of Christianity after the great day of Pentecost:—

1. National or tribal peculiarities. Those anatomical or physiological peculiarities which constitute the differences between races of men are not without effect upon their speech. The inhabitants of a southern climate, and of a richly fertile territory, naturally fall, after a generation or two, into slothful unenergetic habits. They speak lazily; they shrink from the difficulty of hard consonantal pronunciation, and complicated inflexion. Compare the Polynesian tongues with every other family; or, to come to differences in the same family, contrast the soft Italian with the harder Rumonsch of the mountains; Servian with Polish; Bengali with Mahratta,—nay, the English of Aberdeen with the English of Exeter. Again, a peculiar conformation of the organs of speech, produced by some external cause, climatic or otherwise, would soon eliminate some sounds, and introduce others; and thus, if I may so express it, the tuning of the national ear would take a particular direction, and the pronunciation and vocalization of the language would have a tendency to alter towards one class of sounds, and away from another class. As an instance of this “tuning” as I have called it, I may allege the aversion of the Italian ear to a number of consonants in juxtaposition. Such a sentence as “*with great strength and speed*” is positively terrible to a nation which cannot say *il* but *lo sbaglio*, and turns *Xerxes* into *Serse*. Another example is the rigid rule of harmonizing sounds in Turkish, according to which a flat suffix must follow a flat root, and a sharp suffix a sharp

root: *e. g.* *يَمَك* (*ye-mec*, to eat); but *يُمَك* (*yu-mak*, to wash). Another perhaps is the rejection, as offensive and barbarous, of the *clicks* which are so prominent in the language of the Bosjesmans and some few other African tribes; not only are they found in no other family of tongues, but the higher Kafirs, as the Sechuana, never employ them.

Further, habits of mutilation or distortion, not uncommon among barbarous tribes, must exercise a great influence in modifying language. Dental sounds and sibilants must be considerably altered, if not utterly lost, among those who file away or strike out the front teeth. Distortion of the lips, too, must interfere with the articulation of labials. So also among the imperfectly civilized, the habits of mutual suspicion and

dread lead to a plan of speaking with as little apparent movement of the face as possible; hence labials and fine distinctions in vowels disappear, and gutturals, with slight modifications of the "ur-vocale" (Sanskrit अ) take their place in the development.

2. Not only national peculiarities, but those of individuals, influence the language of a tribe. A natural defect in the articulation of a powerful chieftain would lead his followers, out of respect, to imitate that very defect, or at least to conceal their possession of superior powers of speech. Even amongst ourselves we can often observe a tendency to affect some peculiarity in the enunciation or mode of expression of a leading man; his very phrases are caught up and incorporated into the language of his admirers. In the days of unwritten language such imitation must have had a very decided and permanent effect upon the speech of a tribe.

3. A fertile source of variations in dialect is the tendency to imitate the imperfect pronunciation of children, and to clip and alter words in order to adapt them to their untrained organs. Cases of this kind are familiar to ourselves. There is scarcely a family in whose domestic language some eccentric phrase or mis-pronunciation has not become current, derived from the prattle of some one of its youthful members. Such disturbances as these are of course counteracted by the comparative fixedness of a written language: the family *argot* is confined within the circle in which it was produced. But in earlier days, without this impediment to change, as in illiterate tribes at this day, the mimicry of children was doubtless a powerful disturbing force, affecting not only the forms, but the grammatical inflexions of words, and their collocation in sentences.

4. Superstition in less civilized tribes, and, to a slight extent, social rules in more civilized communities, affect the language. Many words and phrases which were usual in this country two centuries ago have become offensive, quaint or ridiculous, and as such are practically banished from our normal literary tongue, though they linger in our provincial dialects. The verbal inflexion in *th* (hath, goeth, &c.) is now quite lost in classical English, though it was current a century ago, and common at double that distance of time. Now, if an inflexion can be lost in this manner out of a written language in whose literary remains it is of continual occurrence, it is plain that under circumstances of less restraint the process of alteration would go on more rapidly; and two portions of the same tribe, separated from one another by a range of mountains or an arid plain, might find, after half a century without

intercourse, that their inflexions were different, and their very vocabulary so altered that they were no longer mutually intelligible. That this process is now going on in many places we learn from travellers. The Indians on the Amazon, we are told, speak languages differing in an extraordinary manner, and varying so much that a person who has learnt to express himself with tolerable fluency in conversation with a certain tribe will with difficulty understand or be understood on revisiting them after the lapse of twenty or twenty-five years. Superstition, too (as I have said), exercises a great influence on the vocabulary, if not on the grammar. In some nations the king takes the name of some animal or object, which name is forthwith banished from the language, since any one using it would be immediately suspected of trying to bewitch the chief. A new noun has to be invented and thenceforward employed to designate the object. In others the *fetish* of the community, or the instrument of some good or evil to them, must no longer be called by the name it bore up to that period. So the greatest ingenuity has to be exercised in the formation of new words which shall be as different as possible from the old ones. It does not always happen that two branches of the same tribe invent the same new appellative; and hence a variation which a very few years suffice to convert into an actual breach of continuity.

5. To these disturbing forces we may add the *occasional* intermixture of foreign individuals. These intermixtures were rarer in early times; but still there is no reason to doubt that, when they did occur, the presence of a few influential strangers had a tendency to introduce new words into the vocabulary, and perhaps to affect in a perceptible degree the use of prefixes, suffixes, and medial changes; or that conquerors or slaves would compel their subjects or masters to accept some of their language, and (in Juvenal's words) make Orontes flow into Tiber.

Such are the principal causes of the alteration, development, and decay of the forms of human speech. Nor will it be correct to argue that they affect vocabulary only, and not grammatical character; that they quite account for the evolution of Persian out of Pehlvi, or of Hindi out of Sanskrit, but cannot be adequate to explain how from one origin there could spring tongues so radically different as Manchú and German. True, the grammar of a written language is invariable in every direction but one. No philological circumstances could ever make Italians form the plural with *s*, or Spaniards without it. But that is owing to the fixity given by written, or at all events traditional, literature. To an early tribe, using a simple

monosyllabic language, the adoption and development of inflexional forms is a matter of ease. It is by no means philologically impossible that out of the Chinese of the present day should be formed languages possessing inflexions, some of them assimilating themselves to the Aryan "umlaut" (change of vowel) and varied termination, others to the Hamitic prefix and suffix system, others to the Shemitic disyllabic root and varied suffix, others to the Turanian agglutination. In fact (according to Müller), those Turanian languages which have hitherto been considered almost on a par with the uninflected Chinese, I mean the Tungusian or Manchú branches, are actually beginning to adopt inflexions and develop verbal forms. What Manchú can do in the nineteenth century A.D., I suppose it might have done in the nineteenth (or twenty-third) B.C. There were adequate causes then, as there are adequate causes now, for throwing out from an uninflected and monosyllabic original a set of inflected polysyllabic and variable offshoots.

But it must not be forgotten, as I said in the outset, that holy Scripture adds another disturbing force, supernatural, or at least exceptional in its character, communicating (to use mechanical language) an initial velocity. The Deity Himself willed to "confound their language"—to mingle with the gift of speech an element of repulsion which it did not formerly possess, or at least not in so eminent a degree. "We will go down" (I translate literally from the Hebrew) "and confuse there their lips, so that they shall not hear each man the lip of his neighbour . . . Therefore He called its name confusion, for there Jehovah confused the lip of all the earth; and from thence Jehovah made them disperse upon the face of all the earth." Such is the simple statement of the will of the Most High and its execution. The bold critic sees in these words a mere legend, engrafted on the original Elohist document by some Jehovistic fabricator; but more reverent minds will accept them as a Divine record of the chastisement of rebellious man by the timely withdrawal of that gift of unity which had been enjoyed and abused. And a sublime chastisement it was too—sublime in its simplicity and its perfectness. The mythology of man's invention told of the consternation in Olympus, the battle of the celestials, the fallen giants weltering in a sea of sulphurous flame; or of the wailing over Baldur, the howls of Fenris, the yawning gulf of Nifheim, the crashing blows of Mjölner; but the Divine record bears the stamp of truth: Jehovah willed to restrain men, and restrained them by the effectual means of destroying the community of their speech.

There are then sufficient reasons (without taking into consideration the Scriptural statement) for us to consider the doctrine of the original unity of language quite as tenable as the polygenist hypothesis—or at least *not untenable*, for that is amply sufficient for our purpose: we are quite satisfied if it be allowed that, however many reasons there may appear for holding to another theory, there are not sufficient scientific grounds for considering the Scriptural statement as at variance with the conclusions of philology; and that, if the truth of the Scriptural record be granted, the whole matter is clear.

But there are also certain affirmative arguments,—arguments, I mean, which make in favour of the monogenist doctrine of language. To prove constructively and actually the oneness of all existing languages,—to show in them all marks of unity which could be explained satisfactorily only on the supposition of identity of origin, would be a superhuman task. It would require that a man should be able to overcome the fiat of Babel, and to learn all languages more or less perfectly; and that he should be further able to exert upon this mass of knowledge a stupendous analysis: to do, in short, for *all* tongues of *every* family, what it was the labour of half of Grimm's life to do for *one* division of *one* family, in his great *Deutsche Grammatik*. Yet it is possible, in a cursory manner, to show that there are similarities between the great families, which seem to be consistent rather with the idea of unity than of plurality of origin.

I. The readiness with which words are assimilated from one family to another. A very deep acquaintance with grammatical and inflexional forms,—deeper perhaps than has been yet attained,—would, I am convinced, show a unity of principle in all, from which a unity of origin might be justly inferred. But, as I have already hinted, grammar is a constant quantity in languages such as we are able to deal with, viz., those which have a written literature. Though the grammar even of a written language still has a tendency to change in its own direction, it can never retrograde; every change must tend to remove it farther from others, and to diminish the argument for identity of origin; or rather to remove all marks from which arguments on either side can be brought. We must be content with drawing our proofs from vocabularies. Within the same family there is no wonder at words being easily borrowed and assimilated; but this operation is not restrained within this limit. We can borrow and incorporate into our own language such words as *sofa* from Turanian, *coffee* from Shemitic (قهوة), *taboo* from Polynesian. The Modern

Greek helps itself to plenty of Turanian words: *τουφέκι*, *gun*, (*طوبغي*), *ἀφέντι*, *master*, (*افندم*), from Turkish, are examples. So the Shemitic Syriac has no difficulty in borrowing and adopting from Aryan Greek not only such words as *σύν-κλητος*, *ἡλωσσόκομον*, but even such a particle as *ἰγάρ*; and the Hamite Coptic can assimilate not only words from Shemitic Hebrew, but also Aryan Greek—*σωμα* *σώμα*, *ψυχη* *ψυχή*, *στολη* *στολή*, *χωρα* *χώρα*. In the same way the Aryan Persian has introduced and appropriated a large vocabulary of pure Shemitic (Arabic) words; and the Turanian Turkish has done the same to such an extent, that the Osmanli of the capital is scarcely intelligible to the Turkish peasant from the country. This easy adoption of foreign and unfamiliar words seems to prove that there is not that difficulty of blending which would be sure to characterize languages specifically and radically different. Were the difference such between the Aryan and Shemitic, the Modern Persian would be no more possible than a breed between a trilobite and a batrachian.

II. Further, we are often startled at finding in the vocabularies of extremely different languages traces of similar roots, and remarkable coincidences of words. A great many of these may be allowed to be mere coincidences; a great many more may be really borrowed either by one from the other, or by both from the same source. But still the phenomenon remains; there will still be a residuum of similarities which can be best explained by the doctrine of a common origin. Thus the Coptic verb *τακο* 'to perish, corrupt,' is perhaps borrowed from the Greek *τήκω*, but it looks very like a derivative from an earlier common origin. *χορ* 'a serpent,' is exactly like the Greek *ὄφης*; but if a borrowed word it would be spelt with the *φ* *phi*: its having the non-Greek letter *ϥ* *fei*, and the *χ* *hori* prefixed for the *spiritus lenis*, seems to prove, that (unless we suppose it came from Egyptian into Greek) the two words are derivatives from a common root, prior to the distinction between Hamitic and Aryan. (The Shemitic has a fuller form from the same root; Arab. *افعي*, Heb. *אֶפְעַי*). So, comparing Coptic with Hebrew, the word *ιοα* for *יָם*, 'sea,' may be a borrowed one; but *μοοϥ*, 'water,' is a word as old as the time of Moses, whose name is derived (probably) from *μοοϥ οϥχε*, 'water-saved,' and can scarcely be the Hebrew *מַיִם*. It must be a growth from a prior

root, from which מַיִם was also formed. The same must be said, I think, of the following coincidences, taken at random :

צוּאֵי שְׁנַיִם (two). צְפוֹדוֹץ שְׁפָתַיִם (lips).

שְׁמוֹנֵה עֶשְׂרִים (eight). מוֹת מוֹדֵד (to die).

חַיָּה חַיָּה (to live, to be).

Such a coincidence as that of **שְׁמוֹנֵה עֶשְׂרִים**, 'to be done' or 'born,' with the Aryan Teutonic '*scippan*,' '*schaffen*,' our '*shape*' (originally 'to create'), is perhaps fortuitous,—that is, I mean, does not spring from any identity of root. But as instances of a number of singular similarities between Turanian and Hamitic we may compare the Coptic **חַי** with Turkish **ا** (a house), **אַלוֹץ** with **اغلان** (a youth), **חֶסֶד** with **ات** (a horse).

The similarities of Shemitic and Aryan are innumerable: the most remarkable are pointed out in every good Hebrew, Syriac, Arabic, or Æthiopic Lexicon. I select at random half a dozen :

נָעַר 'to roar' (of bulls) גֹּי our *cow*.

הַר 'mountain' גִּיר, ὄρος.

מָרַף (hif'il) 'to nourish' מָרַף, τρέφ-ω.

כָּנַע (nif'al), Syr. كِنَع, 'to bend, kneel,' **כָּנַע**, γόνυ, our *knee*.

פָּרַד 'to divide' pars, part-is.

פָּתַח (فتح) 'to open' πετ-άννυμι, pat-eo.

Again, the two negatives in Turkish are **يوق** and **م**. The **م** is perhaps the Arabic **ما**; but is it a mere coincidence that the Greek words are **οὐκ** and **μή**? or that the Turkish for 'well' is **أيو** (pronounced *aié*, but written *ái, o*) when the Greek is **εὖ**? Do not such similarities point to a time and a tongue anterior to the separation of Aryan and Turanian? But we may go a step further. On comparing other languages with Chinese, we find some strange similarities. A proportion of these may be, as I have said, mere chance resemblances in sound; but some it will not be fanciful to consider as arising, in part at least, from unity of derivation. I take at random a few from the 214 radical forms (Grundsetzen) of the Chinese.

人 *jin*, 'a man,' resembles Sanskrit **ज्ञा**, 'to know,' and **जन**, 'to produce;' as if "the rational," and "the animal," were to be

expressed by the same word. From the latter Sanskrit root came the Greek *γίνομαι* and *γυνή*; thence Saxon *acenned*, 'born,' *cynn*, 'race,' *cwen*, 'a woman;' our *kin*, and *queen* (originally the same as *quean*), Danish *köne*. It is curious that the Australian blacks use the word *jin* for wife.

𠄎 *wu*, 'not.' Greek *οὐ*. Turkish *یوق*, as above.

父 *fu*, 'father.' Sanskrit *प*, 'to be:;' whence Greek *φύω*, Lat. *fui*, our word 'be.' Or perhaps, *पा*, 'to protect,' which is the root in Sanskrit of the word *पितृ*, 'a father.'

犬 *k'iuan*. Greek *κύων*. Sanskrit *श्वन्*, our *hound*.

豕 *shí*. Greek *σῦς*, our *swine*, *sow*.

鼻 *pi*, 'nose.' Hebrew *פִּי*, 'nose,' *פֶּה*, 'mouth;' halves probably of the *onomatopæic* *פִּי-פֶּה*, *הִי-פֶּה*.

齒 *tsh'i*. Hebrew *שֵׁן*, 'teeth' (sing. *שֵׁן*).

彡 *san*. Hebrew *שֵׁעַר*, 'hair.'

Here, then, are samples of a large class of similitudes in words between the Aryan, Turanian, Hamitic, Shemitic, and monosyllabic families. I repeat what I have said before, that a few of such similitudes might be explained consistently with the polygenist theory, by suggesting fortuitous coincidences or borrowing of words or roots; but I contend that on the whole they point to a time when there was one and but one primeval language, from which the roots of all languages—whether of their vocabulary or their inflexional forms—are taken, and to which they may, *conceivably*, be ultimately traced back, though it is scarcely probable that man will ever be able to complete the work.

What, then, was this primeval tongue? It is not the task of our Institute to originate theories: our business is to show that Scripture—I mean the very letter of the written Word, as we have it,—is not untenable; and that those who deny it and reject it, because of its alleged discrepancy with the results of science, eventually find themselves involved in difficulties equal to, if not greater than, those which they escaped when they severed the consecrated cord that bound the humble believer to his scientific but not less believing brother. Still I hope I may be pardoned if I throw out an attempt at a theory, or rather a hypothesis, for which, of course, the Institute is not responsible.

“ All that the man, the living soul, calls it, that is its name.” (I translate literally from the Hebrew. The LXX and our version prefer “ all that Adam called it, the living soul”— “ whatsoever Adam called any living creature.”) Man, with the gift of reason, had appended to it, either as a property or an inseparable accident (to speak in logical fashion), the gift of speech,—the gift of producing various articulate sounds as representatives of the various objects and actions coming before his notice, and cognizable by his reason. The primary language, then, must have been formed by *onomatopœia* (the applying names taken from sounds or peculiarity of external appearance). I cannot hold with Goropius Becanus, that this language was German or Flemish; nor with the Welshman I have read of, who claimed the honour of primevalism for his own native tongue; nor yet can I accept the argument of Bishop Patrick and others (borrowed from or suggested by St. Augustin, de Civ. Dei, xvi. 11), that as Adam conversed with Methuselah, Methuselah with Shem, Shem with Jacob, the language of Jacob and his people must have been the same with that of Adam. The long lives of the patriarchs must have contributed to a regular and orderly development of the first articulate utterances of the first man into a real language capable of expressing the relations of time and mutual action. It is not to be conceived that men endued with the gift of speech, and all that that gift comprises, went on from year to year of an extended life without finding some means to express not only the varied objects which were presented to them, but the varied relations in which those objects stood to one another. The *Scripture* account favours the view that poetry was rapidly evolved in the elder branch of the Adamite race. The address of Lamech, sixth from Adam, to his wives is given in a poetical form in Hebrew. There can be little doubt that it is a metrical translation of an antediluvian poem preserved by direct tradition in the younger Adamite house, though originating in the elder, and rendered into the poetry of the age from generation to generation, as time went on and the language altered. The book of Genesis gives us, of course, the current Hebrew version at the time of Moses of this remarkable composition.

The centuries (nearly seventeen according to the ordinary reckoning) which intervened between the Creation and the Flood afforded time for the organization and solidification of the primeval speech. And as there was then no element of mutual repulsion, the development was all in one direction, and each man and set of men contributed something to the *improvement* of the language, not to increasing the width of

the gulf between it and some other. On the plain of Babel the impetus was given which has resulted in the evolution of all the marvellous number of dialects in which men think and hold converse at the present day.

The earliest variations of the one language were probably—1st, the uninflected, or nearly uninflected, represented by the Chinese and Tungusian; 2nd, the inartificial, though inflected by prefix and suffix, now styled Hamitic; spoken in various form by Menes the Egyptian and Uruk the Babylonian, and the early Canaanites, and represented to us in the Coptic. The relics of the ancient Egyptian preserved to us in this language, and in the little that is decipherable and intelligible of the earlier tongue, show us that the vocabulary was inartificial to a degree, preserving much of the presumed onomatopœia of its primeval original.

ΤΕΛΤΕΛ ‘to drop,’

ΛΕΟΤΙ ‘lion,’

ΠΕΤΕΠΕΠ the ‘hoopoe,’

ΟΥΖΟΟΡ ‘dog,’

are specimens of the evidently ancient appellatives used by the Hamites. The Shemite speech of Terah’s tribe was probably evolved from an earlier Hamite modification of Noah’s tongue, rather than started as an independent branch. And thus, though Abraham and the Canaanites had little difficulty in understanding one another, Jacob and Laban used two different names (apparently mutually intelligible) for “the heap of witness,” and the children of Jacob at the court of a Pharaoh—that Pharaoh *perhaps* a Philistine shepherd-king—found it more convenient to employ the services of an interpreter.

Relics of the Noachid speech exist, no doubt, in every tongue, modern and ancient, living and dead. Yet they should be sought for, it may well be imagined, and would be most likely to be detected in greatest number and earliest condition,—1. in those tongues which have to all appearance altered so little from their primitive form, the dialects of China and the Tungusian division of the Turanian family; 2. in the Coptic, and in those offshoots of the great Hamitic Egyptian language which exist, in more or less degraded form, in various parts of Africa; 3. in the language in which the sacred books are written, the Biblical Hebrew, which, though it bears marks of cultivated development, must needs (if our sacred records are to be listened to) contain much that has really directly descended from primeval times.

I cannot close this paper without apologizing for the apparently dogmatic tone which may to some appear to pervade it. But I have designedly abstained from quotations, and from alleging the opinions of eminent writers on either side. Our object is not to collect what men *have* said, but to induce men to think, and think deeply. I have therefore ventured to place before you my own thoughts and reflections on the matter, and leave to profounder learning and deeper reflection the task of going farther. Sure I am, that the profounder the thought and learning, the more clearly will be displayed the simple sublimity of the dealings of the Creator with His creatures, and the unity of the great creation called into being by that Deity who in His wisdom has willed to leave us written records of Himself and of His providence, truer and more certain than the deductions even of the highest of finite minds from the steadiest of finite senses. And as a deep mathematic brings us nearer to the source of all number—the Infinite yet One; as a deep astronomy carries us closer to the Lord of Heaven, a profound geology to the Creator of earth; so will an extended and profound philology raise us nearer to the Author of the tongues of men and angels—to Him who has not disdained to be called the Alpha and Omega, the *Word* of God.

The CHAIRMAN.—I think I may call upon you to give with acclamation a vote of thanks to the Rev. Dr. Thornton for the exceedingly valuable paper he has read. I am sure every one will feel that this Institute is doing a great work, by calling forth such papers as that we have heard this evening—a paper displaying the most profound learning, and yet marked by the deepest modesty. (Hear.) I am sure you will all agree that the author of it is entitled to our most cordial thanks; and I have only to add, that as we are anxious to encourage discussion, I shall be glad to hear any gentleman who has any remarks to make; but I would request that, as our discussions are reported very fully, every one should confine himself as much as possible to the subject of the paper. It has also been intimated to me that the distinguished biblical scholar Dr. Tregelles is present with us this evening, with a suggestion that perhaps he would favour us with his views on the subject. I can only say that I feel certain we shall all be extremely gratified if he will kindly do so. (Hear, hear.)

* Dr. TREGELLES.—As you have invited me to speak on this paper, I shall avail myself of the privilege which you have granted, to make a few remarks upon it. I think it is a very valuable paper, and I listened to it with much pleasure, and followed the arguments which Dr. Thornton brought forward in support of his views with a peculiar degree of interest. I think he has dealt with a very difficult subject in a very masterly manner; and though there are many things which are stated in that paper, for which the writer

has not quoted authorities, I believe it will be found, upon examination, that his statements are quite consistent with the views of some of the highest authorities who have written on the subject. There is one point upon which I presume all are agreed, who hold the Scriptures to be the word of God ; and that is, that there can be no real contradiction between it and the facts of Nature: there can be no contradiction between the word and the works of God. In the pursuit of philological studies, there is one thing which often occurred to me :—the history which is given in Genesis of the origin of language, must either be a well-founded statement, or it must have been invented afterwards to account for the different tongues which are spoken. If it were the latter, I think it would have been far more precise ; if it had been invented in order to account for the different languages in the world, it would have been far more elaborate than the simple narrative which is given in the Bible. With regard to the general question relating to what is commonly called “ philology,” I should feel myself exceedingly incompetent to discuss it ; but I might remark that upon this question, as well as a great many others, I have observed that some persons have gone out of their way to raise difficulties against the Scriptures, where no difficulties really exist. (Hear, hear.) I have observed the manner in which Scripture has been objected to, and have seen many persons straining at the merest trifles in order to raise difficulties, which in any other matter they would have felt to be no difficulty at all. And in consequence of the determination which has been shown to do this, the believers in Revelation have often been called upon to defend and explain things which, if it were not for the way in which their meaning has been distorted, would have required no explanation whatever. Now I think we have reason to complain of this. It is very unfair. Let the readers of Scripture, and men of science, and observers of facts, wait until facts are fully ascertained before they raise objections. It is quite possible that upon a closer examination they might find that many things turned out in a different manner from what they had at first supposed. We all find that, as children, we formed opinions upon those things that came under our notice, which we have since discovered to be altogether erroneous. It is thus with science. Men form their opinions with too much haste, and they subsequently find that they were wrong. I say that science ought to be the observer of facts. Let men of science wait a sufficient time for facts, and let them thoroughly test every theory which is put before them, before they come forward and say, “ Here is something infallible,—here is something which cannot be disproved.” We often hear it said that “ science teaches ” this or that. Something is wrapped up in this mysterious language, which we are supposed to be bound to accept as absolutely dogmatic. Now in such cases there is room for considerable doubt as to what science does teach. It may be true that our present knowledge of science teaches us so and so ; but our present knowledge is quite imperfect. We are only just beginning to know what is the meaning of some things which are called science ; and therefore the phrase “ science teaches ” has no real meaning. It is an expression commonly used, not by those who are most competent to

discuss questions, but by those who endeavour by phrases of that kind to conceal their own ignorance, and who really know nothing about what science teaches or what it does not teach. I did not, however, come here with the view of taking any part in the discussion. I would far rather have heard the remarks of others; and it was only because I was called upon that I have ventured at all to say a word. I have only one more observation to make, and it is this: It is a strange fact that a person who has the greatest powers to acquire languages has often the least comprehension of the relations of one language to another. We have an instance of this in the late Cardinal Mezzofanti. He was perfectly accustomed to read and write in very many different languages; but if you asked him a question upon any point with respect to philology as a science, he had no conception of the matter whatever, and was unable to give you any information. It is also a remarkable circumstance in connection with this subject, that if you are listening to several different languages spoken at the same time, the effect is such as to produce a sensation almost like absolute deafness. With regard to the observations in the paper as to the way in which habit and temperament affect language and the pronunciation of speech, it is a thing which all of us must have observed; it is a thing which is doing its work at present, and will continue to do its work after our generation has passed away. I have nothing further to say with respect to the paper, except to state how heartily I join in the vote of thanks which has been proposed to Dr. Thornton, and to express the sincere desire that I have to see men who deal in science confining themselves strictly to facts. The moment we find science taking primary ground of opposition to Scripture, we ought to ask whether it is science or *inscience*; and I do not think we need have any doubt as to the answer which we should get to that question.

Professor OLIVER BYRNE. — There is one argument which I think Dr. Thornton might have used in support of his theory as to the common origin of the languages now in use in the world. It might be possible to select twelve words in one language similar to those in another; but for that language to be able to return the compliment, unless they were of common origin, is not within the range of mathematical probability.

Mr. WARINGTON. — I have just two remarks to make with reference to the paper. I have listened to it with great interest; but it struck me that there is one objection to the conclusions drawn, which I think can be very easily disposed of, and which has not been touched upon in the arguments of Dr. Thornton. It is this: — We have to account for more than a mere difference in the names applied to things; we have to account for a difference of grammar. It appeared to me that Dr. Thornton gave us no hint in his paper as to how he would account for one nation having suffixes and another affixes, in their grammar. Is it not to be accounted for in this way? If you take a language with suffixes, you will find that these appendages consist of other words shortened so habitually that they lose their apparent meaning. You can trace them, upon the examination of several words; and you will find that what appears to be a suffix is really

another word tacked on to the root in such a way that it has lost part of its sound. I think that is a very important point. It clears up matters of grammar as well as matters of vocabulary. Both differ very much; but I believe if we examined the question, we should find that the differences of grammar are the greater and the more important of the two. There is one other point to which I wish to call attention. I think Dr. Thornton showed great wisdom in not pressing his argument for the unity of language as necessarily destructive to the polygenous theory. It is plainly possible, *à priori*, that the different races of men may have descended from different original stocks, and yet possess similar and apparently related languages. For, whether from one stock or from many, it is certain that there is a very close resemblance between human beings of different races. All are formed in the same way; all are possessed of similar organs of speech. It is therefore a moral certainty that, however originated, their languages would also be similar. Scripture, indeed, tells us that the polygenous theory is incorrect, and so leads us to adopt another explanation of these phenomena, but if we had no revelation to tell us, we could not arrive at that conclusion from the similarity discovered between one language and another. Again, with regard to the monogenous theory, it is no disproof of that theory, that differences in language exist; but it is no proof of it, that similarities exist; because they can be accounted for on other grounds. Take the instance quoted by Dr. Thornton, the great resemblance of the word *father* in all languages. I do not know whether he quoted also the word *mother*, but I believe it would be found that nearly all the words which represent father and mother in different languages, possess one or two sounds which are closely related to the sounds of Pa and Ma. This might seem a proof that all languages came from the same source; but there is another explanation of it, which is this—that those are likely to be just the sort of sounds that children would first make in addressing their father or mother. It is therefore only natural that they should be nearly alike in all languages. The only case in which similarity affords really a good argument is when you can show a *number* of words which are similar; but it is rather a hazardous argument to contend that races are identical because languages are similar. (Hear, hear.)

Rev. W. NIVEN.—I should highly value the lecturer's opinion with respect to the following passage in the third chapter of the book of Zephaniah, v. 9:—“For then will I turn to the people a pure language, that they may all call on the name of the Lord, to serve Him with one consent.”

Capt. FISHBOURNE.—It occurred to me, taking the language as we find it in Scripture,—from the speech of God with Adam, as well as the speech of the devil with Eve—that language must have been in a much more perfect condition than the arguments of the polygenists would admit of. I would go a little further, and say that if Dr. Thornton had enlarged in that direction he must have told us that language is more than a means of communication. I think we must consider language as something more than a mere philological science; it is the instrument of thought. Without language I do not think we could excogitate. I think that the fact of the devil speaking to

Eve and reasoning with her implies that there was a current language with which he made himself acquainted. And the facts which I think go far to prove the unity of speech are the remarkable traditions we have, and their palpable identity. We must deny history altogether if we deny tradition. We have a tradition of the Flood and of the dispersion of mankind prevailing amongst the Chinese and amongst the Mexicans. It is not, perhaps, so remarkable to find it amongst the Chinese, who had a written language; but it is very remarkable to find it existing amongst nations which had no written language. With respect to the remarks in the paper, as to the facility with which people slide out of the original language of their ancestors, it might be supposed that in China, where they have a written language, these modifications would be the least likely to occur. Yet it is a most extraordinary thing that in that country there is the greatest difference between the dialects spoken in the various and even in adjacent provinces. I remember on one occasion being at Nankin, and, wishing to communicate with certain individuals, we were only able to reach them through a chain of four or five interpreters, in consequence of the amazing difference in the dialects. I never yet saw two Chinese persons, even belonging to the same district, and speaking the same language, who yet spoke with perfect intelligence one to the other. So nice are the inflections, that two persons in China cannot converse for five minutes together, without having recourse to the employment of the signs or characters, which they make on their hands, to explain what they mean. If you observe them conversing, you can see at once that there is a great diversity in their dialects. And this diversity is becoming greater every day, so that, in the course of time, instead of having nine hundred languages, we shall have a thousand, or perhaps more.

Mr. INCE.—I rise for the purpose of making one remark. An expression was introduced into the paper implying that man had improved upon the language which he originally possessed. Now, I cannot agree with Dr. Thornton in that matter. I think that, as God Almighty created Adam, He created him a perfect being with perfect speech, and He did not leave His work for man to mend. Man might have increased the number of words, but I do not think it was possible for him to improve upon what God had imparted to him.

Mr. REDDIE.—With reference to the observations of Mr. Ince, I quite hold with him that language must of necessity have been a gift to man from his Creator; and, if so, that it would be a "perfect gift." I was glad to find it plainly advanced in the admirable paper we have all listened to with so much pleasure, that language was a gift from God, and not a human invention. I think I may also venture to say that it was not Mr. Ince's intention to attribute to Dr. Thornton anything contrary—

Mr. INCE.—My objection was only to the word "improve."

Mr. REDDIE.—So I understood. I was about to point out, that if man, as created by God, was endowed with the highest wisdom and capacity for knowledge, he must also have been endowed with the power of speech; for without speech, as Capt. Fishbourne has very properly observed, he could

not really have thought : he would not have been man. Mr. Max Müller appears to be of the same opinion ; for he calls thinking “ speaking low.” In saying this, of course he does not mean, that, in thinking, there is an absolute articulation of words, but that there is necessarily the idea of words, or what words mean. But although man was so created in this perfect state, —with every capacity for knowledge, with the power of speech, and with wisdom and intelligent instincts, all of the highest order,—he must still have been ignorant of that kind of knowledge which can only be gained by experience. For instance, he could have no knowledge or experience of the sensation of fear, till he disobeyed God and fell from his original state of innocence. Therefore, his ideas, and correspondingly his language, would have to be increased, as of necessity ; and by being thus increased, his language would also be “ improved,” without implying any imperfection in his original gift of speech, but rather the contrary. If we bear in mind that the gift of speech was a faculty, a power intended to be exercised and developed by man, rather than a mere vocabulary or complete set of words, it will be seen that its capability of thus improving in development is really the best proof of its perfection. Touching this question of the improvement of a language, I was somewhat surprised at one remark of Dr. Thornton with reference to the language of the Greeks. Philologists, I believe, consider the Sanskrit to be the most perfect language. But, at least, after the Sanskrit, I suppose the Greek will be acknowledged to be the most perfect and polished language with which we are acquainted. Now, I am inclined to think that it chiefly owes that perfection to what I thought Dr. Thornton was almost inclined to sneer at (though I do not like to use the expression), namely to their exclusive devotion and attention to the study and development of their own language, without much regarding the other languages spoken around them. I believe, as a consequence of this, that in Athens you would not have heard Greek spoken with such constant variation as we hear English spoken, even at our chief seats of learning, in the present day. At Oxford and Cambridge, more attention is certainly given to the pronunciation and composition of Greek and Latin, than to English. At present, too, we make a point of knowing something of so many other living languages besides our own, that it does not improve, as no doubt it otherwise would. I do not say we are wrong in being so cosmopolitan. To a certain extent we may be forced to be so. But this certainly does not conduce to the improvement of our own language, which some even disparage and despise. In that respect, the French are now more like what the Greeks were : they are devoted to their own language especially, and pride themselves upon it ; and it is correspondingly improved. With reference to Mr. Warington’s criticism of Dr. Thornton’s argument, I must say I do not think he has quite done justice to it. It appeared to me that Dr. Thornton put the case upon the very lowest ground, and claimed to have proved much less than he was entitled to claim. He did not say that there was any strong positive argument in favour of the monogenist theory to be derived from comparative philology ; but only that there is a balance in its favour. He argued, that if

we start with believing the Scriptures, and then find, upon a scientific examination of man's speech, that there is an undercurrent of similarity running through all languages, this is a ground for holding to the truth of what the Scriptures tell us. Now I think that that is a perfectly sound argument. And if you do not limit your consideration of the subject merely to language, —but if you will also take into account all human traditions ; if you will take the whole of man's history, and all the facts connected with his past and present condition, so far as we can discover them, then you will find that what might be but a weak argument by itself, and if it rested upon philology alone, becomes, with the addition of these other arguments, a very strong and completely built-up proof of the original unity of the human race. We have the statement of the Bible to begin with—which surely must go for something ; and when we find it is supported by all the other evidence we can collect, does not that afford good ground for holding to what the Scriptures narrate ? (Hear, hear.) For my own part, I do not hesitate to say that I do not believe that man could ever have invented language, if originally without speech. But, at the best, if he really did so, it must have been by a very slow process indeed. For we must remember that those who reject the Scriptures and adopt the polygenist theory, must start with mankind in the very lowest condition. Except to account for the existence of savages in that abject condition, with their low mental capacity and imperfect language, there would be no need for a polygenist hypothesis at all. But if you adopt that hypothesis, then the question is limited very nearly to this: What rational ground have you for believing that civilized man with his perfect language has been developed out of the savage with his almost unintelligible gibberish ? Now I venture to say, Mr. Warrington has not given us any reason, nor a single fact, for believing in that. (Hear, hear.) As regards the somewhat ingenious argument he has advanced (whether he has adopted it *bonâ fide* as his own view, I do not know), namely, that as human nature is everywhere much alike, and as men have all the same organs of speech, they would therefore naturally hit upon the same sounds to express their ideas ; and hence the similarities in all languages might be accounted for. I can scarcely imagine a more thoroughly perverted view of the whole question than this. The admission of such similarities is important. But it is surely notorious that it is because of the physical differences and the philological differences between one race and another of mankind, and between one language and another, that the polygenous theory of man's origin has ever been thought of. It is surely a fact within our own experience also, that, starting with the same parents, we find diversities in their children, and that every living language of which we know anything is gradually changing and modifying before our eyes, and tending to diverge away from its original ; while it is not a fact that from diversity of origin we have any experience of this assumed tendency towards unity. The differences between languages are patent ; but those traces of unity in various languages which Dr. Thornton has called attention to, are found lying hid in the original roots and the oldest germs of words, and not in their present forms or last developments. Then, as to the notion that the

radical sounds in father and mother come from some primary root to be found in *Pa* and *Ma*, it would prove nothing for the one theory more than the other, even if true. It is akin to what Max Müller calls the "bow-wow theory" of language, in which I have no faith whatever. Children are taught to say *Pa* and *Ma* in the nursery, and it is natural that they should imitate the *Baa* of the sheep, when they can do little else as babies. But, if that is a true theory for language beyond the nursery, how is it that in no language whatever, so far as I am aware, the sheep is, after all, called a *Baa*? It is not so in Latin, where we have *ovis* and *agnus* for what in English we call a *sheep* and a *lamb*. It is not so in Greek or in French, and perhaps not in any other tongue; and therefore the theory requires no other refutation: it is not founded on any facts. As regards the monogenist theory, on the other hand, you have not only the Holy Scriptures which give you the hypothesis, but you have those extraordinary coincidences of similarity in language which Dr. Thornton has so ably brought before us, in support of it. You have, also, the high perfection of the Sanskrit language, though one of the oldest; and that is in accordance with the idea that God created man not only a perfect being, but with a perfect faculty of speech, or perfect instrument of thought. And, indeed, it could not have been otherwise, if you once admit the theory that God created man in a state of perfection. It will be my duty a fortnight hence to bring forward some arguments against the contrary notion that God might have created man imperfect. If, however, you adopt the Scriptural account, and admit that speech was a gift of God, there is still a question which perhaps may be raised, as to whether that gift was not at first limited to the power of giving things names. Dr. Thornton appears to lean to this view. To give names to objects would no doubt be naturally one of the first exercises of that power; but I can see no reason for believing that it had any such limitation. The idea of action or of motion is inseparable from the observance of living beings, and is as definite as the idea of the existence of things themselves; and therefore verbs to express such ideas are as essential to intelligent thought and intelligible speech as substantives. If there is any part of Dr. Thornton's valuable paper with which I did not go, it is what relates to this. But I do not agree with Mr. Warrington that the learned Doctor overlooked the grammatical differences or agreements in language, to which Mr. Warrington has called special attention. Mr. Crawford and other ethnologists I know are of opinion that grammatical inflection is a matter of the greatest importance in determining the family of a dialect. Granting that man was created a perfect being, he must have been endowed with the capacity of speaking what he was obliged to think. He would at the very first have to think of the power of God as his Creator, and of his own relative position upon earth. According to Revelation, he had to think, in his communications with the Deity himself; but that is beyond our present range of conception, as it relates to what is supernatural. But at all events, after the creation there is nothing in the Scriptural account to lead us to the conclusion that man had to invent his language. And, in point of fact, now, we never invent words: we either borrow them, or we modify them, to suit new ideas. And if we

were to attempt to describe any object by some inherent quality which it possessed, we should find it the most difficult thing imaginable. We fancy sometimes that words are thus expressive of ideas by their sound ; but that is mostly imaginative. If we take, for instance, the words "rush" and "crush,"—the one signifying rapid motion, and the other arrested motion—which are almost quite opposite in idea ; yet they both appear perfectly expressive, merely because, through the association of ideas, we are accustomed to connect the meanings of the words with their sound, and so we think that they are expressive. Again, bearing upon the question of change of dialect, we must all have observed what a difference exists amongst ourselves with regard to the pronunciation of the English language. If you go down to Whitechapel, you will not find the same dialect there as you will find in Belgrave Square. Language, as it were, develops and grows naturally, and as it grows it sometimes also tends to corrupt in its growth. The only thing which preserves it from more rapid alterations now, as formerly, is that it is written. In former days, when men had not the facilities for writing which they now so commonly possess, and when they wrote on stones or on tablets of wax, and when a still greater majority of the people than now were necessarily illiterate, language must have degenerated or altered very rapidly ; and thus would be originated that great diversity of speech among mankind which we are now trying to account for. But, if anything is clear from the numerous philological differences and theories of language that exist, it is this,—namely, that there has been a "confusion of tongues" in the world. I do not think we can want any more absolute proof than we already have to be convinced of this.

Professor BYRNE.—There is one principle in the law of Confucius which ought to be mentioned. He taught the Chinese that they should give attention to things and not to words. It is a part of their religious duty to carry out this principle.

Mr. REDDIE.—I fancy they must have been very unsuccessful in doing so, for they have more words than any other nation in the world. (Laughter.)

Mr. WARINGTON.—I wish to state that in the observations which I made I was not criticising the paper ; I was rather praising the author for *not* using an argument which he might have used.

The CHAIRMAN.—I may say that I did not understand the observations of Mr. Warington as criticisms upon the paper. I rather thought that he was calling attention to an argument which might have been used, but was not used by Dr. Thornton. I think the arguments in the paper have been very ably sustained in the discussion ; and the views advanced by the author have been supported by the very interesting fact which has been mentioned by Captain Fishbourne with respect to the Chinese language. The variety of language spoken in China affords a remarkable confirmation of what Dr. Thornton has been maintaining in his paper. There is this remarkable distinction between the Chinese and every other language,—it is a language of ideographic symbols ; all other languages are phonetic. The symbols used by the Chinese do not represent sounds ; they represent things, as was stated by Professor Byrne. It is a very remarkable fact, that in a

nation like China, which is a very exclusive nation, and a nation possessing the power of writing, you need not travel out of it to look for an illustration of all the arguments which have been maintained in Dr. Thornton's paper. If you take one of the northern provinces in China, and compare the dialect spoken there with that spoken in one of the southern provinces—

Captain FISHBOURNE.—You might take the adjoining provinces.

The CHAIRMAN.—You will find that if, as Captain Fishbourne states, you compare the dialects even of the adjoining provinces, the diversity between them is so great that the inhabitants cannot understand each other; yet they have no difficulty in communicating their thoughts in writing. It is also to be remembered that we possess exactly the same kind of thing in the language of our arithmetical calculations. If we write down an arithmetical calculation, or an equation in algebra, it can be read by a man in France or Germany who knows nothing about our language; and thus mathematicians write down their symbols, and can communicate their ideas, though they may not be able to speak the same language. With regard to the observations of Mr. Warington, I differ from him in thinking that Dr. Thornton has neglected the comparison of the different grammars as well as the words of languages, though I don't think so much can be made out of the argument from grammar. Nothing can be more unsettled than the grammar of our own language, I know some who state that we have no grammar at all; such is the delightful position in which we are placed. It must have been observed by every one, that our language has degenerated from the complex grammar of its supposed parent language. At any rate we have lost almost all our inflexions, and have nearly arrived again at what some might think the more primitive style of language.

Rev. Dr. THORNTON.—Allow me to say, before I allude to the remarks which have been made on my paper, that I thank you most heartily for the vote of thanks which you have passed to me. I can assure you that I had great pleasure in preparing the paper, and that pleasure has been very much enhanced by hearing the many valuable observations which it has called forth. With reference to the observations of Dr. Tregelles, they were so favourable, that any remark upon them would be presumptuous on my part; nor was there anything in those of Mr. Warington which calls for any particular remark; I think he appreciated my arguments very fairly. I argued that, putting Scripture entirely out of the question, there is no reason to believe, from the study of man's speech, that what we find stated historically in the Scripture is not true, or that it disagrees with the conclusions which we fairly derive from the facts obtained from other sources. Of course it is impossible to invent a theory which will square with facts in every particular, and my argument was that the apparent probability inclined in favour of Scripture. It is perfectly true that suffixes and prefixes are originally separate words attached to the inflected word, as, for instance, the verb "have" may be clearly traced as a suffix in the futures and conditionals of Romance verbs; and the use of these attachments in so many different families of languages is a proof of their common origin. The choice of prefix by one family and of

suffix by another, is the result of that tendency to divergence which I hold to have been inflicted on mankind at Babel: the primæval tongue of the Noachidæ probably used both. With regard to the observations of Mr. Warrington, as to the similarity, in all languages, of the words used for father and mother, there are certain radical sounds which are accepted as word-roots in nearly all tongues. One of the first of these is "P;" and "M" is a modification of it,—both implying "that which is near." We might add that the harder "P" is probably used to distinguish the sterner, and the softer "M" the gentler parent. "Ma" is used in the Sanskrit in the sense of bringing into the world, and "Pa" in that of preserving or maintaining. It is certain that the radicals Pa and Ma exist in every language, however it may be accounted for. I come now to the question as to the probable meaning of a passage in Scripture. Of course my explanation is given, off-hand, with the greatest diffidence. But the way in which I understand it is that in a future state the curse of Babel is to be done away. Man then being unwilling to speak that which is wrong, will be privileged to communicate in "pure language" with his Father. That language will not be the tongue of man, but what I will call the tongue of angels, which he shall use for glorifying God. (Hear.) As to the communications in Paradise, between the woman and the devil, and between man and the Deity, we cannot argue or deduce much from the little we know of what went on in the Garden of Eden. Man, in a state of innocence, which he lost by his fall, had very simple ideas, which did not require any extensive knowledge of language to express. The devil, in his conversation with Eve, had only to use a little persuasion in addition to the negative reasons which he gave to her; but to enlarge on this topic would lead us into metaphysical theology, which is beyond the range of our present debate. Captain Fishbourne said that without speech we cannot think; but I should modify this statement by saying that, granting that we think in words, we do not think in grammar. If you contrast a conversation which you hold with any one with a debate carried on in your own mind, you will find that the relations expressed by grammatical means in the former case are, in the latter, necessities of thought rather than mentally-conceived inflexions. Here, again, however, we are getting into metaphysics. A farther objection was started with which I cannot agree, that language came from God perfect—that it was given as a gift to man, and was not given imperfect. I think that argument cannot be sustained. "Whatever Adam called every living thing, that was the name thereof." There was a work which was left to man to do. His power to articulate was absolutely perfect, but it was given to him that he should develop it, and use it for something higher. I do not suppose that the power of speech can be called an imperfect gift, any more than a grain of wheat which has not been put into the ground is imperfect; but language, till developed, was so. I will only now refer to the observation of Mr. Reddie as to what I stated about the Greek language. As an Oxford man and a schoolmaster, I am not one who is likely to undervalue that language; and when I stated that the Greeks were slavish in their devotion to their own language, I did not mean to sneer at this, as Mr. Reddie appears to think, but to express an

opinion that they cultivated their own language so deeply and exclusively that it almost amounted to a fault. There is, for instance, in the Rhetoric of Aristotle an amusing passage, in which a person is introduced as contending, half in earnest, that if you predicate non-existence, you predicate a species of existence; as if not-being were a peculiar way of being. That is a confusion which would never occur to a man who had learned another language. I do not think I need now make any further observations upon the question, and I will conclude by again thanking you for the kind way in which you have heard me.

The Chairman then adjourned the meeting.

ORDINARY MEETING, JULY 16, 1866.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous meeting were read and confirmed; and the names of the following Members and Associates were announced as having been elected since last Ordinary Meeting:—

MEMBERS:—John Corderoy, Esq., 3, Kennington Green; Rev. John Philip Gell, M.A., St. John's, Notting Hill; Malcolm Goldsmith, Esq., H.M. Civ. Ser., 43, Addison Road, Kensington; D. J. Jenkins, Esq., 61, Marquis Road, Canonbury; Frederick Prideaux, Esq., Barrister-at-Law, Reader on the Law of Real Property to the Inns of Court, Castelnau Cottage, Barnes; J. Hornsby Wright, Esq., 2, Abbey Road, Maida Hill.

ASSOCIATES,—1ST CLASS:—Miss Broke, Marlborough Buildings, Bath;
2ND CLASS:—Peter Carthew, Esq., 15A, Kensington Palace Gardens, and Woodbridge Abbey, Suffolk.

The following paper was then read:—

ON THE VARIOUS THEORIES OF MAN'S PAST AND PRESENT CONDITION.—BY JAMES REDDIE, ESQ.,
Hon. Mem. Dial. Soc., Edin. Univer., HONORARY SECRETARY.

THERE are three leading doctrines or theories current in the present day, which claim our attention as professing to account for the facts of man's past and present condition. The oldest and first in importance is what we have all been taught as children, that God created man a little lower than the angels, and gave him dominion over the inferior creatures. This might well be called *the Monogenist, or the Historical Theory*, but on the present occasion I prefer to give it another name, and will call it *the Religious Theory*. The second in importance, because, although the latest put forward, it is antagonistic to both the others, is *the Darwinian Theory*, which derives man from the ape. And the third is *the*

Polygenous Theory, which, without descending quite so low for an ancestor, nevertheless propounds that the primitive men were savages, but lower than any known race of savages, inasmuch as, according to the theory, men originally could not even speak.

There may be minor distinctions and sub-theories perhaps, but still it will be convenient to keep to this classification. There may be polygenists, for instance, whose imagined primitive men were not all of the same low caste,—all merely speechless savages of different colours, white, yellow, red, and black. And it is surely not worth while to have a polygenous theory at all, if merely physical differences are all it can account for. There would certainly be a greater similarity between men of all the existing varied races, while in the same savage, low condition, than between men of identical race when savage and when civilized. The physical race-characteristics of a people might not much differ, through such a change in their mental character,—or rather, let me say, the physical differences would be only and literally superficial,—whereas the differences, between savage and civilized races, when regarded in a mental, moral, and social point of view, are well-nigh infinite. But then, the polygenist, who would make only some of his primitive men to be low-caste savages, and others an elevated race of superior clay and capacity, would be involved in contradictions as to his very theory of creation, or, if he denies creation, in his theory of man's origin and development. And, in point of fact, no such theory has yet been propounded, at least not in such a way as to lay hold upon men's minds, or to call for further examination. Some, who have not studied the whole question, may vaguely speak as if they held such a theory. They may have been puzzled at seeing the marked differences between the various races of mankind as now developed; and, influenced by the persistency with which a diverse origin for each has been urged by some eminent physiologists upon scientific grounds, they may not have inquired what science and equally eminent physiologists have said upon the other side.

But here Darwinism comes to the aid of the religious theory, and decides in favour of a monogenist hypothesis, professedly upon scientific grounds. Not that there may not be, again, a sub-class here, who are Darwinians and yet polygenists. At one time I thought that not possible; but on arguing before the Anthropological Society of London,*

* *Anthropological Review*, vol. II. p. cxv *et seq.*

two years ago, that Darwinism "gets rid of the polygenous theory, by assigning to us the ape for an ancestor, mediately through the negro," I was answered thus:—

"Mr. Bendyshe could not perceive how the transmutation theory could get rid of the polygenous theory. Mr. Reddie appeared to suppose that, admitting the transmutation theory, man must have descended from a single ape; but that by no means followed. Man might have descended from several different apes. The question of the origin of man from one or from many Adams was not settled at all by the transmutation theory."*

To this it was replied, that "Mr. Bendyshe's suggestion of 'more apes than one,' to reconcile transmutation with the polygenous theory, is at any rate something new; but if these apes are all to be found in the 'equatorial regions,' to which Sir Charles Lyell refers us for a search, we are still relegated to the 'unimprovable' negro races for the first ancestor of civilized man! If it could be established that low-class savages could raise themselves, one difficulty in this theory would be got rid of—that would be all. But if this cannot be established, the theory is incredible, as being impossible."†

Mr. Bendyshe is Vice-President of the Anthropological Society of London; but I am not aware how far his opinions are shared by others, or even if there really exists a class of Darwinian Polygenists in this country. On the Continent, Professor Carl Vogt is a Darwinian, who derives mankind from three kinds of apes; and he denounces, as irreconcilable with facts, the Darwinian monogenist theory. But it will be observed that this view of more apes than one, to obtain for the human race a polygenous origin, only brings us back, after all, to the other polygenous theory we have glanced at, which gives us "merely low-caste speechless savages of different colours" for the ancestors of all the races of mankind. If there be any great difference between the two theories, so far as anthropological considerations are involved, it is only this, that the one gets entirely rid of the special creation of man. In that respect Darwinism is completely antagonistic both to the religious theory and to all such polygenous theories as recognize the necessity for the intervention of a Creator, in order to account for the existence of "the paragon of animals"—man.

But the two best-known advocates of Darwinism are monogenists. Professor Huxley has become a convert to it as a

* *Anthropological Review*, vol. II. p. cxxxii.

† *Ibid.* p. cxxxiv.

monogenist, and has urged its probability upon physiological grounds. Mr. Alfred R. Wallace, who (upon Mr. Darwin's frank acknowledgment) may be regarded as the joint author of the theory, and ought therefore to understand it, pleads for it exclusively on monogenist grounds. The Darwinian is, therefore, so far in agreement with *the Religious Theory*; but only *so far*.

Still it is useful to have an eminent physiologist and anatomist, like Professor Huxley, strenuously declaring upon scientific grounds that he has no difficulty in understanding how all the varieties of the human race may originally have sprung from a single pair. His scientific dicta and arguments counterbalance what may be put forward, also as scientific dicta and arguments, on the other side. It is of great consequence also to have Mr. Wallace, as a distinguished naturalist, traveller and ethnologist, upon the monogenist side; even although other travellers and ethnologists, also eminent, have come to totally opposite conclusions. This being so, the holders of the religious theory may fairly say, that at least nothing is scientifically determined by physiology, comparative anatomy or ethnology, on the one side or the other. And this leaves us free to study the matter with regard to other considerations, if it does not indeed compel us to do so, in order to understand on what side is the weight of evidence and probability. It is to these other considerations I now wish especially to call attention.

But there may be also monogenists, who, while rejecting Darwinism, do not hold the religious theory. They may believe that all mankind are of one species, and have sprung from a single pair, but yet they may consider the primitive man to have been a savage. If there be such a theory, it practically differs little from the Darwinian, *after* (but only *after*) we have arrived at man upon the theory of transmutation. The difficulties of Darwinism begin, however, long before we have got to man.

The classification adopted may, therefore, suffice for a tolerably complete review of the leading theories opposed to that of Scripture, which differs essentially from the others, in this, that it not only holds the special creation of man, but also that man was created not a low-caste, speechless savage, but a man in perfection. All the theories recognize the fact that there has been some kind of development or change in the human family; the chief differences between them all relate to the origin and character of the primitive man.

While acknowledging in what respect the religious theory differs from all the others, it must also be pointed out in what

essential particular Darwinism differs from them all,—from all, at any rate, that admit the distinct creation of man; for they all may be regarded as beginning with man in a state of manhood; whereas Darwinism, of necessity, begins with a human infant which had not human parents. But long before we arrive at that development under this theory, we are forced to ask, in our endeavour to realize what it professes to explain, “How possibly the first young mammal was nourished in its struggle for existence, if its immediate progenitor was not a mammal?” No answer has ever been given to that inquiry; not even by Mr. Wallace in the ingenious paper* which he read before the Anthropological Society of London two years ago, in which he endeavoured to work out in some kind of detail the Darwinian hypothesis applied to man. Nor does Mr. Darwin make any attempt to explain this, in his own elaborate volume. But the question is really a very old one, now revived. It differs nothing from that discussed in the *Symposiacs* of Plutarch, namely, “Which was first, the bird or the egg?” And I must say, to the credit of those ancient inquirers, that when they started a theory, they did not shrink from discussing it in all its bearings. The same question—which really involves the theory of creation—has been more ably and fully discussed than anywhere else, so far as I am aware, in the work called *Omphalos*, by our Vice-President, Mr. Gosse, F.R.S.

But passing over that, with all other difficulties which lie against Darwinism long before we come to its application to the origin of man, and contemplating “the lowly stock whence man has sprung,” as Professor Huxley expresses himself, it has also been pointed out that “to this physiological difficulty there is added one that is psychological; for, even if we see no difficulty as to the physical rearing and training of the first human baby which some favoured ape brought forth, we are forced to ask the transmutationist to favour us with some hint of the educational secret by which the monkeys trained and elevated their progeny into men, when we ourselves are scarcely able, with all our enlightenment and educational efforts, to prevent our masses falling back to a state rather akin to that of monkeys and brutes.”

To this, again, no answer has ever been given; and there is even a prior difficulty, which I may say has been suggested by Mr. Wallace himself. For, in the paper already referred to, he laid it down that the intellect of man and his speech would be developed together; in fact, he recognized that they are

* *Anthropological Review*, vol. II. p. clviii, et seq.

correlative. And, granting this, he was asked to explain how, "upon any principle of natural selection, this intellect came at all? We have only as yet the animal—something between the man and the gorilla; but it could not speak nor think. From whence then did intellect and speech proceed?"—Now I beg your especial attention to all that Mr. Wallace could reply to such an essential question. He said: "Mr. Reddie also wants to know how the intellect came at first. *I don't pretend to answer that question, because we must go so long back.* If Mr. Reddie denies that any animal has intellect, it is a difficult question to answer; but if animals have intellect in different proportions, and if the human infant, the moment it is born, has not so much intellect as an animal, and if, as the infant grows, the intellect grows with it, I do not see the immense difficulty, if you grant the universal process of selection from lower to higher animals. If you throw aside altogether this process of selection, you need not make the objection about the intellect."* Now, in the first place, there is an *ignoratio elenchi* in this reply; for the objection has been urged expressly to enable us to test the theory (assuming its possibility) on a point in which we can test it; and, besides, Mr. Wallace ought to have seen that he had also answered himself. It is his own proposition, that speech and intellect would go together; and if that be so, then the inferior animals have *not* the intellect, so defined, that goes with speech. But the difference between the intelligence of the dumb creation and the intelligence of speaking man might well form the subject of further investigation, which might fitly be brought before this Society. No doubt the intellect of the child grows with its growth; but then the child is the child of intelligent and speaking man; and let me ask, would its intellect grow even now as it does, if the child was not taught to speak? The problem Mr. Wallace had to solve, and failed to solve, was how intellect and speech could come of themselves, to endow an animal whose progenitor had neither one nor other?

Before I bid farewell to Darwinism, I must notice Mr. Wallace's reply to another pertinent objection raised in the Anthropological Society. He said: "Dr. Hunt asserts that archæology shows that the crania of the ancient races were the same as the modern. Well, that is a fact I quoted on my own side, and his quoting it against me only shows that you can twist a fact as you like. I quoted it as a proof that you must go to an enormous distance of time, to bridge over the difference between the crania of the lower animals and man.

* *Anthropological Review*, vol. II. p. clxxxiii.

I said, perhaps a million, or even ten millions, of years were necessary."

I beg leave to recall attention to the fact, though no doubt known to many present, that the famous Neanderthal skull, of which so much was made both by Sir Charles Lyell and Professor Huxley as probably a specimen of this missing link—which is still, however, missing—between men and apes, has been proved to be merely an abnormal formation, arising from synostosis or ossification of the sutures, and that similar deformed skulls of perfectly modern date are in existence. And so we are still without a single specimen of the crania that, if found, would be considered as bridging over the gulf between man and apes.

Having mentioned Sir Charles Lyell's name in connection with Darwinism, I must observe that, in his *Antiquity of Man*, he adopts the theory, and recommends it as "at least a good working hypothesis," in the absence of any proof of its probability, or even possibility, upon the sole ground that the geological record, which at present contradicts it, is so very imperfect. This has been characterized as not merely an instance of *non-induction*, or "hasty generalization," based upon a limited or partial knowledge of facts, which is so rightly and strongly condemned by Lord Bacon, even when the facts we do know are not inconsistent with the hypothesis we adopt; but as, indeed, a "glaring specimen of positively false generalization, the hypothesis being not in accordance with any recognized facts or principles whatever, but directly in the teeth of all our knowledge and experience."

Having made use of the word Darwinism, I also feel bound to notice, that Mr. Darwin has not himself worked up his theory so as to apply it to man's development, though Professor Huxley is no doubt right in saying, plainly, that that is the goal to which it tends. Strictly speaking, Mr. Darwin has not professed to prove anything beyond "the origin of species" by his theory. And all that he has proved as a naturalist, is the fact, that numerous varieties of plants and animals are developed within the limits of each particular species. He has not proved a single instance of development beyond these limits of nature's laws; and most certainly no permanence of development in any such case. He has indeed shown that the classifications of naturalists may probably in some cases be at fault, and that what they may have called different species are sometimes only varieties. But this rather goes against his theory, and may be the true explanation of the few exceptional and only apparent approximations to the origination of new species which he almost claims to have observed. But

even were we to grant that a new variety might, under special influences, become so distinct as to form a new species, that would still leave us very far short of transmutation from one genus to another, and farther still from the change from vegetable to animal life, or from any of the inferior animals to man. All beyond the probable, but not proved, origin of species, is mere speculation, with not a ghost of a proof in support of it. And when Sir Charles Lyell admits that the palæontological facts are as yet against the theory, what does that mean? Namely, that, so far as we know, there have not ever been the necessary graduated forms in existence which the theory requires before it can be thought possible even by its advocates. But, of course, we must remember, that even if the gradations in nature were found to be finer and more shaded off one into another than they are yet known to be, that would not by any means prove that any one form had been developed out of another. At present, and within the historical period, this does not happen, and has never happened. To suppose that it did take place continually, though "a long time back," is to assert that nature's laws have been reversed. I do not understand how that can ever be established upon scientific or inductive grounds!

* [At the meeting of the British Association at Birmingham last year, I ventured to oppose the polygenous theory, chiefly by an appeal to all the facts of which we have knowledge relating to the savage and civilized races of mankind. The monkey theory was then left out altogether; for, to say truth, it had not a single advocate who ventured to raise his voice in the Ethnological section! Mr. John Crawford, the venerable President of the Ethnological Society, plainly denounced it; though he is one of the most strenuous advocates of the polygenous theory which derives all the civilized races of mankind from savage progenitors. But when he was asked to give a single instance of a savage race who had civilized themselves,—as some justification of his extraordinary faith that all the civilization of the world owes its origin to savagery!—he was ominously silent.

As the discussion of this question has thus already been approached from the point of view both of the so-called Darwinians and of those who hold a polygenous theory which makes out man to have been originally a savage,—there can be no reason why, on the present occasion, and especially in this

* *Vide Note*, p. 214.

Society, the subject may not be contemplated from the nobler stand-point which is furnished us in Holy Scripture, in contrast with all conflicting hypotheses. What our religion teaches us of man's origin is nothing new. And, to examine it freely, we need not go beyond the scope of the objects of this Society, by entering upon theological discussion or exegesis of Scripture. Our arguments, on the contrary, may be exclusively rational and based upon our knowledge of nature. They may be directed—like miracles at the foundation of our religion—to those who believe not, and not merely to those who believe the Scriptures. But we have no right to conceal the fact, that we have not invented the theory we may have adopted. And my endeavour shall now be to prove that, apart altogether from its origin, the religious theory ought to be adopted by all rational men, as being in accordance with all evidence and analogy, and with all our experience and knowledge of the human family. Surely there is no appeal to natural things in Scripture, that is not an appeal to man's reason, and to all he can investigate and discover with respect to the nature that surrounds him. When St. Paul argues that the invisible things of God—His Eternity, His power and Godhead—are clearly witnessed by the things that do appear,—that is, by the whole visible creation,—is not that an appeal to man's reason, which throughout the whole world, except among the few most degraded races or rather tribes of mankind, has been universally and rationally responded to? Is not the beneficence of the Creator—"filling our hearts with food and gladness"—equally a matter of rational proof, appreciable by all mankind? And so, when it is recorded that God created man in His own image, and gave him dominion over the inferior creatures, have we not a hypothesis of man's place in nature, that also appeals to all we can discover of man's past history, and to all we know now of mankind throughout the world?

Without presuming to fathom all that is meant by man being created in God's image and likeness, and taking merely the generally understood and universally accepted idea among Jews and Christians for ages, that man was created a perfect being, "upright," "very good" (for how, if created at all, could he come otherwise than perfect from the hand of God?),—taking that as what religion teaches us of our origin, I wish to show what a wide field of investigation and inquiry we may have in this Society, without in the least trenching upon the territory of the theologian or the Scripture expositor. Not that I undervalue theology or Scriptural exegesis, any more than I would admit that religion is not one of the

most important considerations affecting anthropology. If this were disputed, indeed, I might appeal to other quarters, which might possibly have greater weight with some, outside this Society, who do not with us accept Holy Scripture as "the key of knowledge."

For instance, in M. Boudin's *Etudes Anthropologiques*, published in Paris in 1864, he begins by citing Cicero as one of the most eminent philosophers of antiquity who has defined man as a religious animal. "There is not, in fact, any other animal," says Cicero, "who has knowledge of God. And there is no nation so barbarous or so savage, that even if it is ignorant what deity it ought to have, does not at least know that it ought to have a deity of some kind." (*De Leg.*, lib. II. cap. 8.) Boudin then goes on to quote Plutarch, as saying, "You may find peoples in cities deprived of walls, of houses, of gymnasia, of laws, of monies, of literature; but a people without God, without prayers, without oaths, without religious rites, without sacrifices, is what nobody has ever seen." (*Adv. Colleton.*) In citing Cicero's definition of man as a religious animal, Boudin refers, in a foot-note, to a curious exception, or rather attempt to make an exception to this, which I quote as having a peculiar value in the present day. He says, "Buddhism alone has the credit of attempting to teach religion to beasts. The author of a Tibetan work, translated into the Mongol tongue, and from Mongol rendered into French by Klaproth, who treats of the origin of the progress of the religion of Buddha in India and in other Asiatic countries, recounts the following: 'When the veritable religion of Chackiamouni (*Çakya-Muni*) had been spread in Hindostan and among the most distant barbarians, the high priest and chief of the Buddhist faith, not seeing any others of mankind to convert, resolved to civilize the large species of monkey called jaktcha or raktcha; to introduce among them the religion of Buddha, and to accustom them to the practice of duties, as well as the exact observance of sacred rites. This enterprise was entrusted to a mission under the direction of a priest regarded as an incarnation of the saint *Khomchim-Botitaso*. This priest succeeded perfectly, and converted a prodigious number of apes to the Indian faith.'"—You smile at this story, as so recounted, even although you may before have heard of the sacred monkeys kept in the Buddhist temples. It is doubtful whether the story would be accepted in the Ethnological or Anthropological societies. But, if you reject it here, and laugh at it; if the notion of monkeys being taught religious duties and observances by men is truly ridiculous; how much more ridiculous and absurd must be the

notion that mankind owe their own faith and ideas of religion, and even themselves, to a monkey origin! Well may M. Boudin observe, that "just as the diseased eye bears everything better than light, so the mind diseased with the evil of pride, accepts anything rather than the truth;"....."and instead of attaching itself to transcendent truths which enlighten, it gives itself over to astounding errors which delude."

Not long ago I observed it was argued in an article in the *Anthropological Review*, that, in order to study history aright, we must step out of our libraries—a hint, perhaps, in other words, that we may as well burn all our books! And you cannot fail to have heard of late years that anthropology, or the study of man, is quite a new science. Before you can believe that, you must, indeed, walk out of your libraries! The oldest books in the world, the oldest history, sacred and profane, and the oldest poetry of the ancients, alike disprove it. It is not only, as our own poet has it, "the noblest study of mankind," but it has been, in truth, the oldest and most universal. Nor could we find a more fitting motto for a work on anthropology—unless, indeed, we borrowed the language of holy Scripture, that "God created man"—than the words of the Delphic oracle, "Know thyself."]

Assuming, then, man's creation in a perfect condition, or as "made upright" by God,—as having intuitive wisdom, the highest intellectual power, the gift of speech, and moral faculties all in perfection,—we must yet remember that he had not possibly the kind of knowledge that comes alone by experience; and that he was necessarily at first without those artificial adjuncts of an elevated or civilized condition which we are now, perhaps, too apt to confound with the true essentials of civilization or elevation of character. The "many inventions," whether for good or evil, whether for man's comfort or destruction, which were readily found out, were yet not all discovered in a moment; and, as necessity is well said to be the mother of invention, we should remember that, as at first man's necessities in a fruitful and genial clime were probably few, inventions of arts of some kinds would come but by degrees. Nevertheless, as we have assumed the greatest intellectual capacity for the primitive man, as part of our hypothesis, we may fairly deduce from this, that man's first strides in invention and in art would be stupendous, and even more than equal to his absolute necessities. And so, just as we might have anticipated upon these suppositions, we find,

in the earliest chapters of Genesis, while Cain and Abel were, the one a "tiller of the ground," and the other a "keeper of sheep," that Enoch, Cain's first-born, built a city; and we afterwards read, not only of those who dwelt in tents, and of others who were breeders of cattle, but also of the invention of harps and organs, and of artificers in brass and iron. Again, immediately after the Flood, we have the account of the building of Nineveh and other great cities, and of the projected building of the tower of Babel; and then, afterwards, of the dispersion of mankind, and their separation into diverse nations and communities. After this general indication of the primitive history of the world, the Scriptures almost exclusively narrate the history of the descendants of Abraham, or of other peoples only when their history comes in contact with that of the Jews.

We therefore naturally turn to profane records, and to the monuments of antiquity, to discover what they tell of the past history of mankind. But we have no other such systematic written history of the world at large as we find in the sacred Scriptures. If we turn to Herodotus, "the father of profane history," we find he deals with particular nations merely, and with peoples comparatively modern; and only repeats vague traditions as to their origin and first migrations. But still let us observe the character of the facts as well as of the traditions he narrates. Invariably he introduces us to peoples more or less civilized, having the arts and ornaments and other appliances of civilized life, though a civilization differing from ours. And we find that all the traditions of their past relate to preceding civilizations, and those frequently superior to that of their then present condition. In no instance is there a record, and apparently not any knowledge, of the existence of mere savages without civilization, its arts and appliances. Barbarous and horrid customs are no doubt alluded to as practised by some of those ancient peoples, but yet there are none of them (not even those least known, about whom the traditions recorded are most vague,) without some adjuncts of civilization.

It is much the same if we turn to Homer or Hesiod as poets. They also introduce us to men who had noble sentiments, though heathens; to men who knew something of astronomy, understood agriculture, erected fortifications, wore armour, and wielded well-made weapons of war; whose women also worked embroidery, and taught their children in their tents or houses to emulate the noble deeds and speak the dignified language of their fathers.

I may venture to say that ancient history knew nothing of

savages, such as have been discovered now to exist in remote corners of the earth, furthest away from the traditional place of the origin and dispersion of mankind. Is it not then a fair question to raise, Whether, at the times of the history recorded by the most ancient historians, human nature had so far degenerated as to have arrived at the savage state?

For, when we turn from written history to the still older monuments of antiquity, what do we find? The pyramids of Egypt, the remains of Thebes, of Memphis, of Rabek (the Scriptural *On*, and *Heliopolis* of the Greeks), the ruins of Persepolis, Nineveh, Babylon, of the Giant Cities, of Khorsabad, Birs Nimroud, Balbek, and Palmyra. In India, Ceylon, Japan, China, Central America, Italy, Greece, everywhere almost throughout the whole world, evidences may be adduced of man's possession of knowledge, ingenuity, art and science, in the ages long past. Even in North America, on the banks of Ohio and Mississippi, the latest discoveries of archæology and geology go to prove, as Sir Charles Lyell bears witness in his *Antiquity of Man*, that an anterior civilization had also existed there,—where “the noble savage ran” in later times—older than that savagedom of the Red Indians which was found to exist when the modern Europeans first visited America.

But while noticing this testimony to the antiquity of civilization in America, which surely goes somewhat towards proving that the Red Indian savages are not specimens of “the primitive man,” as some have supposed, but really a degenerate race, we must keep in mind that the absence of any such proof of the former civilization of the oldest dwellers in America would by no means have established the contrary. Nomadic tribes sunk in barbarism, and in process of degeneration to savagery, whose remote ancestors might have been civilized, might of course migrate into regions previously uninhabited altogether; in which case the local geological record could afford no evidence of the stock whence such a people might have really sprung.

Again, if we trace the thread of civilization backwards, begin where we may, we have the same results. If we begin with ourselves and our own authentic history,—comparatively recent though it be,—we are led back to Rome, to Greece, to Phœnicia, and so on, till civilization becomes lost in time immemorial; and then the vast ruins of magnificent and giant cities, of obelisks, pyramids and temples, speak to us where all written history—save that of Holy Scripture—is silent.

That there are difficulties in dealing with man's past his-

tory, whatever view we may take of his origin and primitive state, no one who has given the least attention to the intricacies of the problem, or to the volumes that have been written upon it, by the ancients and moderns alike, can have any doubt. I can only hope to be able to bring forward a few of the most important considerations and salient points which affect the question, in order to elicit truth and to show what theory, if any, is free from difficulties which are insuperable.

In the mean time there is one thing more to be noticed as regards the religious theory, in which it is in marked opposition to all the others. When we take the Scriptural view of man's creation, we can at once comprehend and read aright all those evidences afforded by the remains of antiquity and of profane history of his wonderful original capacity and early civilization. We thus get over all difficulties we might otherwise feel as regards the time in which he would arrive at this artificially cultivated condition, and accomplish these stupendous monuments of his genius and pristine glory. We can then understand our old chronology, which makes the world to be but some six or eight thousand years old; and so also perceive the value of the conclusion arrived at by the most critical of our modern authors, the late Sir George Cornewall Lewis, who in his last work, *The Astronomy of the Ancients*, considers that we have little ground for believing in any chronology of the ancient Egyptians and Babylonians, beyond about 3,000 or 4,000 years prior to the Christian era.

I cannot, of course, enter here upon any discussion of the long antiquity claimed for the world upon geological grounds. In my opinion these long leaps into the past make few of the difficult problems of nature a whit more easy. But I will say this, that those who ask for millions or tens of millions of years, in order to get over the difficulties of their own invented theories,—whether they start the world with a nebulous fire, or man with an ape,—are really moderate in their demands for time, compared with what they ask of our faith. They might multiply their millions of years by millions more, and yet not have time enough to develop this real world we know—full of teeming life and intelligence—out of fire-mists, monads, and monkeys!

The religious theory, on the contrary, throws light upon history and experience. Supposing mankind to be highly endowed, with the highest intellectual capacity, at the time of the confusion of their language and dispersion in the East, it also presumes they would carry with them, in greater or less degree, the primitive traditions and the acquired knowledge which would be retained by individuals in each family

or tribe. The men, in short, who combined together to build Babel, are supposed to be dispersed in different directions in the richest virgin countries of the earth, and the result to be the sudden erection of magnificent temples, pyramids, palaces, and cities. In confirmation of this view, we have the actual remains of antiquity, which puzzle or excite the admiration of our modern architects, engineers, and mathematicians, as to how some of those ancient works were accomplished; and yet, according to all trustworthy chronology, they were executed about the period we speak of. To enable us to realize this the better, extraordinary as it may appear, I cannot do better than quote from a newspaper paragraph of recent date. We can only properly judge of the past by a wise consideration of the present, or understand what our predecessors upon earth may have done, by considering what men do now in our own age. In *The Times*, then, of 28th June last will be found the following pregnant words in an article relating to the American iron-clad turret-ship *Miantonomoh*:—"To say that the Americans are a great people is but to repeat a universally acknowledged aphorism. They build a city, launch a fleet, or set an army in the field, in about the same space of time it would occupy us in this grand old but slow-moving country, to discuss the preliminaries."—Let us consider this. The capital of the United States of America is not yet one hundred years old; and there, as also in Australia, we see what an intelligent and civilized community of emigrants can do in a very few years; and that too, remember, in our commercial times, when not under the rule of absolute kings, or chiefs of castes, like those who in former times bestowed their energies chiefly upon works that would redound to their pride and glory. If we also merely consider the changes in the cities of London or Paris within a hundred or even fifty years, we ought to have no difficulty in realizing how much could be done in Egypt, India, Assyria, Etruria, Greece and Rome, in some hundreds of years, granting that three or four thousand years ago men were intelligent and civilized, and not degraded savages. In America also, we find already, in the course of one or two generations such a change in the very physique of a people, as enables us, within our own experience, to see how new races would come to be developed out of an originally common stock.

[With these hints for reflection, I must now pass on, to glance at the opinions of those who, notwithstanding what all history and archæology attest, have come to conclusions diametrically opposed to what is here advanced.

No answer having been given last year at Birmingham, when the question was asked, What single instance could be adduced of a savage people having civilized themselves? I afterwards wrote a brief paper, with the title, "Man, savage and civilized—an appeal to facts," and published it in the *Ethnological Journal* for October, 1865, embodying the same arguments and repeating that question; from which paper I beg leave to make the following brief extract, by way of introducing the answer it received:—

The thesis I now venture especially to maintain is, not only that civilization is older than the savage state, but that it *must* be so. Here I appeal to all our knowledge of mankind, moral, social, and metaphysical, as well as to all the facts of history, both as regards the course of civilization throughout the world and all that we know of savage races.

. . . . Setting out with M. Guizot's famous sentence, that "Civilization is a fact," I argue, from its very existence now, that it must always have existed since man was. We are not here, of course, concerned with minor details respecting the various phases into which civilization may have been developed. I speak of "the civilized man" only as an elevated, intellectual, and moral being, apart from his peculiar circumstances.

I argue that civilization (in this proper sense) must always have existed since man's creation:—First, because I am not aware of any civilization in the world which has not either always existed among the civilized race from time immemorial, or has had its origin attributed to the prior civilization of another race, brought *ab extra* to the race becoming civilized. We can scarcely consider that the Greeks were "savages" before the introduction among them of written language and Egyptian civilization; nor that the Britons (with their chariots) were savages when invaded by the Romans. But, be that as it may, the civilization of Egypt and of Rome had at least a prior existence; which is enough for my main thesis.—And, Second, because we know nothing of any truly "savage" race having raised itself to a state of civilization; while it is questionable whether there is any thoroughly savage people that can be said to have become civilized through the influence of a superior race. But, even could such a case be adduced, it would not of course disprove the priority of civilization. The real point to be established by those who dispute my position is *the proof that savage races can civilize, or have ever civilized, themselves.*

To this, two answers appeared in the *Ethnological Journal* of November last; one by a writer signing "A. B.," who began by explaining why no answer was given by the President of the Ethnological Society at Birmingham. He says: "I fear the explanation amounts simply to this, that Mr. Crawford may have thought the theory the mere coruscation of a too exuberant fancy which needed no extinguisher. But

as your contributor now repeats his challenge, and, above all, as this is not the first time that the strange crotchet has been propounded, I shall attempt a refutation of it."

It is amusing to hear what had frankly been called "the old tradition of the creation of Adam," characterized at once as "a theory" of mine, as "the mere coruscation of a too exuberant fancy," and as "a strange crotchet," by a writer who forgets, while he is writing, his admission that he had heard of it before! It is high time surely that this sneering tone should cease in discussing such questions. I trust the institution of this Society will do something to put a stop to it. Before eminent ethnologists or physiologists talk thus of crotchets, or parade that in their opinion "no competent man of science believes in Adam and Eve," they had better be sure that the theories they have adopted, as so superior to what they call "*time-honoured and strongly-rooted prejudices*," are not themselves mere crotchets, that will never either become "time-honoured," or succeed in establishing a prejudice in thinking minds. Even traditions must have had a beginning, and strong prejudices may exist in favour of what is merely new, as well as for what has stood the test of time, and withstood not a little antagonism.

But to return to our ethnologist.—He says, "Let us see what this supposed civilized man and woman must have been when first created. If they had the persons of Apollo and Venus, and the brains of Newton and Elizabeth, they must still have been cowering, helpless savages, for they had everything to acquire. The imaginary civilized pair must have been at first without language, without fire, without tools, without clothing. They had to learn even to walk and to run. . . . They must have fed on the dead carcasses of fish, reptiles, birds, and quadrupeds, or starved. In fact, the civilized man of your imaginative contributor turns out to be a more arrant savage than a native of Australia, of Tierra del Fuego, or of the Andaman Islands; for all of these had made some small progress." This is ruthless—I had almost said savage—logic! to which the only reply of a rational being could be, that if the "imagined civilized man" was really a savage that could not even walk or talk, he could not have been supposed to be elevated or civilized.—Of course, you all know very well who are the real authors of this imagined animal, that "a long time back"—no doubt a very long time!—had neither intellect nor speech, and it seems (unlike all other animals) not even power to walk! Although, also, we know as a fact, that perhaps the great majority of the human race have lived, and do probably now live, upon vegetable food, yet

the primitive man, we are assured, "must have eaten dead carcasses" or starved!

To throw light upon this tissue of mere assertions and "musts," I ought to explain that Mr. Crawford, in his *History of Cannibalism*, puts it forward in greater detail, and imagines that all races of mankind must have passed through a cannibal era, which followed one during which they were content to pick up what he calls "the dead carcasses of animals," which may have died. This theory found few, if any, adherents in the British Association last year, where it was discussed; and it is worthy of notice that, notwithstanding all we do really know of the Cannibal Islands and Dahomey, Mr. Crawford comes to the conclusion, that "although in Northern and Western Europe the quality of the race of man was of the highest order, yet, owing to unpropitious conditions, it was precisely in this cold quarter of Europe that cannibalism probably, and human sacrifices certainly, lingered the longest!" Such doctrine, I think, might well make any man shudder who is not rather inclined to exercise a peculiarly human function, and to laugh, in thinking of the contrast between a theoretical and the actual world! Well may we smile, once more, with Voltaire's *Vieux Solitaire*, at the notions of those speculators (a race of men not yet extinct), *qui ont créé l'univers avec leur plume!*

But our critic goes boldly on: "How the declaration of Solomon, that 'God hath made man upright,' comes to be in accord with the paradox, is more than I am able to guess; for it simply means that a *vertical attitude was given to man*, to distinguish him from the beasts of the field that had a horizontal one. In truth, the declaration of Solomon seems as little in accord with the theory as is the wisdom of Solomon." Now, this was not only printed and published in London in 1865, but it occurs in what was specially praised in a literary notice in a famous London journal, on 10th November last, "as an excellent paper on savagery and civilization!" I must observe that the word rendered "upright," in the passage of Scripture referred to (Eccles. vii. 29), is *yashar* in the original. It occurs about 120 times altogether in the sacred volume, in the same or in cognate forms, and in every instance it refers solely to moral or spiritual uprightness. It is several times applied to describe the character of God Himself; thus making Solomon's declaration throw light upon that of Moses, that man was made in God's spiritual image, or in uprightness like to God. I have referred to this argument as an instructive illustration of how both science and Scripture are sometimes handled in our day, and not without applause

in certain influential quarters. And perhaps I may be permitted to add, with reference to the discussion at our first ordinary meeting last month, that I do not consider I am trenching in the least upon the province of the Scriptural exegetist, in merely ascertaining and noticing what is the unquestionable sense of a word or the undisputed meaning of a passage of Scripture. I doubt whether there exists a second man who in any reputed organ of the press would venture to say that *yashar* only means *perpendicular*!

But our ethnologist made use of such arguments and ventured to write in such a tone, although obliged to make the following important admissions: "The Greeks and Romans (he says), who might have written an account of savages, *knew of none*. They knew many 'barbarians,' but never saw a savage.....The races inhabiting Europe that came under the notice of the Greeks and Romans were all of a high quality.....Among the most backward known to the ancients were our own forefathers, the Britons; but, in possession of herds and flocks, of iron and corn, they were very far advanced beyond the savage state. The other civilized races of the old world, such as the Egyptians, the Jews, and Assyrians, the Persians, the Hindoos, and the Chinese, were probably in the same state of ignorance of the existence of savages, such as were found in America and the isles of the Pacific, as the Greeks and Romans were. They had experience of many barbarians, as they have now, but of no savages."

This, you will perceive, is precisely my argument. I had appealed to all these facts, which my opponent cannot deny; and asked for facts upon the other side. The only reply was this: "But those who are now civilized *must* once have been barbarians,—the barbarians *must* have been savages, and the lowest savages known to us, as in the example of the Australians, *must* have been once lower still,—*must* have been once without language, fire, and implements. We can hardly be said to have any authentic account of savages rising to the ranks of barbarians; but we are notwithstanding satisfied that, from the nature of things, such a progress *must* have taken place."

Of course, these reiterated "musts" all go for nothing. They are mere strongly-prejudiced assumptions of the point at issue; and being contrary to the ascertained facts within our knowledge and experience, they are false assumptions against analogy and induction. I am glad to say that such views were emphatically repudiated by Professor Rawlinson (an ethnologist who yet pays some respect to history), while **presiding in the Ethnological section of the British Association last year:—**

“ Professor Rawlinson protested against the assumption that human beings were originally in that poor and destitute condition, which had been described, and that they all rose from a state of barbarism. He held the very opposite opinion, viz., that they were created in a state of considerable civilization, and that while most of the races had declined into absolute barbarism, some races had never done so. The Egyptian, Babylonians and Jews had never so declined.” (*Rep. of Brit. Assoc.*, 1865.)

And now, mark the importance of the facts contradicted by such assumptions. If this theory of the savage origin of mankind were true, is it not utterly incredible that not a single civilized people should have a knowledge, not even a tradition, of their immediate ancestors having been savages?

But some further important admissions have been made in confirmation of the religious theory. Our critic admits that “ empires have fallen through their own vices and the inroads and conquests of barbarians,” and also that “ there are a few examples of civilization ending in barbarism;” nevertheless, he has the hardihood to conclude by telling me that “ my theory,” (as he will call our common old tradition of the Bible,) “ is an idle attempt to turn the order of social progress bottom upwards;” and he patronizingly advises that, “ as I evidently possess both knowledge and ingenuity, I should henceforth use them logically and forswear paradox!”

My other critic in the *Ethnological Journal* was scarcely another, for his views are much the same. His conclusion is, that, “ scientifically considered, primitive man *must* be viewed as naked, speechless, defenceless, and ignorant.” This is surely “ science made easy”! If a “ needs must” is thus “ scientifically” to be employed to drive us into distance and darkness beyond all our knowledge, what does science mean? Then he tries to evade the evidence of all history by saying, “ history can know nothing of the remote times of man unless by divine revelation, and to bring in this is to remove the question out of the domain of scientific discussion.” But may it not rather be said that, *therefore*, divine revelation may be the very means to enable us to complete our science? At all events, we surely keep within the scientific domain when we subject the theory we adopt—whether its source is believed to be divine or human—to every possible test of experience, and never once say that it “ must” be so, except upon rational grounds, and because it is in accordance with human history and human knowledge of facts and nature. This objector also admits that social degradation is easily intelligible and may happen to any people, though he does not

appear to consider that that would eventually result in a concomitant "physical degradation." He calls the theory of degradation "Darwinism read backwards," to which he objects; and yet I venture to say that, if there is any truth in Darwinism at all, it will be found, whether as regards plants or animals,—when all is left to "nature," and mere "natural selection"—to tend, though even then within certain limits, rather in this downward direction. The question now, however, is, whether or not this has been the case in respect of mankind.]

We must remember, however, that the fact of the antiquity of civilization, as proved by all history, tradition, and archaeological remains, is only one of many converging proofs, all bearing in favour of the religious theory of man's past and present condition. There are also other proofs to be derived from the common knowledge among civilized races, which speak of a common origin, and of some previous intercommunication among them all. One of the most important of these proofs is derived from the astronomy of the ancients, more especially from the names and figures of the constellations still delineated upon our celestial globes. Similar figures are found upon the Dendera planisphere and zodiac of Esneh, and upon sarcophagi from Egypt, and landmark-stones from Assyria, which may be seen in the British Museum. The apparently arbitrary character of these figures, there being nothing in nature to suggest them, and yet their being found nearly identical among all the ancient nations of the old world, and sufficiently similar, even in America, to indicate the same ably common origin,—all combine to furnish a most important cumulation of proof as to the ancient intercommunication between peoples and races, besides those derived from comparative philology, comparative mythology, or the common traditional stories found among mankind. From all these sources may be urged other arguments in favour of the religious theory. [That derived from comparative philology was most ably treated by Dr. Thornton at the last meeting of this Society; and it will now also be seen, that the very origin of speech is bound up with the origin of man himself.] I venture to allege that no theory either about man or language which we can devise—even with all our after-knowledge of the facts now existing in respect of both—will so well account for all the facts of the case as our old religious and (I think I may still say) "*time-honoured*" theory of man's origin and the confusion of language at Babel.

Having now appealed, in proof of this, to all we can gather

from history and among the civilized races, there is one further appeal to be made, though one of less importance. It is to all that we also can discover from the traditions of the various savage races. The result of that appeal I must be content to state in little more than a sentence from the paper already quoted; namely, "That among all savage races (except perhaps the very lowest of the low, from whom we can gather nothing), there are traces, more or less, of an anterior civilization, or previous superiority of condition, that testifies to their being now in a literally *degraded* state. Even the poetical legends of the Viti Islanders, and the superstitious traditions of the Negroes, testify to something in their ancestors superior to themselves." In illustration of this, I quote from an independent source the following:—"The islands of the Pacific, under a general appearance of primeval simplicity, present here and there many remarkable evidences of a former civilization, as well as of a degree of connection between the several populations, which seems inconsistent with their present isolation."* I ought here perhaps also to observe incidentally, that among almost all the savage races when first discovered, the traditions connected with their corrupt forms of religion are found to have something about serpents, and trees, and woman.

So that here again the verdict of facts is still in favour of the priority of civilization, and a proof that the savage races have degenerated from a higher grade. On this point, too, I may refer to the Bosjesmen, as a known instance of the growth of a distinctive savage race within a few generations. Without going further into details as regards the savage races, I venture to claim to have pretty well established my thesis, and proved that the religious theory may now also be called with propriety *the Historical Theory*.

Since the foregoing was written, additional testimony of a valuable kind has come under my notice, and to this I beg leave very briefly to allude. At the last meeting of the Ethnological Society, held only on Tuesday, 10th July, a paper was read by the distinguished African traveller Mr. S. W. Baker, in which he gave an interesting account of *the various tribes of the White Nile Basin*. One of these tribes (the Kytch tribe), he says, is "hardly a remove above the chimpanzee, *except* (a most important exception) in the power of speech. They live in a marshy district and are wretched skeletons." Most of these tribes, it seems, know how to work in metals. But in one in the

* *Principles of Mythonomy*, by Mr. Luke Burke, p. 51.

Shir district, having no iron-ore, hard iron-wood supplies the people with a substitute for iron, like the hard stone used by the New Zealander, and flints by other savages elsewhere. Mr. Baker remarks that "the absence of articles and weapons of metal in no way proves their excess of savagery; but where there are no metals to work, there are no blacksmiths." Mr. Baker also describes "the tribes on the borders of Abyssinia, who are still in a state of superior civilization." They are sprung from a land inhabited by the only independent Christian community in the whole of Africa, among whom reading and writing are common, and where the features and forms of the inhabitants are closely allied to the European, forming a strong contrast to the tribes who inhabit the borders of the White Nile." At the same meeting, Dr. Beke, also a well-known African traveller, is reported as having made some remarks on the retrogression of civilization among the savage tribes. In his opinion, they are becoming more and more savage, and he asserts that nearly all travellers in Africa are of that opinion. I am glad that Mr. Crawford, the President, was present when this was stated in the Ethnological Society, as he is well known to entertain opinions opposed to those I have here ventured to advance.

[Still bearing intimately on our subject, and especially on an important point to which I am anxious to allude before I conclude, another paper was read the same evening, by Lieut.-Colonel Fytche, on attempts that had been made to civilize some of the Andaman Islanders, which had entirely failed, even the wearing of clothes producing consumption. Dr. Mouet, however, spoke of other similar attempts, and of one exceptional case, that of a young girl, in which the efforts made had proved successful.

It was no part of my case to prove that individual savages, or tribes, cannot be reclaimed and raised. That this may even be possible of races, I will not dispute, though it may be a question whether the process of degeneration may not sometimes proceed so far as to render the elevation of the race afterwards impossible. My argument has been, that these low races do not, as a fact, ever rise of themselves. The late Dr. Waitz has said further, that they neither do emerge from their barbarous state, nor do they exhibit any desire to leave it; and they even, in spite of example and teaching, rather tend to remain as they are. It is not a fact, then, that they rise, nor is it "natural" that they should, however easy and natural it may be that they should fall still lower and lower.

But, whence, then, it may be asked, if all this be true, has the idea of human advancement and progress come to enter men's minds at all? To that I reply, it has no doubt also been derived from human experience, and is best explained by the religious theory. Ours is no dark and fatalistic creed that always and only points downwards. We have, thank God, a knowledge and experience of advancement and human progress in the world's history, as well as of man's degeneration. The real fact is, indeed, that we have lived so much in the light of this state of advancement, in which we were born, that some of us have forgotten its cause, and that it is an absolute reversal of a previously existing state of things. Not a reversal of any natural law—let us leave that to those who believe that intellect and speech could come of themselves, and the noblest manhood be developed out of apes or speechless savages;—not a reversal of any natural law, but the introduction of a higher law, that claims to regenerate man, and to elevate his nature. Just as by our theory we believe that some thousands of years ago man was created very good by God, yet afterwards fell, and so the human race degenerated;—by slow degrees no doubt, for he always had a better spirit that strove within him, and an intellect that could not lose its lustre in a day;—so we also believe that some eighteen hundred years ago the progress of this human corruption was arrested, by a revival of new spiritual life and fresh power of becoming "upright." We appeal equally to the facts of history, to prove both man's fall and his restoration. Since the second Adam came, in fact, the history of human advancement and of the highest civilizations, from the time the Roman empire fell, is little else than the history of the progress of Christianity. The students of "the science of man" will never understand their whole subject if they ignore this crowning fact of all, which completes *the religious theory* of man's past and present condition.

My argument required that I should chiefly dwell upon the downward course of humanity, but I gladly recognize that that is only half the truth with which we are concerned. "The question of questions for mankind (well says Professor Huxley)—the problem which underlies all others, and is more deeply interesting than any other, is the ascertainment of the place which man occupies in nature, and of his relation to the universe of things. Whence our race has come; what are the limits of our power over nature, and of nature's power over us; to what goal we are tending; are the problems which present themselves anew, and with undiminished interest to every man born in the world."

These words of the learned Professor are worthy of the

theme. They recognize a power beyond mere nature, and show that the past and present of man cannot be well considered without reference also to his future. The institution of this Society has not been devised with the view of stifling or suppressing such problems, but to secure their more complete consideration. This paper, be assured, is no "idle attempt to turn the order of social progress bottom upwards," but rather an honest endeavour—however inadequate—to overthrow ill-grounded theories, which,—by ignoring the true source of all "our power over nature," and of that righteousness, or moral uprightness, which alone can raise a people, and secure for them a social progress that will last,—not only *cannot* tell mankind "to what goal they are tending," but have even failed to account satisfactorily for either the original existence or present condition of the civilized and savage races of the great human family.]

The CHAIRMAN.—I am sure it will be perfectly unnecessary for me to call upon you to pass a vote of thanks by acclamation to Mr. Reddie for the very valuable paper he has read. (Hear.) I can only say that it is adding one more to the many obligations which the Victoria Institute owes him. No one who has not been associated with him in the formation of this Society can understand how earnestly he has worked for its advancement; and the admirable and exhaustive paper which he has produced this evening shows how, in the midst of those labours, he has found time to devote himself to the great cause which this Society advocates. I have to announce that I have received a letter from our noble President (the Earl of Shaftesbury), in which he expresses his deep regret that he is prevented by indisposition from profiting by Mr. Reddie's paper. (Hear, hear.) I have only to add that I most cordially invite discussion upon this paper. I am sure Mr. Reddie will be disappointed if his paper does not provoke that free discussion which he considers the most wholesome feature of this Society's proceedings. (Hear, hear.)

Dr. GLADSTONE.—I rise to express the great pleasure with which I have listened to Mr. Reddie's paper this evening, and especially to the latter part of it; and I am quite sure that there are many here who have also felt, and who will express that same pleasure. I know Mr. Reddie likes discussion; he and I can never be together for two minutes without coming across one another; and he had not been reading his paper one minute this evening before he advanced an opinion which I could not adopt. The subject is a most noble one. It has been treated very extensively; it ought to be treated with all philosophical calmness; it ought to be considered with all the largeness of mind that can be brought to bear upon it. We ought, if possible, to remove every prejudice, and everything which would prevent philosophical consideration. I am quite sure Mr. Reddie has too much nobility of mind and too much courage to call people bad names when they don't deserve it; or

to give them a bad character without facts to justify him in doing so. He has, however, done this, I am sure unintentionally, in his paper, in using the classification which he adopted in dealing with his subject ; for he has called one theory a religious theory, and by doing so he has implied that the other theories are irreligious. (No, no.) Well, I think you will allow me to say that I do understand that it does imply that ; and that is the accusation which I have to bring against him. I have been curious to know what is the reason of the objection on religious grounds to the Darwinian theory. I am not going to speak now of the polygenous theory, or to defend it from the charge to which I think it lies open, of being irreligious ; but I am anxious to know what are the Scriptural grounds of objection to the Darwinian theory. The Bible declares that God created man. It tells us what sort of a being he was when he was created ; but it does not tell us how or by what process he was created. I have looked carefully into all the passages in which the Hebrew word for "create" occurs, and I do not find that any one of them indicates any particular theory of creation. The word "created" is never used in the Old Testament except in reference to the works of God ; but it may indicate either the calling of things out of nothing, or the bringing together of various parts, and putting them in a form in which they were not known before. In several cases it distinctly refers to ordinary generation. It never implies that all that was created or made by God was not called out of something that existed before. If we turn to the New Testament, we find that the equivalent Greek word has in only two instances been applied to the works of man. It is applied expressly to that which God makes ; so that, in the New Testament, as in the Old, there is no theory of creation laid down. I do not say we ought to accept the Darwinian theory ; but we have no other which gives us a possible solution as to how God made all those creatures He has placed in the world, and I do not see how it opposes any statement of Scripture. I think we ought to remove this impression, and consider the question upon its own merits. I am aware that Darwin himself not only never applies his theory to the creation of man, but that there are various expressions in his book which seem to indicate, by the idea of natural selection, the action of some kind of power independent of God. We are not, however, to suppose that some persons may not take this natural selection as in subordination to the will of God ; and it seems to me, that, if we were to come to the conclusion that God created great whales by natural selection, we should be as much in accordance with Scripture as if we supposed that He created them by some other process. We know the argument of Paley, that if a person going along the ground strikes his foot against a watch, and takes it up and looks at the various contrivances, and sees how it is made, he must come to the conclusion that it was the work of some intelligent being. But supposing, in continuing his walk across the common, he came upon a chronometer and a clock, he would arrive at the same conclusion as before ; but most likely he would think that different minds had been employed to create the different pieces of mechanism. But if it were revealed to him by some messenger from heaven or otherwise, that the clock was produced from the chronometer,

and the chronometer from the watch, and that the mechanism was so perfect that the one was evolved out of the other, then his idea of the intelligence of the artificer, instead of being diminished, would be exalted. But this analogy is not perfect, because in mechanism we cannot bring in God's work—we cannot bring in the laws of nature, that is, the finger of God. But whether God, in some inscrutable way, has called beings out of nothing, or whether He has acted in some such way as is indicated by Darwin, in either case we have God's direct power in creating and sustaining all things, and directing the processes by which He produced animal life, and lastly, man himself. I think I will close this subject with these few remarks. I am quite sure they do not detract in the least from the value of Mr. Reddie's arguments. I think he has shot most powerful shells into the hostile camp, although some of them may have fallen short of the mark.

Captain FISHBOURNE.—It did not strike me that in using the expression "religious theory," any attack was made upon the opponents of it—not the least. I think Dr. Gladstone's exegesis is not fair. He attacks the term; but the term is used to express, shortly, what is the view taken by a class of persons from the stand-point of revealed truth. It means no more than that the class of persons to whom it especially refers, are those who accept the Scriptural account of the creation; and I think it is perfectly natural that their theory should be called the religious theory. I say, taking the whole argument in the paper, it is quite in opposition to the view Dr. Gladstone has taken of it. The argument throughout has been based on a rational, and not a mere scriptural consideration of the facts brought under our notice; taking them more particularly, too, from witnesses on the opposite side of the question; and it is only after Mr. Reddie has established his position, from the evidence of persons who exclude the religious view, that he introduces proofs of its being in accordance with what might be termed the religious view, or that which is drawn from Scripture. I think Dr. Gladstone is a little touchy about this. (A laugh.) I think Mr. Reddie has pointedly and distinctly, on more occasions than one, not only insisted, but emphatically insisted, that there was no intended antagonism to other views on any but rational grounds, or, at least, that there was no imputation of irreligion intended. I do not think it is right or fair, therefore, to fix upon a mere expression, and deduce from it an argument which neither anything in the paper warrants, nor anything which Mr. Reddie has ever said or written on any previous occasion. (Hear, hear.)

Mr. WARINGTON.—If I apprehend the matter rightly, I think the objection of Dr. Gladstone was not that he thought Mr. Reddie had charged those who did not accept the scriptural account of the creation with being irreligious, but that the term was not exactly the one which ought to be chosen to denote the particular views to which Mr. Reddie applied it, since there might be other views entertained on the subject that might be considered equally religious. Now I really must, on that point, go hand in hand very warmly with what Dr. Gladstone has said. It struck me, after reading Darwin's book on *The Origin of Species*, that it was quite possible

that it might be perfectly true that man originated in that way, and that devoutly religious men might therefore hold the Darwinian theory and also believe their Bible to be literally true. We believe God created all men. I think we should all deny the assertion that God only created the *first* man. We believe He has created all men. We make it part of our religion that we believe in God as *our* Creator. What do we mean by that? We don't mean that He has brought together a number of atoms from different parts of the world and made us just as we are at once. We believe He has made us by the process of generation; that we gradually developed into our present state. But what then? Does that make it the less true, at the same time, that He created us? I do not think there is anything irreligious in believing that the first man was developed from a lower animal; but, then, it does not follow that the animal had power of itself to develop us. That may be the opinion of Darwin, but it is by no means involved in his theory. It might be a power exercised upon the animal by some higher influence. We admit that all varieties have arisen on the principle of natural selection; but in the origin of these varieties, then, do we exclude the hand of God? If I find a plant, differing from all its fellows, growing in a different place from other plants of the same kind, I hold that that plant has come thus to differ by what is called the action of natural selection; but this does not by any means exclude the idea that God made that plant as well as all the others. On this account, it struck me that the term "religious theory" was scarcely the correct term by which to designate the particular theory to which it was applied. I have, further, one or two remarks to make in the way of criticism, with reference to the arguments of Mr. Reddie. I think there is nothing more dangerous than bad arguments. I believe that bad arguments are worse than no arguments at all; and if there be any weakness in those which have been used, I think it is our duty to point them out. There was an argument used by the essayist which seemed, at the first glance, to be very plausible—that was an argument with reference to language and intellect. He said animals did not seem to have an analogy to man, such as was necessary to make development possible, because they had no language. But though that may seem very plausible, it struck me as being really a most unsound argument; for if you take a child born perfectly deaf, that child has no spoken language, it hears no sound, and it cannot be taught any language—

Mr. REDDIE.—Oh, yes; it can.

Mr. WARINGTON.—It cannot be taught any language by *sound*; but yet that child develops its intellect, though unable to talk; for it can express its ideas by means of signs. (Hear.) Therefore it appears to me that the connection of articulate speech with intellect is not essential. There must be speech of some kind (hear, hear); but it is not at all necessary that it should be articulate language. Now Mr. Reddie is not surely prepared to assert that there is no inarticulate speech amongst animals, no signs or sounds by which they can convey their ideas to one another. (Laughter.) For instance, you see a dog in the street going and fetching another dog; by which it would

appear that dogs had some means of conveying their thoughts to one another, either by instinct, or reason, or intellect, or whatever you like to call it——

Mr. REDDIE.—Excuse me for the interruption ; but you are contending against an argument of Mr. Wallace, to which I alluded, and not to an argument of mine. I never raised that issue. But Mr. Wallace, in a paper which he read before the Anthropological Society, advocating the Darwinian theory, laid it down as a canon of that theory, that intellect and speech would go together. I have no objection to that view ; but I wish it to be understood that I gave no reasons in its favour ; because Mr. Wallace having laid down that theory, I merely adopted it as an *argumentum ad hominem*.

Mr. WARINGTON.—I was quite aware of that. I was simply endeavouring to show that the answer you gave to that was an insufficient answer. There is a kind of speech possible among animals, and a kind of intellect, as well as human speech and human intellect——

Mr. REDDIE.—I beg your pardon ; but if you had attended to the paper, I think you would have seen that I had almost said as much, and expressly reserved that point as one requiring further consideration.

Mr. WARINGTON.—Very well ; I will not further dwell upon that. The other point which I wish shortly to mention, is in respect to the possibility or impossibility of savage nations ever rising in civilization. We are told as evidence that they never could have risen, that there is no tradition existing amongst civilized nations of their having been previously in a savage state. Before we insist upon that argument, it would be necessary to look at this further point—Is it probable, if a nation had risen from savagery to a state of high civilization, that it would recollect, as a tradition to be handed down from one generation to another, that it originally belonged to a class near to the brute ? I put it to yourselves : Is that the kind of tradition you would hand down ? If you were aware of the fact that your immediate ancestor was a monkey, or some other species of brute (laughter), would you have taken care to hand that down to your children ? On the contrary, would you not try to conceal it ? I know I should. (Laughter.) Therefore, is it not possible that a nation may have risen from a state of savagery, and have forgotten it, from the people having concealed the fact ? Mr. Reddie has quoted evidence to show that particular nations look back to a higher state of civilization ; but is it not perfectly natural that they should do so ? Traditions of this kind, looking back to former glories, would be precisely those most likely to be handed down. This, it struck me, considerably weakened his argument. Again, is it not a fact which tells against the general position of Mr. Reddie, that there are traditions existing among nations who have attained to an advanced state of civilization, as to certain persons who were the inventors of the most fundamental parts of civilization ? Are there not traditions of those who invented the use of fire ? When we have traditions of that kind actually existing——

Mr. REDDIE.—Would you mention precisely *what* traditions you refer to ?

Mr. WARINGTON.—I believe the tradition exists amongst the Chinese, and amongst a number of other nations considerably civilized——

Rev. Dr. IRONS.—I doubt that.

Mr. WARINGTON.—I am speaking from memory ; but I am quoting from a book written by one of our best ethnologists (Mr. E. B. Tylor), who mentions a considerable number of nations in which traditions exist amongst the people as to those who first brought fire into their country. I think we might take a statement of this kind,—especially from a person who is extremely careful and cautious in all he says, and whose deductions have been always well considered,—I think we might take his statement as somewhat antagonistic to the general position which Mr. Reddie took up in his argument ; for surely this is a tradition of rising in civilization, or rising from a lower state in civilization to a state which was higher. I do not mean to say it is a rise from utter savagery (hear, hear) ; but it is a rise tending in that direction,—it is a tradition going against that which I thought Mr. Reddie insisted upon so strenuously, namely, the tradition of a fall from what was higher to what was lower ;—an item, therefore, of positive evidence, over and above the general probability that the traditions of a fall from a higher state would be remembered, while the traditions of a rise from a lower to a higher state of civilization would be forgotten.

Professor OLIVER BYRNE.—I have just one remark to make with reference to the arguments in the paper. We find that all those properties in creation that have come by little and little have more or less a complete gamut. We have, however, five senses ; but we have no positive gamut for any of them. Neither have we a gamut for any of the qualities of the heart. We have no gamut for friendship ; we have got no gamut for love ; we have not a single gamut for any of those perfect things of which we have experience,—consequently they never grew little by little. If they had grown little by little, there would have been a symbol for every change—there would have been a mark for all the powers and passions of the head and heart. For instance, there are three qualities of the head : we have got the power to analyze—the power of taking things apart and looking at them ; the power of putting them together ; and the power of alternation ; but we have got no gamut to show how we commenced to learn these mental processes. When we speak of science, also, we must recollect that true science depends upon positive proof. But Darwinism is not science : it is without proof—without axioms or definitions. Had man grown little by little, as the Darwinians say, every single power and passion of the head and heart would have had a nicely-formed gamut. But what is the fact ? Look at the man, for instance, who is employed in China tasting tea. He cannot teach a man how he tells the taste ; he cannot tell how he does it ; he cannot give a gamut for the taste that God Almighty gave him,—it cannot, therefore, have grown little by little : it must have been got altogether ; and so it is with all the perfect things in creation.

Mr. FOWLER.—With reference to the remarks of the gentleman who spoke before Professor Byrne, I have one word to say. Mr. Warington's argument appeared to be, that it was quite possible that civilized man could have developed himself from a savage state. Now it appears to me, that we

must look at the question as regards the development of mankind, in the way it has been very ably put in Mr. Reddie's paper, but which, among the many other points referred to, has been somewhat overlooked ; namely, that there is no account of the history of mankind which does not essentially harmonize with the account we have in the Scriptures. If we look at the question as to how civilization grew up, we will find, as Mr. Reddie very properly observed, that the oldest uninspired account we have is that given by Herodotus, and if we examine his history, we do not find it inconsistent with the Scriptures. All we learn from it of the history of mankind thoroughly harmonizes with the account which we get in the Bible. Egypt is the oldest country of which Herodotus speaks in much detail ; but when he refers to the ancient accounts of transactions which occurred in the early part of the history of Egypt, he only mentions what he was told by the priests of that country. He does not appear to be able to vindicate all that he has written, or to speak with the accuracy and certainty which is evident in the inspired writings of the Bible. Now the same thing might be said with regard to the oldest accounts which we get from all other sources with regard to the history of mankind. And I think it is a point we ought especially to bear in mind, among the many able arguments that have been advanced in the paper, that we have no account of the early history of mankind which in any way contravenes the earliest account of all, namely that given us by the inspired writers of the Old Testament. (Hear, hear.)

Rev. S. C. ADAM.—I rise for the purpose of asking a question of some able Hebrew scholar with regard to the meaning of the Hebrew word *BARA*, *created*. I have always understood that it means that God gave a perfect existence to everything that He created ; and if so, He gave a perfect form to man in creating him.

Rev. Dr. IRONS.—It is an awkward thing to rise in order to answer a question so put. Without, however, professing to be a Hebrew scholar, I may say that I have read Hebrew for many years, and I may observe that the state of the language is so primitive that it is impossible for us to analyze the exact force of its roots, beyond a certain limit. You find instances in which the word in question has a definite meaning ; but they are very few, and it would be out of the question to attempt to build up a doctrine of philosophy on the etymology of a Hebrew word. It is used ordinarily in the same way as we use the ordinary English word "created," or "made,"—sometimes it means the one and sometimes the other. The idea of "creating out of nothing" is an idea we bring to the word, rather than extract from it. It is not an idea which belongs necessarily to the word itself. There is no doubt that is the traditional sense of the word ; but it would be impossible to push its force beyond a mere general sense, and to build an argument upon its etymology would be most unwise. Would you allow me to say in defence of our Essayist, that I think a little unfairness was used by Mr. Warrington and Dr. Gladstone in questioning what is or is not religious. Of course, Mr. Reddie used the word in its ordinary sense. We are not here merely to play with words. We are using terms in their common

signification. Every one knows that there is a religious view of all the subjects which engage us here ; and we must not be debarred from using common phrases in discussion. It leads people from the truth, and gives an appearance of pettiness to our discussions, to have issues raised in debate which are not worthy of debate. Now with respect to the Darwinian theory, I think it was incumbent upon Dr. Gladstone to define what he meant when he made a distinction between Mr. Darwin and the Darwinian theory. The force of his argument was that a man might be a good Darwinian and be at the same time a sound Mosaical theologian ; but at the present moment I am in doubt as to what he meant when he said that the Darwinian theory might be held by those who considered the Bible substantially true throughout. Of course I could put a meaning upon it, because in the Christian Church there has been a theory (though it has not been ordinarily discussed amongst us) which very closely approximates to that which I suppose to be the Darwinian theory, and it has been held by great men without the least rebuke. I remember, some time ago, reading a sermon by Father Ventura, preached in Rome and Paris, which received the direct approbation of the Pope, and it begins with a statement which I recently had occasion to quote. It occurs in a sermon on the certainty of the instruction of the Catholic Church ; and in it the preacher states : "There is no father of the Church, there is no doctor of Catholic antiquity, who does not acknowledge that everything in the system of grace is correspondent with something which had previously existed in the realm of nature." He attempts to show from that the truth, that there is nothing whatever in the new creation which had not its dim parallel shadowed beforehand in the previous operations of what we call nature. That I suppose may harmonize to a great extent with Darwinism. I remember distinctly, when I quoted this in a sermon, that several good old Churchmen were shocked at it, and said it was Darwinism. I suppose I must not mind being called hard names, but I think a Christian clergyman standing up in this metropolis of Christianity, in this city which we might regard as the centre of intellectual Christendom, ought not to be called names for maintaining a truth which, according to Le Père Ventura, and according to his present Holiness the Pope, has been laid down by all the doctors and fathers of the Church unanimously. But all this only shows that we might eliminate that whole discussion from our present debate ; and I think we might spare altogether that part of Mr. Warrington's observations. I do not think it was *ad rem* to-night. He came at last to the point. He came to consider whether there was anything like a tradition in the world, of a savage people having civilized themselves. Now, I think our essayist threw down the challenge boldly. And, indeed, this is not a matter in respect to which there need be any doubt. As to the obscure and more than obscure tradition existing in some races, that their ancestors had originally derived fire from the discovery of their fellow-men, I would put it to the conscience of Mr. Warrington, whether that tradition is not more like poetry than history ? It is a sort of imagination. Being accustomed to the comforts and blessings of fire, it was not unnatural, in the savage state to which they had sunk, that they should have some vague tradition of this

kind. But the very fact that there was such a tradition, attributing the origin of fire to some one who brought it to them, rather proves Mr. Reddie's case, and shows that they attributed even their knowledge of fire to some being wiser than themselves. (Applause.) It was not a thing discovered by their generation ; it was in the dim religious past. And so we find that traditions invariably take a religious turn. We all know that Prometheus suffered for stealing fire from heaven ; but then Prometheus was considered to be a demigod. (Hear, hear.)

Mr. BARRETT.—The impression left on my mind is similar to that which was left on the mind of Dr. Gladstone. As far as I can judge, Mr. Reddie appeared to think that Christianity must stand or fall by the objections to the Darwinian theory. (Cries of No, no.) Well I may be right, or I may be wrong, but that was the impression left on my mind. I think a greater disservice cannot be done to Christianity than dogmatically to assert that its claims depended upon refuting the truth of the Darwinian theory. Darwinism may be right or it may not ; but the Bible teaches us nothing at all about it. (Hear, hear.) The Bible teaches us nothing about science. It was not written to teach us science. It was sent to appeal to our affections, not to our intellectual nature. I do not think, therefore, it has any connection with the Darwinian theory—

Mr. REDDIE.—I am sure I will be excused for the interruption, for I must say that this is really not the question here. I have not said that Christianity must stand or fall by Darwinism, or the objections to Darwinism. I stated what Darwinism was, and I tried to oppose it, not by any words of Scripture, but by our experience and the facts of nature. (Hear, hear.)

Mr. BARRETT.—I was simply stating the impression left on my mind from hearing the paper—

The CHAIRMAN.—As I understood the paper, the subject has not been discussed from the Bible point of view simply, but from a consideration of the facts of nature, as opposed to the Darwinian theory.

Mr. BARRETT.—I was simply stating the impression left on my mind, which was, that it was argued that Christianity must stand or fall by the objections to the Darwinian theory ; and I thought I was justified in stating that I did not adopt that opinion.

The CHAIRMAN.—I must say I can see nothing of that kind in the paper. I regret the tone which has been imported into this discussion by Dr. Gladstone, unintentionally no doubt ; as it has drawn us away from the subject of the paper. I think Mr. Reddie was extremely cautious in not attempting to call names. But in dealing with a subject of this kind, it is sometimes very hard not to call things by their right names. There is a certain theory which we believe to be the religious theory ; and by the religious theory I mean that which a plain common-sense man will deduce from the word of God, reading it as a plain, common-sense man will read the Scriptures. I cannot conceive that a man is very much to be deprecated, if he calls that plain, common-sense view the religious view, as opposed to other

views which deduce theories out of their own conceptions rather than from the facts of nature. Dr. Gladstone referred us to a well-known simile—that of Paley—of a man going across a common and striking his foot against a watch. Now if Paley had known more of the question, he would have seen that this was a bad sort of simile to take for working out his theory from analogy; because if a man struck his foot against a stone instead of a watch, he would have found, upon an examination of it, that it contained a far more complicated structure than was to be seen even in a watch, and that it was the work of a far higher power. With regard to the observations which have been made in reference to the Darwinian theory,—and when I make use of that term, it is in no spirit of calling names,—I must say that those that advance that there is no such thing as a Creator, or no such thing as creation, claim (I do not say whether they do it rightly or wrongly) Darwin as a supporter of what I think every one must therefore admit to be an irreligious theory. But take his own arguments. I have not to go simply to statements scattered here and there in the volume of Mr. Darwin; I take the whole spirit of it. The whole gist of his argument is directed against anything like design appearing in creation. How does he form the eye? I need not now go into that matter; it takes a very prominent part in the Darwinian theory. No one can read his description of the formation of the eye, without seeing that it is an attempt, as unphilosophical as contrary to common sense, to account for such a perfect instrument without any design on the part of the Creator. I think any theory which attempts to get rid of that which is the most striking feature in God's work, namely design, is the most irreligious theory that the mind of man has ever yet devised. Darwin completely fails to account for the marvellous structure of the eye from any principle of natural selection. In my opinion, if Thomas Carlyle were to give his version of Darwinism, he would call it "the devil-take-the-hindmost theory." This monstrous theory that the stronger will always destroy the weaker, and that perfection comes through the destruction of the weaker, utterly ignores the operation of any intelligent design. Another great crux of Darwin's was the formation of the cell of the common hive bee. He could not discover how to account for this upon the theory of "natural selection." He could not tell how the bee discovered that marvellous angle of 109 deg. 28 min., by which it secured the greatest possible amount of space with the least amount of work, except that, after much trial and error, it discovered the square root of two to six places of decimals! You may think I am travelling out of the question under discussion, but I do not think I am. I want to draw a very important distinction, which has not been drawn to-night in this discussion. I have not heard one real objection to the arguments of Mr. Reddie, with the exception of that taken by Mr. Warrington with reference to the tradition about fire, which has been so ably answered by Dr. Irons. Therefore I think the paper is a very triumphant one. But there is one thing which was not argued in the paper. It is this, we have heard of men improving, and of men making inventions. Men can make out the square root of two to twenty or thirty, or even fifty places of decimals; but

we find that there is this distinction between man's intellect and the intellect, if you will so call it, or the intelligence or the instinct of other animals, that they were created with their instincts perfect, and required no instruction, no bringing out, no improvement of any kind. As they were created, so they are now. We find amongst the simplest and the humblest of God's creatures that their instincts have anticipated some of the greatest inventions and discoveries of man. Before Archimedes was a mathematician, before logarithms were invented, the bee was the great geometrician. When we were in want of materials for paper, we went to the wasp to be instructed, and found it making paper out of dry wood. We thought we had made a discovery in aeronautics, but we found that we had been anticipated by the little spider. Another spider anticipated the invention of the diving bell. All this proves that it is possible for beings to be created with perfect instincts, and that therefore it is possible for such a thing as a perfect man to have been created. If we have perfect insects created, with all their faculties at once appearing bright, clear, and beautiful, I say man might have been—I don't say he was—created perfect; and that he might have degenerated, for he has the power to lose knowledge as well as to acquire it. I do not think that men ought to shrink from expressing their opinion upon a matter, as to whether it is religious or whether it is not, when they do not do it in the spirit of calling names, and they ought to be allowed to protest against theories which they do not believe to be true, without being charged with being unchristian and uncharitable in the interpretation which they put upon them. There is another thing which I think has a remarkable bearing on the question. That is, when a man is raised to a high point of civilization he forgets a vast amount of the instinctive faculties he possesses. As science advances, he is better able to interpret great facts in nature; and it is by these facts that he begins to learn what instincts he unknowingly possesses. How is it that one class of men in one part of the world have discovered that the leaf of a certain tree dried and formed into tea makes a very valuable article of food? How is it that in another quarter of the globe men have discovered that the fruit of another tree (coffee) roasted and ground produces an article of food which has the very same effect on their constitution? How is it that another set of men have discovered the value of cocoa? How is it that these things have been ascertained? What could have guided men in their selection of these things? They are substances without taste or any other sensible property in common. Everything was so naturally adverse to the gamut of which Professor Byrne has spoken; and yet, if we come to a chemical analysis, we find that they all contain the same kind of substance, and that is a certain vegetable alkaloid, of an isomeric character. All of them contain the same elements, combined together in the same proportion. How is it that men instinctively arrived at that knowledge? And if man has such subtle instincts as these, has he not other higher instincts? Is not poetry a subtle instinct? Is not the power of reasoning a subtle instinct? Is not geometry founded upon the most subtle instincts of the human mind? Are we to deny all that? Again to recur to the instructive use of coffee and

tea. If we go to Wiltshire, we find the ill-paid labourer knowing that by the use of tea he is enabled to do the greatest amount of labour with the least amount of waste. We also find that the poor, hardworking sempstress has discovered the same fact. She knows that it is the best food she can take. How is it that these people find out these things? I was told once by an inspector of prisons that he had made an experiment in which he put 400 men on oatmeal and milk, and 400 others on tea; and he found that those to whom the oatmeal had been given had lost in weight, while those who received tea had lost nothing at all: the alkaloid in tea, coffee, and cocoa prevents waste of muscle. These marvellous human instincts lead us to the conclusion that man comes not from the lower animals by any educational process or any education of instincts, and prove that while man possesses instincts in common with the brute species, he has something which the brute species do not possess; for the latter cannot be educated—they never can improve their instincts, nor, on the other hand, do they ever lose them or become in any way degenerated.

Rev. Dr. THORNTON.*—The *Periplus* of Hanno, and Herodotus's account of the *Troglodytæ*, seem to contain instances of savagery known to the Greeks. But the *Gorillæ* of Hanno were most probably apes,—the name perhaps derived from *gur* and *jalal*, meaning "howling monsters" in Punic. The *Troglodytæ* were apparently a very early Hamitic colony, degenerated, through want of communication with their fellow-men, both in physical character and in language; and this is, therefore, an argument in favour of Mr. Reddie's view.

* Dr. Thornton was unable to remain sufficiently long at the meeting to make these remarks, which he has since been good enough to forward for insertion in the *Journal of Transactions*. In addition to what he has stated as regards the *Troglodytæ*, I would beg leave to observe, that the allusion Herodotus makes to them does not seem to indicate any actual knowledge of their existence or real character, but only hearsay, and so little of that—mixed up, too, with so much besides that is incredible—as to amount to nothing. He tells us in the same place of the *Lotophagi*, whose kine feed backwards, because they have horns so bent forward and downwards that they would stick in the ground if the animals endeavoured to advance. Then he says—"The Garamantes hunt the Ethiopian Troglodytes in *four-horse chariots*; for the Ethiopian Troglodytes are the swiftest of foot of all men of whom we have heard any account given. They feed upon serpents and lizards, and such-like reptiles; and they speak a language like no other, but screech like bats." (*Melpom.* IV. 183.) Very little of this, I think, can be accepted as *history*, or as facts within the writer's actual knowledge. That one race of men might in his day chase another in four-horse chariots might be true enough; but to speak of employing "four-horse chariots" for the purpose of *hunting* men who were "the swiftest of foot," destroys the whole story. Take away the horses and chariots, and the foundation of fact for this exaggerated "hearsay" may well be imagined to relate to a monkey-hunt! In referring to Herodotus, I only meant to rely upon what he narrates as within his personal knowledge, and to exclude the more fabulous stories he repeats, such as the above, and also what he recounts of a one-eyed people, the Arimaspians, in whose existence, Herodotus tells us, he did not believe himself. (*Thal.* III. 116.)

Mr. REDDIE.—I have but very little to say in reply to the remarks which have been made upon my paper. I regret extremely that it has not been criticised more thoroughly. With the exception of the observations of Mr. Warington, as to the traditions relating to the discovery of fire, no attempt has been made to controvert any one of my arguments. I should wish, however, to give a few explanations. In the first place, I am most anxious to remove the impression which my friend Dr. Gladstone appears to entertain with respect to my use of the term “religious theory.” I can only say that I used it most innocently, and without the slightest idea that my doing so could have given offence to those who hold other theories. I certainly had no intention of implying that either the Darwinian or the polygenous theories are necessarily irreligious—

Rev. Dr. IRONS.—But they are so. (Hear, hear.)

Mr. REDDIE.—Well ; perhaps I may think so too ; but I wish to explain, as a matter of fact, that, whatever I may think, I did not wish to convey any such impression, by applying the term “religious theory” to that which I adopted. I think I might further appeal to the way in which I have spoken in detail of the other theories, as a proof that I could have had no such intention. I may observe, besides, that I am quite aware that Mr. Darwin himself unquestionably recognizes the Creator in his book ; and in one of the discussions which took place in the Anthropological Society, to which I have referred in my paper, I actually appealed to that fact against the arguments of several gentlemen who had adopted his theory and advocated it upon what would generally be called Atheistic grounds. I had to remind them that Mr. Darwin was obliged, in order to get a beginning for his system, to speak of “the breathing of life by the Creator into one or into a few forms,” from which his theory derives all the others.* And, in truth, they did not like it. And I believe that most Darwinians would themselves repudiate the notion that their theory has the religious character which Dr. Gladstone claims for it. There is great difficulty in the present day in speaking of questions that touch religion. If you go to one Society, for instance, to advocate what I have now called “the religious theory,” merely as a monogenous theory, and say nothing about religion, religion and miraculous creation are thrown in your teeth. This I have experienced. While here, I am now called to account, when I call the theory which derives mankind from Adam and Eve, as the Scriptures teach, plainly by its name, which I thought every one would understand. I certainly did so most innocently, as I have said, and merely as the best descriptive term I could think of. But since the question has been raised, I would ask Dr. Gladstone, as one of the managers of the Royal Institution of Great Britain, whether he is not aware of the fact, that one at least of the best-known and most zealous advocates of Darwinism, Professor Huxley, who has lectured upon it in that Institution, distinctly adopts it, *because* it gets rid of the interposition of the Creator to account for man’s origin ; or (as noticed in our Chairman’s Inaugural Address) gets rid of

* *Anthrop. Rev.*, vol. II. p. cxxxiv.

the special creation of Adam and Eve? Now, I would ask, how can we possibly tell what a theory is, unless we take its advocates as its exponents? And since the theory I advocate is not merely a monogenous theory, but is founded upon what Professor Huxley so completely despises—the Scriptural account which begins mankind with the special creation of Adam and Eve—what can I call it, if I do not call it the religious theory? I should be glad to change it, if Dr. Gladstone or Mr. Warington will supply me with some other term by which I could better or more intelligibly designate it. With regard to the polygenous theory, I not only do not think it is necessarily irreligious, but I know that some persons found their views upon the expressions they find in Genesis as to “the sons of God” and “the daughters of men,” in support of a polygenous theory, which they may therefore regard as religious. But still, while admitting this, I think everybody will understand that what I have called the religious theory is what the Scriptures most obviously teach. And what is the main feature of that theory? Why, that man was created perfect, and in the same way that God created all things. Animals, for instance, do not acquire their instincts gradually: they have them, and, so far as we know, always had them complete, and each its own distinctive characteristics. The dog has its *bark*, the cow its *low*, the nightingale its *song*, and every inferior creature its distinctive instincts, by nature, and all in perfection. But we do not suppose that the bee, in forming its hexagonal cells, knows anything of geometry or understands the nature of angles. And when the Chairman was speaking of those wonderful powers exhibited by the insect creation, he was, in fact, really speaking of the greatness and power of the Deity who formed them, and gave them all those wonderful instincts which they possess, but which they exercise without understanding:—the skill which they exhibit being rather—like an instrument that is played upon by a skilful hand—an exhibition of the skill of the Great Invisible performer who gave them all their instincts. (Hear, hear.) When Dr. Gladstone reproved me (with a mild censure, I admit,) for calling names, as he termed it, he himself did the very thing for which he was blaming me; for, while he thought proper to defend the Darwinian theory as possibly religious, he distinctly charged the polygenous theory with being irreligious. (Hear, hear.) Now my argument against that theory was chiefly this, that it involves an inconsistency in its theory of creation, if it assumes that some men were originally inferior to others, as if God would contradict himself by making a being which was not perfect. And surely there is nothing more shocking, nothing more revolting to one’s ideas of what a human being ought to be, than a low, degraded savage; there is nothing so utterly abject even among the brute creation. But then, although I frankly acknowledged the source whence we derive the theory I have advocated, and gave a statement in a general way of the facts relating to man’s origin contained in the Bible; still I have not supported it by a single argument to be derived from Scripture: I have taken the Bible merely as a historical book; I have referred to it, as it were, merely as containing a part of our knowledge of the history of our race; and my arguments have been rational appeals to nature through-

out, and have been supported by such facts as those which have been so recently told us by Mr. Baker and Dr. Beke in the Ethnological Society, based upon their actual knowledge of the degeneration of the savage tribes of Africa. Taking such facts, and taking the traditions of all civilization, I must say I do not understand how the conclusions I have arrived at can be disputed. As to the tradition among some savages as to the origin of fire, to which Mr. Warington has alluded, my friend Dr. Irons has satisfactorily shown that that rather would tell in favour of my view ; but I think it will be found upon investigation, that among those low races this is one of the vaguest of traditions, and not even worthy of the name of "poetry."* And when Mr. Warington argues that if we were derived from savages we would not tell it, I suppose he means that he would not do so : he has, in fact, said that he would not (hear, hear) ; but I can only tell him that this argument has been already repudiated in anticipation by the Darwinians. Professor Huxley almost glories in his ape-ancestry, and argues that to have risen from a monkey "is the best proof of the splendour of man's capacities." Perhaps his monkey progenitor ought rather to have this credit ; but I have never yet heard of a Darwinian who had such faith in his theory as to put his children under the tutorship of monkeys. (Laughter.) It is all very well for men to speculate about these things ; but when we come gravely to discuss a subject of this kind, we must deal with facts. I never meant in my paper to deny that there are different phases of civilization, or that there may be an advance from one degree of civilization to another. I carefully guarded against that, though I could not dwell upon that branch of the subject at any length. I was, of course, obliged to leave out a great deal, and I have, indeed, felt as if I had only dealt with one ninety-ninth part of the whole question. But I have discussed this subject before ; and

* Mr. Warington has quoted Mr. E. B. Tylor on this point ; and, in endeavouring to find the passages he may have had in mind, I have come upon the following remarks of Mr. Tylor, bearing upon my general argument. Speaking of "the native Australian and the Andaman Islander, as fairly representing the lowest state of human society of which we have any certain knowledge," Mr. Tylor says :—"These savages have articulate language ; they know the use of fire ; they have tools, though but simple and clumsy ones. *There is no authentic account,*" he adds, "*of any people having been discovered who did not possess language, tools, and fire.*" He concludes the interesting paper from which this is quoted in the following words :—"The 'original men,' as the poet describes them, roaming, 'a dumb and miserable herd,' about the woods, *do not exist on the earth.* The inquirer who seeks to find out the beginnings of man's civilization must deduce general principles by reasoning downwards, from the civilized European to the savage, and then descend to still lower possible levels of human existence." These citations are taken from an article in the *Anthropological Review* (vol. I. p. 21, *et seq.*), on "Wild Men and Beast-Children," well worthy of consideration with reference to this whole question. For (as I once remarked in previously discussing this subject), "the few questionable instances of 'beast-children,' as they are called, if they prove anything, only prove that if not rescued from association with beasts, the offspring even of men might soon sink into something scarcely better than brutes." (*Anthrop. Rev.*, vol. II. p. cxxi.)

in doing so, I especially noticed what I believe is the nearest approach to a rise, — I cannot quite say from savagery, — but from a lower to a higher state of civilization, of which we have any knowledge. I am glad that Mr. Warrington's objection has given me an opportunity of referring to this case now, which I was reluctantly forced to exclude from my paper. I allude to the Sikhs, who have risen to a state of civilization, and attained an elevation of character, far superior to the rest of the Hindoos from whom they were originally derived. Now the Sikhs might be described as originally a sect of Indian iconoclasts, who through the influence of Nanaka threw off the superstitious worship of idols, to which they were accustomed, for the worship of the invisible and only God. And, it is remarkable, the consequence has been precisely similar to what Mr. Baker found among the African Christians; namely, that we have a race very superior even in their physical appearance, and with features corresponding with, or at least closely approximating to, the European type. Then again we have the natives of Cashmere, with a striking resemblance to Europeans in their features. And to what, let me ask, is their superiority over the tribes which surround them to be traced? Well, they are Mahometans; and Mahometanism, with all its faults, has this grand feature, in common with Judaism and Christianity, — it teaches men to look up to heaven for Deity, and away from idols as gods. And I would venture to argue, that the essential or fundamental principle of all civilization is not fire, as Mr. Warrington seemed to think, but a true notion of Deity — of the invisible God. Wherever a people possess that, they have that in them which is the seed of progress and elevation; and when they reject it and make their own gods, they are on the downward path of degradation. To turn to another point, — the perfection of the animal creation is the foundation of one of my arguments, and it is a perfectly natural and rational one, and not merely derived from Scripture. I could not, however, afford time to do more than allude to this, and I am glad the Chairman dwelt somewhat upon it in his remarks. All other animals being made perfect, there seems to be no reason why there should have been a difference between them and man. I do not think there was anything else advanced which remains unanswered, and at this late hour, I will not trouble the meeting with any further observations.

The CHAIRMAN then announced the adjournment of the meetings of the Society until November next, and expressed a hope that they would all meet again at the opening of the next session, which he trusted would be as successful as that just closed.

NOTE. (See p. 181.)

DISCUSSION IN THE BRITISH ASSOCIATION.

It will be observed that portions of the forgoing paper, *On the various Theories of Man's Past and Present Condition*, are inclosed within brackets. I beg leave to explain that the other portions of the paper were read by me before Section E of the British Association for the Advancement of Science, at Nottingham, on the 25th of August, 1866; on which occasion the passages bracketed were omitted.

I may observe that it is not unusual to read papers before the British Association which have been previously read in scientific societies, provided they have not been published previously; and, having taken with me to Nottingham a single copy of this paper, in proof, I showed it to Mr. Crawford, the president of the Ethnological Society, and one of the vice-presidents of the Section, stating briefly its purport, and said that I should be glad to read it if approved. He at once most frankly took charge of the paper, to lay it before the committee of the Section in the usual manner; and he afterwards told me it would be read, but would require (as I quite expected) to be cut down considerably, in order to bring it within the limit of time that alone could be spared for a single paper among so many others. I therefore bracketed-off such passages as were least essential to my main thesis, and especially those, it will be seen, that relate to the cognate discussion which had taken place in the same Section, at Birmingham, in 1865, and was continued in the *Ethnological Journal* shortly afterwards. I was also, I regret, obliged to omit the concluding portion of my paper, relating to the advancement of mankind and the progress of civilization, through the influence of Christianity; as, to have touched upon that, would have opened up quite another branch of the same large question. But I beg to say, that the decision as to what I should omit, as well as what I should read, was left entirely to myself—not even a hint of any kind whatever having been given to me on the subject. I say this in justice to the committee of Section E, which was most ably and courteously presided over by Sir Charles Nicholson; and I do so more especially, in order to remove certain misapprehensions which appear to have been entertained in some portions of the press, as to the reading of this paper before the British Association—partly attributable, no doubt, to the remarks which Professor Huxley was pleased to make, on being invited to discuss it by the president.

I may observe, for the information of those who are unacquainted with the doings of what has been called “our great scientific congress,” that the meetings in Section E, combining *Geography and Ethnology*, are usually by far the most numerously attended, and that that Section has consequently always the largest room assigned to it for its meetings. This was the case at Nottingham; and I confess that, for various reasons, I felt a desire to be

able to bring forward some of the arguments I had so recently urged in the Victoria Institute, against the notion that the primitive man could possibly have been a speechless savage, before the largest possible audience that could be hoped for in the Sections of the British Association. I may also add that, while no discussion follows the introductory *Address* delivered by the president of the Association or the evening *Lectures* that are given every year, all the papers read in the several Sections are open to discussion, and are usually discussed, although unfortunately there is no systematic or official report of the discussions that take place. The newspapers to a certain extent supply this defect; but it will be obvious that, when so much has to be recorded, their reports, as a rule, must be very imperfect.

I have much pleasure in stating that when my paper was read at Nottingham, it was as well received by the audience generally, as it had been previously when read in the Victoria Institute.

I shall now give some account of the discussion that followed, partly taken from the newspaper reports (in which case I shall employ quotation-marks), and otherwise upon my own responsibility as to accuracy. Professor Huxley's observations I am glad to be able to give, I think very nearly *verbatim*, from the *Nottingham Daily Guardian*, viz. :—

“Professor HUXLEY, who was invited by the president to offer some remarks on the paper which had just been read, said :—I should be delighted in my private capacity to obey any of your behests, but, on the present occasion, I am unfortunately not in my primitive or personal insignificance, but the representative of a department of the Association, and one of the officers of the Association charged with the administration of a Section. It has, in the wisdom of the council of the Association, been thought proper that a department should be instituted in Section D, of which I have the honour to be the head. It is called the Department of Anthropology; and if I have any comprehension of scientific method or arrangement, the paper we have just heard read is purely an anthropological paper, and can only be competently discussed by those persons who are familiar with all the sciences necessary for the student of anthropology. Under these circumstances, therefore, I should, by beginning to discuss this paper, admit the propriety of its being read here, and that in my official capacity I cannot do. I may, perhaps, be allowed to remark that in our department we have a wholesome practice called ‘referring a paper.’ When a paper is sent to us we ‘refer’ it, in order to ascertain whether it contains anything new, anything true, or anything worth discussing; in a word, whether the paper should be read or whether it should not. But though I think this is a paper for our section, I do not pledge myself that it would have passed the particular ordeal which I have described. (Laughter.)”

Mr. NASH, as secretary of the Ethnological Society, and one of the secretaries of Section E, “protested against the views of Professor Huxley, and defended the reading of the paper in this section, inasmuch as it is not only a Geographical, but an Ethnological Section;” and he added that the Ethnological Society had never admitted that their science precluded them from the consideration of all the facts that bear upon man's past and present condition, such as those which had been brought forward in this paper.

Sir JOHN LUBBOCK said, he must also differ from his friend Professor Huxley ; but with reference to the ingenious paper which had been read, "he objected to the term 'religious theory,' because it implied that all other theories must be anti-religious. Now, for his part (without professing to be more orthodox than he was), he believed that religion and science were not opposed one to the other. He did not think Mr. Reddie really comprehended the Darwinian theory. He was an humble disciple of Mr. Darwin's, and he ventured to claim for that gentleman's theory, that it was the only one which accounted in any way for the origin of man ; for all the other theories were, in his judgment, no theories at all, but simply confessions of ignorance, and did not convey those definite ideas to the mind which were conveyed by the theory of Mr. Darwin."

"Mr. CRAWFURD was of opinion that the terms 'anthropology' and 'ethnology' were synonymous, or nearly so. For his own part he could not believe one word of Darwin's theory. He was sorry for that, because it was believed in by so many men of eminence. It was a surprising thing to him that men of talent should nail themselves to such a belief. (Hear, hear.) Man, it was said, was derived from a monkey. From what monkey? (Laughter.) There were two hundred or three hundred kinds of monkeys, and the biggest monkey, viz., the gorilla, was the biggest brute. (Laughter.) Then there were monkeys with tails and monkeys without tails, but curiously enough those which had no tails, and were consequently the most like man, were the stupidest of all. (Laughter.) People were at a loss to know how the universe was created, and that, no doubt, was a difficult subject. Mr. Reddie, however, seemed to invert the order of nature, for all the history of man showed that he was progressive. Our ancestors were barbarians, and it was the same with every other race."

Mr. CARTER BLAKE said he should wish to be informed what traditions among savages Mr. Reddie referred to, as relating to their previous higher condition ; and where such traditions are to be found recorded.

Mr. FELLOWS also briefly addressed the meeting, but his observations were of a general kind (not, however, adverse to the paper), and I regret they have not been reported, so far as I am aware.

In reply to Professor Huxley's remarks, so far as they related to the propriety of my paper being read in Section E, I contented myself—as Professor Huxley had then left the room—with referring to the complete answer he had received from Mr. Nash. His observations were, besides, rather a reflection upon the Committee of the Section, and it is not for me to say whether they were in the best taste or not. They were received with "laughter," no doubt, but also with adverse murmurs in the Section. For myself, I was not placed on the committee till after my paper had been accepted, but I am not aware that Professor Huxley had any grounds whatever for affecting to suppose that my paper had not been "referred" (as I do know that other papers were), in Section E, before being read. Anyhow, the paper, upon being read, was extremely well received, and was also more fully reported in the newspapers, with one or two exceptions, than perhaps any other ordinary paper read at the meetings. As it is now printed and published along with Professor Huxley's remarks as to its character, the public generally will be able to form their own judgment of it, and will further know (if I gather the Professor's

meaning aright), that had it gone before his Section he would have endeavoured to suppress it. I am glad that in Section E, a more liberal spirit was exhibited and my paper allowed to be read. I do not deny that it might quite properly be called an "Anthropological Paper," though now (knowing what its probable fate would have been), I am very glad I had *declined* to offer it to the Anthropological Department of Section D. There are, however, special reasons for saying that the paper was *most properly* read in Section E. In the first place, it will be observed, that the physiologists and naturalists being at issue about Darwinism, the arguments advanced in the paper are chiefly based upon historical and ethnological evidences. At the very next meeting of the same Section a most interesting account was given by Mr. Thomson of the recent discoveries in Cambodia (in Siam), of the ruins of magnificent and gigantic temples, so far beyond the capabilities of the present inhabitants or their immediate forefathers for many generations to accomplish, that their tradition is that these ancient buildings must have been constructed by a superior race of beings altogether,—or "the gods." Of their great antiquity there can be no doubt; the style of architecture is intermediate between that of Egypt and Greece; and there is now a dense forest interposed between the buildings and the rocks whence the stone used in their construction is supposed to have been procured. Dr. Mann, also, on the same day and in the same Section, narrated his experiences relating to the attempts which have been made to educate and civilize the Kaffirs and Zulus; and on the following day Sir Samuel Baker recounted some of his recent most interesting adventures among the negroes of the White Nile Basin, and especially discussed their savage condition, and their tendency to continue savage and degenerate. The only instance which he mentioned of anything somewhat better to be found among them, he attributed to the influence of the Arabs with whom they had had communications. Professor Huxley was present, too, when that paper was read, and he even spoke upon it; though I cannot say he discussed it, for he only referred to one or two of the facts mentioned by Sir Samuel Baker, which did *not* bear upon "the question of questions for mankind." Having referred in my paper (p. 195) to Sir Samuel Baker's statements made in the Ethnological Society, merely as I had seen them reported in the newspapers, it was a great gratification to me to hear them myself, repeated in the crowded meeting in Section E, where my own paper had been previously read, and to hear not a word from him that was not entirely confirmatory of the views which I had expressed. The account of the ruins of Cambodia was also a fresh illustration in support of one branch of my arguments; and I think, now, it will be seen that it was most fitting that arguments based upon our knowledge of such archæological and ethnological facts should have been advanced in the same section of the British Association, where fresh evidence and additional facts of the very same kind are constantly brought forward.

To revert to the discussion upon my paper. I scarcely required to answer Sir John Lubbock's objection to the term "religious theory," as it had met

with a pretty general expression of dissent in the meeting. If people would only consider, that for thousands of years no one ever thought that anything like "development," or Darwinism, was taught in *Genesis*, they would surely refrain from the vain endeavour to import that meaning now into the old Mosaic narrative,—into the language of a book (to quote Mr. Warington's words*) "written in plain and simple style, which has been in the hands of theologians complete for nigh 1,800 years, and on which they have bestowed unremitting study ; where no new facts can ever be rising up to disconcert past conclusions ; and where, therefore, if anywhere, unanimity would seem to be inevitable, and diversity of opinion most inexplicable and criminal."

As regards the charge of not understanding Darwinism, I replied by citing Professor Carl Vogt, who, as a physiologist, is just as eminent on the Continent as Professor Huxley is in England, and who, as a Darwinian, differs totally from the latter. I was somewhat surprised that a debater so clear-headed and courteous as Sir John Lubbock, should have cared to repeat what is now a mere hackneyed charge against all who oppose Darwinism. When the Darwinians are themselves agreed about the theory it might be time enough to expect objectors to "understand it." But Sir John Lubbock surely overlooks the drift of my argument altogether, when he makes that reply, even were he right in his assertion. My main argument in the present paper, he might see, does not require me to understand Darwinism. It is a *reductio ad absurdum*, assuming the possibility of the theory, and not questioning in detail its processes. Of course, I do not believe that even a monkey, and still less a man, could be developed in the Darwinian way. But *granting* that we have got the imaginary "speechless man," or the real "low-caste savage," to begin with, then, I say, you cannot even then, with such a beginning, get the world as it is, or arrive at the civilized man. All our experience is against this. All the facts we know are contrary to it ; and, if so, it is not possibly true, and it is irrational to believe it. It is not only not "science," but it is *contrary* to all we really *do know*. I have no doubt that Darwinism can be and will be (if it has not already been) refuted at other stages. I do not think it has established even a single step of its almost infinite assumptions. But be that as it may,—and raising no primary objections,—I have maintained that it must stop at man ; because, as I have proved, civilization has not, and cannot be, developed out of savagery. Everybody knows that it is only when Darwinism comes to be applied to man, that its conclusions ostensibly clash with "time-honoured traditions," and what Professor Huxley calls "strongly-rooted prejudices." I have therefore met it at that point.

With respect to Mr. Crawford's observations, I am bound to notice, that besides what he is above reported to have said, he also disclaimed being a polygenist (very much to my surprise), though it will be seen he still thinks mankind have advanced from an originally savage condition. But his reference to our ancestors having been barbarians, is nothing against my argument. I have not denied the possibility of a rise from a "barbarous" to a "civilized" condition, using the words strictly, but a rise from utter "savagery." But

* *Journal of Transactions of the Victoria Institute*, vol. i., p. 101.

so far as I know, even barbarians have not, as a rule, civilized themselves, but they have either had civilization brought to them, or they have gone to it. Our barbarian ancestors had civilization brought to them by the Romans, while Rome itself was invaded by barbarians. But there are various degrees of "barbarism" running upwards and into civilization, as well as various phases of the latter running downwards into barbarism. But the utterly "savage" condition is perfectly distinct from both. No one knows that better than Mr. Crawfurd. There were two passages in my paper among those bracketed-off as unread at Nottingham, which, however, I did read; namely, the quotation on page 192 (from line 12 to the end of the paragraph), the author of which (as I suspected) was discovered upon reading it to be Mr. Crawfurd himself. The other was the quotation from Professor Rawlinson at the top of page 193; and taking it in connection with what I say in the latter part of my paper (p. 197), I think we have the real key to all Mr. Crawfurd's difficulties about human progress and the spread of civilization.

I am glad that Mr. Carter Blake asked the question he did, relating to savage traditions, as it gave me an opportunity of removing an evident misconception on this point, for which I am probably to blame. I by no means meant to say that the savages had definite traditions of their own descent from a superior ancestry. To say truth, I should not have regarded such traditions as of much value, coming from such a quarter. What I rely upon is better evidence, as being unintentional and quite incidental. I appeal to their traditional stories and songs, extravagant though they be, as proofs that their authors were superior to those who can only now repeat them, without even professing to understand them. In doing this, I had chiefly in mind what I had heard stated in the Anthropological Society, or read in the Journal of that Society, which is edited by Mr. Carter Blake himself,—and especially an interesting memoir by Mr. Pritchard, relating to the Viti Islanders; while I may add that I have heard Dr. Seemann, a vice-president of the Anthropological Society, say, on more than one occasion, that among all savage tribes their oldest traditions are almost always mixed up with some references "to trees and serpents and to woman," as I have stated on p. 193. To give further authorities as to the character of savage traditions,—their frequent resemblance to one another, and their superiority to anything the savages who now repeat them could themselves originate,—would require a reference to almost every work on ethnology.

Mr. PRITCHARD'S interesting Paper (*On Viti and its Inhabitants*) will be found in the *Memoirs of the Anthropological Society* (p. 195, et seq.). When it was read the following remarks were made upon it, which I reproduce, as bearing upon the present discussion :—

"DR. SEEMANN said he considered the paper they had heard was one of the most important that had been communicated to the Society, and he was able, from personal acquaintance with the island, to corroborate many of Mr. Pritchard's statements. A great many things connected with the inhabitants of the Fiji islands had only appeared to him in their true light since he arrived in England. For instance, the Andaman islanders showed that in

many particulars they are similar to the Fijians. The first account of the Andaman islanders was that given in 'Sinbad the Sailor,' which narrative, though generally regarded only as a fiction, contained many correct statements. The Andaman canoes were similar to those used by the Fijians, especially in the outrigger. Dr. Seemann remarked on the curious legends of the islanders, of which Mr. Pritchard had given an account, especially those relating to their own origin. It was interesting to notice that, in so many legends, the original progenitors of man were placed under or near sacred trees. It was a curious circumstance that, in these legendary cosmogonies, there was always a serpent, in which symbol he considered there was a deep meaning. The supreme god of Fiji (Degei) had the shape of a serpent.

"Mr. REDDIE observed that the traditions of these islanders were very remarkable, and he considered it extraordinary that the people should be able to preserve them and repeat them to travellers. Such a preservation of our Christian legends could not be expected even in London among the common people. As to the frequent occurrence of the serpent in those legends, it was a very curious fact. . . . In the constellations of the heavens, which had been traced to the most ancient peoples on the face of the earth, the serpent was one of the most common emblems, and was to be found in several parts of both hemispheres of the celestial globe. It was interesting to find also the same symbols conspicuous among the legends of the inhabitants of the Fiji islands, and it appeared they had a common ancient origin. Such beautiful traditions could not be inventions of the present Fijians. Even in civilized London, not one out of ten would be capable of inventing such beautiful stories. The question was, whether they were not traditions of a people superior to those who now inhabited those islands, thus showing that the present inhabitants had deteriorated. The invention of such legends, in more ancient times, at all events tended to prove that their inventors must have been greatly superior to improved baboons. It would be interesting to know something of the present literary qualifications of the people, and how far such traditions are retained among the inhabitants generally.

"Mr. PRITCHARD in reply said:—As to the date of the traditions, there can be no doubt of their antiquity. Different natives, without the possibility of collusion, narrate the same traditions in almost the same words. The missionaries discountenance the old traditions, and also any new stories. It is not easy to collect these traditions from the inhabitants, for it is necessary to be master of the language to do so, and those who are not thoroughly acquainted with it sometimes are imposed on, especially by runaway sailors, who know the language very imperfectly, and invent strange stories, which they represent to have heard from the natives. To learn their legends and traditions correctly, it is necessary to live amongst the natives, as he had done; and, to gain an influence over the native mind, it is necessary to learn their mode of reasoning when certain data are placed before them."^{*}

* *Anthropological Review*, vol. III. pp. xii—xiv.

ORDINARY MEETING, Nov. 19, 1866.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous meeting were read and confirmed ; and the names of the following Foundation Members and Associates were announced as having been elected since last Ordinary Meeting :—

MEMBERS :—The Right Honourable the Earl of Carnarvon, 66, Lower Grosvenor Street, W. ; Richard Edward Arden, Esq., Barrister-at-Law, J.P., and Dep.-Lieut. for Middlesex, F.G.S., F.R.G.S., Fell. Acclim. and Ornithol. Socs., M.R.I., Sunbury Park, Middlesex ; William Barrington, Esq., C.E., 51, George Street, Limerick, and Ballywilliam Cottage, Rathkeale ; Amos Beardsley, Esq., F.L.S., F.G.S., Surgeon, &c., the Grange, Newton-in-Cartmel ; Henry Beckett, Esq., F.G.S., Mining Engineer, &c. &c., Penover, near Wolverhampton ; Henry Butler, Esq., H. M. Civ. Serv., Bexley House, Blackheath, S.E. ; Rev. Charles Campe, Minister of Christ Chapel, 14, Northwick Terrace, Maida Hill, N.W. ; T. B. Chester, Esq., B.C.L., Solicitor, 24, The Grove, Hammer-smith, W. ; Henry G. Heald, Esq., 9, County Terrace, Camberwell, S. ; Elkanah Healey, Esq., Oakfield, Gateacre, Liverpool ; Rev. John Kirk, Professor of Practical Theology in the Evangelical Union Academy at Glasgow, 17, Greenhill Gardens, Edinburgh ; Rev. W. Leask, D.D., Newington Green, N. ; Rev. R. T. Lowe, M.A., Cantab., Member of the Lisbon Academy of Sciences, Corresponding Member Z.S.L., Lea Rectory, Gainsborough ; George Lowe, Esq., C.E., F.R.S., F.G.S., &c. &c., 9, St. John's Wood Park, N.W. ; William Macdonald, Esq., M.D., F.R.S.E., F.L.S., F.G.S., Fellow of Royal College of Physicians, Edinburgh, Professor of Civil and Natural History, St. Andrews ; Patrick M'Farlane, Esq., Comrie, Perthshire ; John Patton, junr., Esq., Shipowner, 11, Pembury Road, Clapton, N.E. ; Thos. Prothero, Esq., F.S.A., M.R.I., Barrister-at-Law, 36, Queen's Gardens, Hyde Park, W. ; Charles Ratchiff, Esq., Wyddrington, Edgbaston, Birmingham ; Rev. S. D. Waddy, D.D., 3, Chester Place, Kennington Cross, S. ; John Hewitt Wheatley, Esq., Abbey View, Sligo ; Edward Whitwell, Esq., Bank Field, Kendal, Westmoreland ; Thomas Vernon Wollaston, Esq., M.A., F.L.S., &c. &c., 1, Barnepark Terrace, Teignmouth.

ASSOCIATES, 1ST CLASS :—Mr. D. R. Davies, 5, Cardiff Street, Aberdare ;
2ND CLASS :—A. K. Bickford, Esq., Lieut. R.N., *H.M.S. Research*,

Channel Squadron ; Thomas Ensor, Esq., Merchant, Milborne Port, Somerset ; W. A. Nunes, Esq., Her Majesty's Civil Service, 2, Hanover Villas, Brook Green, W.

It was also announced that the following books and pamphlets had been presented to the Society :—

Ti-Ping Tien-Kwoh : The History of the Ti-Ping Revolution, including the Author's adventures. By Lin-Le. Two Vols.

From Messrs. Wyman & Sons.

Modern Geology Exposed. By Patrick M'Farlane, Esq., M.V.I.

From the Author.

The First Man, and his Place in Creation. By George Moore, Esq., M.D.

From the Author.

The Flint Implements from the Drift not Authentic. By Nicholas Whitley, Esq.

From the Author.

THE CHAIRMAN.—I must apologize for the extemporaneous character of the few remarks I am about to make. Until this afternoon, I thought I should only have had to commence our business by calling upon Professor Young to read his paper. It has, however, been suggested to me that on the present occasion it may be expected that I should give a short introductory address :—

LADIES AND GENTLEMEN,—At this opening meeting of our second session, I cannot help congratulating the society on the progress it has made since its public inauguration only six months ago. That progress is a proof that there are not a few persons of educated minds and of varied pursuits, who are ready not only to declare that a man can be a believer in Divine Revelation, and at the same time maintain that the Author of that Revelation is the Author of all truth, of all knowledge, and of all that constitutes sound science ; but who are also willing to evince the sincerity of their convictions by openly co-operating as members and associates of this Institute, in order that the pretensions of all contrary science may be thoroughly and impartially investigated, and that truth may be elicited and established.

Since we last met, the British Association, called by some the Parliament of Science for Great Britain, has held its annual session. It was opened by an eloquent address by a very distinguished cultivator of science. I cannot but regret the tone of that address—a tone which seems to imply that a calm inquiry after truth can only be undertaken by such as ignore those truths which we believe the Creator has specially revealed to His creature, man ;—which assumes that a belief in

the miraculous, if not quite inconsistent with philosophy, is at least to be restricted within the narrowest limits, and that as any special act of creation is a miracle, it is expedient to reduce creation, if possible, to the smallest possible number of acts ;—and which ends by concluding, that what elsewhere has been termed the chain of endless causation, is merely a law of “continuity,” which, if not infinite, has no definite beginning that can be traced even to one special act of creation ! This is a tone of thought, as I conceive, only suited to those who wish to evade all acknowledgment of a final cause, or the design of an intelligent and omnipotent Creator, and not to such as are satisfied that the Creator has revealed to man, that “by His word were all things created that are in heaven, and that are in earth, visible and invisible.” It cannot be palatable to those who believe that there were consecutive acts of creation, in which God said “Let there be,” and there was,—that plants and animals were created in a perfect state, (so that God could behold His works and pronounce them very good,) and not imperfect works, left to perfect themselves by accidental “laws” of natural selection and emendation, carried on through æons of ages.

To show that I am not misinterpreting the tone of Mr. Grove’s address, I will quote from it some few passages :—

“To suppose a zoophyte the progenitor of a mammal, or to suppose at some particular period of time a highly developed animal to have come out of nothing, or suddenly grown out of inorganic matter, would appear at first sight equally extravagant hypotheses. As an effort of Almighty creative power, neither of these alternatives presents more difficulty than the other ; but as we have no means of ascertaining how creative power worked, but by an examination and study of the works themselves, we are not likely to get either side proved to ocular demonstration.”

Now, does not this passage ignore the revelation that God has made to us, that He did act in a manner which is here designated as an apparently extravagant hypothesis ? and allege that in a matter where we cannot have demonstration, the same kind of faith by which we arrive at so many truths, even of science, which do not admit of ocular demonstration, cannot lead us up to a rational, that is not an extravagant, hypothesis ?

I will quote another passage :—

“The more the gaps between species are filled up by the discovery of intermediate varieties, the stronger becomes the argument for transmutation, and the weaker that for successive creations, because the former view then becomes more and more consistent with experience, the latter more discordant

from it. As undoubted cases of variation, more or less permanent, from given characteristics, are produced by the effects of climate, food, domestication, &c., the more species are increased by intercalation, the more the distinctions slide down towards those which are within the limits of such observed deviations; *while on the other hand, to suppose the more and more frequent recurrence of fresh creations out of amorphous matter, is a multiplication of miracles or special interventions not in accordance with what we see of the uniform and gradual progress of nature, either in the organic or inorganic world.* If we were entitled to conclude that the progress of discovery would continue in the same course, and that species would become indefinitely multiplied, the distinctions would become infinitely minute, and all lines of demarcation would cease, the polygon would become a circle, the succession of plants a line. Certain it is, the more we observe, the more we increase the subdivision of species, *and consequently the number of these supposed creations; so that new creations become innumerable, and yet of these we have no one well authenticated instance, and in no other observed operation of nature have we seen this want of continuity, these frequent per saltum deviations from uniformity, each of which is a miracle.*"

There is not a word of this argument which does not apply as much to a number of simultaneous or consecutive creations of vegetable or animal living organisms, out of what Mr. Grove calls amorphous matter (why amorphous I know not), as to the theory of successive creations in periods of time widely apart. Nay, if the argument be taken rigidly and logically, it militates equally against any single act of creation, which must be as miraculous as a thousand, whether simultaneous or successive creations.

In words Mr. Grove professed that he was not "going to put forth any theory of his own, or to argue in support of any special theory;" but I maintain that making his choice between two at first sight, as he terms them, equally extravagant hypotheses,—whether we are "*to suppose a zoophyte the progenitor of a mammal,* or to suppose at some particular period of time a highly developed animal to have come out of nothing, or suddenly grown out of inorganic matter,"—he ignored the latter, (which I believe to be a truth revealed by God to man,) and argued with all the art and dialectic skill of a practised advocate in favour of the former.

To test his reasoning and conclusions, I willingly assent to a proposition laid down by Mr. Grove himself, namely:—"*Does the newly proposed view (hypothesis?) remove more difficulties, require fewer assumptions, and present more consistency with observed facts, than that which it seeks to supersede?*"

I am prepared to maintain that the hypothesis Mr. Grove

rejects—the hypothesis put forth in a book which many, nay, I believe a large majority of sound-thinking men, consider a Divine Revelation,—is more consistent with observed facts, removes more difficulties and requires fewer assumptions, than that which he endeavoured to enforce, with all his skill, on his auditors at the meeting of the British Association.

Not only do I believe this, but by the same laws of thought by which I am compelled to accept those axioms which I acknowledge as scientific truths, or rather as the bases upon which the sciences are built,—I feel constrained to believe that all things, whether organic or inorganic, with which my senses make me conversant, were the works of a Divine Creator.

Mathematical axioms are not the only self-evident truths, or, if not self-evident, *truths which must, nevertheless, be accepted without demonstration*, before we can raise the structure of any science. Before we make any progress in science, whether abstract or applied, we must lay the foundations of our science on axioms. The man who will not admit these puts himself beyond the pale of science. The man who tells me that he cannot believe that “the whole is greater than the part,” or “that things which are equal to the same are equal to one another,” cannot step over the very threshold of geometry. Nor are these axioms confined to self-evident truths. Even in the abstract science of geometry, the eleventh axiom of the first book of Euclid is an undemonstrable proposition, as difficult to be received as any proposition for which Euclid has produced a demonstration.

If I were required to show what claims pure science makes on man’s capacity for faith, I might refer you to the algebraist who says that anything multiplied by nothing is nothing, but that anything divided by nothing is infinite, while nothing divided by nothing may be something! If not satisfied by these calls on his faith, I might go a step further, and mystify him with the astounding metaphysical assumptions required by the differential and integral calculus. When, however, we take a stride from the abstract sciences to the concrete or applied ones, what do we meet with! The same foundation on axiomatic truths. Are not the three laws of motion axioms on which the whole structure of astronomical and dynamical science rest? These axioms apply to the motion of physical, tangible matter, yet an experimental, a true convincing experimental demonstration of any one of these three laws cannot be given. They are deduced from a vast crowd of facts, by making some special deduction, or excepting some particular phenomenon from each experimental fact. They are then added to the science of abstract mathematics, as

unfolded by the differential and integral calculus, or their representative calculi, and the final convincing proof of the truth of these laws of motion, and the propositions of the calculus, which defy even the power of the most metaphysical of minds thoroughly or satisfactorily to comprehend, is founded on the agreement of profound mathematical analysis, and of calculation founded on these axioms, with the observed phenomena of the movements of the planets and their satellites. But are there no axioms but those of abstract mathematics and applied dynamical science which force themselves on the acceptance of thinking minds? I think there are. Ay; and I believe they force themselves for acceptance, even with greater power than these.

I would fearlessly maintain that all the works of creation carry with them a proof that they are works of design, that they are the product of an intelligent mind; and that every rightly constituted mind, freely and without prejudice examining these works, must admit that they indicate that they were framed, are preserved, and continued, by the design of an all-wise as well as intelligent mind; and that the admission of this requires no higher, if so high, a call on man's credulity, imagination or reason than those axioms on which every boasted science of man's construction is reared.

He who can read no evidence of design in the marvellous structure of the eye and its adaptation to those laws of light, which certainly were no active agents in forming that eye in the dark recesses of the womb—where its marvellous structure was reared—can certainly make no rational progress in the realms of pure or applied science. He who can see this marked design in the eye, may read evidence as cogent for it, in every animal or vegetable structure. Nay, he may go farther, and find that the most minute particle of dust, if thoroughly interrogated, gives a proof to the rightly educated mind of design not less certain than the most marvellous structures of organic life, which are only more striking because more easily read.

Among the discussions of men, reputed to be men of science, why do we find such vain efforts to hide or evade this evidence of design? and to form the works of nature by some chain of endless causation, some law of continuity, which shall seem to evade its evidence? Design implies a designer, as creation implies a creator, and law a lawgiver. Why this effort to evade the evidence of design—why this attempt to exclude a creating power, or to confine its efforts—why this endeavour to make law convey the impression of independence of a lawgiver?

We may trace it everywhere, wherever it is exhibited, to a manifest impatience of all miracle and all mystery. And here

I may remark, how in Mr. Grove's address, as elsewhere, miracle and mystery are confounded. Many things may be mysterious which are by no means miraculous, in the ordinary or generally received sense of the words. These terms are not to be confounded; our whole existence and everything around us teems with mystery. The power by which I now perceive you, the power by which I convey my thoughts to you at this moment, are mysteries which no human knowledge, no human inquisition, can thoroughly or satisfactorily explain or even penetrate. Take the commonest occurrences of nature. Consider the lilies, how they grow; try to get at the bottom of this common occurrence; though it is no miracle, it none the less leads you ultimately to that which is profoundly mysterious.

If the growth of things be a mystery, if the power of mind over matter be mysterious, if the communication of thought be also mysterious, if the power of investigating the laws which govern these things be still more mysterious, must not the origin of all these mysterious things be itself mysterious? But there are things not only mysterious but even miraculous; and creation is admitted to be in this sense miraculous as well as mysterious,—a miracle also, in that sense of the word in which it is used in Scripture—a miracle, because a sign, a token of God's own working.

When the Bible tells me that God made all things, that He said and it was done, that He created the earth and the waters, that He commanded the earth to produce the herbs and plants, that He commanded the waters and the earth to bring forth all living animal creatures after their kinds, lastly, that He made man out of the dust of the earth, and breathed into his nostrils the breath of life, and caused him to become a living soul, and that after He had done all this by many successive fiats, He rested from the work of His creation; I am content to believe all this. If it be called an apparently extravagant hypothesis, I ask, does it not present a greater consistency with observed facts—does it not require fewer assumptions, does it not remove more difficulties, than any other hypothesis? I maintain, without fear, without shrinking, with every love for truth, with all boldness in investigating the regions of science, that it does. And therefore, on Mr. Grove's own canon, I claim for it the character of being the most rational and philosophical hypothesis.

What proofs have I afforded me for the contrary hypothesis which Mr. Grove has laboured so assiduously to maintain? Where am I to look for my origin as a man, if I refuse to admit man's special creation? I am called upon to trace my

ancestry, not only through some series of improving apes, but even some myriads of ages back to some zoophyte! Even here I am not to stop, but must conceive that this zoophyte attained its life by some accidental chemical combination of dead matter! And, when I ask for the origin of this matter, I am not allowed to attribute even its formation to creation, but must wait till "philosophy" can discover some less mysterious or non-miraculous origin for it! Hence, at last of all, I am led back only to an unreasoning dislike of the miraculous and the mysterious. But will this extravagant, monstrous hypothesis, for which nothing like demonstration can be urged; this hypothesis, which, while it attempts to evade, does not account for one of the teeming mysteries by which we are surrounded, explain how life, that mysterious, undefinable thing, was communicated to the matter of the zoophyte? Matter cannot multiply or increase itself one single particle. Yet the hypothesis which would derive man or an elephant from the primeval zoophyte makes me maintain the mystery or the miracle, call it which you please, that the chance combination of certain material elements produced a new power, the power of life, capable under certain circumstances of forcing matter to reproduce this form, *ad infinitum*. Nay, more than this, that one such combination was the commencement of all those marvellous structures, which evince so much design, without one particle of design being ever exerted by any intelligent agent! Is this, or is it not, the more monstrous hypothesis? Am I to be laughed out of my faith by ridicule, by a free translation of the Epicurean poet Lucretius?

"You have abandoned the belief in one primeval creation at one point of time; you cannot assert that an elephant existed when the first saurians roamed over earth and water. Without, then, in any way limiting Almighty power, if an elephant were created without progenitors, the first elephant must, in some way or other, have physically arrived on this earth. Whence did he come? did he fall from the sky, (*i.e.*, from the interplanetary space)? did he rise moulded out of a mass of amorphous earth or rock? did he appear out of the cleft of a tree? If he had no antecedent progenitors, some such beginning must be assigned to him."

Though the point of this satire is levelled against those palæontologists who, till lately, maintained a succession of widely-separated creations, I may ask does not this free translation, like the original, satirize every creative act? Is it not as applicable to the creation of a zoophyte as to that of a mammal?

Can Mr. Grove prove that elephants were not co-existent with the first saurians that ever roamed over earth and water?

Palæontologists have abandoned their theory, because now there is evidence that creatures supposed to be members of successive creations have been contemporary, and, in reality, members of the same creation. Is it not more consonant with the known facts of geology, that the elephant and saurians should have been co-existent, than to suppose the saurian transmuted by the "law of continuity" into an elephant? Where are we to look for the successive steps of this process, not only from the saurian upwards, but further back still, from the zoophyte? We have now the admission that the records of geology, the records of the rocks and strata of the earth, afford no such evidence; and since we may look in vain for the production of a mammal or saurian by the naked eye, we are taught to look for the first step in the creative process of life by the aid of the microscope!

"As we detect no such phenomenon as the creation or spontaneous generation of vegetables and animals which are large enough for the eye to see without instrumental assistance; as we have long ceased to expect to find a Plesiosaurus spontaneously generated in our fishpond, or a Pterodactyle in our pheasant-cover, the field of this class of research has become identified with the field of the microscope, and at each new phase the investigation has passed from a larger to a smaller class of organisms. The question whether among the smallest, and apparently the most elementary forms of organic life the phenomenon of spontaneous generation obtains, has recently formed the subject of careful experiment and animated discussion in France. If it could be found that organisms of a complex character were generated without progenitors out of amorphous matter, it might reasonably be argued that a similar mode of creation might obtain in regard to larger organisms. Although we see no such phenomenon as the formation of an animal such as an elephant, or a tree such as an oak, excepting from a parent which resembles it, yet if the microscope revealed to us organisms, smaller but equally complex, so formed without having been reproduced, it would render it not improbable that such might have been the case with larger organic beings."

Yet, after all these sage remarks, Mr. Grove confesses that the balance of experiment and opinion is against the spontaneous generation of even the simplest form of organism!

In vain do I look for the grand Baconian system of induction, in arriving at the hypothesis which would substitute the spontaneous generation of a zoophyte, and the development of a zoophyte into an elephant, for the creation of the elephant at once by the fiat of the Almighty, perfect in form, and with every organ of its body, evidencing the wisdom of its designer, fit for the wants of the animal. I meet no array of facts ineluctable on any other hypothesis. No evidence of the com-

mencement, no evidence of the successive steps of the process of transmutation. All these exist nowhere but in the fertile imagination of the coiners of such theories, based upon supposition, and not upon facts. I venture to maintain that no so-called Aristotelians of the middle ages, no philosophers of any period where the inductive method was entirely disregarded, ever displayed a more mischievous instance of groundless hypothesis or hasty generalization, where imagination has usurped the office of reason.

For Mr. Grove to command our respect for his authority, on matters leading us up to the most transcendental parts of human knowledge, we should look at least for a display of sound philosophical induction, on those subjects with which his scientific pursuits have rendered him more familiar. Even here, however, I find his dread of the mysterious leading him beyond the limits of strict inductive science.

The belief in the elixir vitæ, in the archæus or stomach demon, and in the notion that amber possessed a soul, Mr. Grove classes as equal absurdities with the supposition "that a mysterious fluid could knock down a steeple." I find him also casting doubt on the existence of what he terms "so-called imponderables." Yet I search in vain for some substitute for the "mysterious fluid,"—so destructive and terrific, in the stroke of lightning, which undoubtedly has knocked down many a steeple—and for something to supply the place of the "so-called imponderables." I know of but two theories of light supported by anything like sound deduction from a vast number of intricate and varying phenomena. Both these theories require the admission of the existence of so-called imponderable matter. What is imponderable matter? It is matter not subject to the law of gravitation. If, as regards light, I take the emission theory of Newton, which accounts for a large array of optical facts, then light consists of imponderable matter projected from a luminous body. If I abandon this theory for the undulatory hypothesis, (which accounts for a greater number of optical phenomena of the most recondite character than the former,) light is produced by *the vibration of* "an imponderable fluid." Now heat, light, and electricity are regarded, as far as I can understand Mr. Grove's speculations, as not only correlative, but even transmutable phenomena of matter—as indications of the same force under varied conditions, or as modes of the motion of matter. Now I ask how are we to eliminate the mysterious fluid which, under the form of lightning, strikes down a steeple or shatters an oak into a thousand splinters, from the electrical phenomenon, and not, according to Mr. Grove's own theories,

eliminate the notion of imponderables from the phenomena of light?

I know many men of sound science who deplore the departure of so many modern scientific men from the sound method of induction, for the dreams of inventors of hypotheses. The hazy notions of Mr. Grove and kindred philosophers, on the nature of force and matter, are supported more by theoretical dreams than by sound deductions from facts.

While Mr. Grove speaks with contempt of mysterious fluids and so-called imponderables, (supported by an array of facts not much less numerous, and by mathematical analysis as rigid as that by which the law of gravitation is proved,) he can regard with complacency, where facts and arguments fail, the imagined perpetual-motion shower of innumerable meteors into the sun; a hypothesis unsupported by a single fact or observed phenomenon of nature, but invented solely to make tenable those theories of force and matter which evade the existence of imponderables.

If I take the most transcendental views of matter that have ever yet been imagined by men, I am led on the one hand to regard all interplanetary space, not as filled with imponderable fluid, but by something very like a solid combination of matter; while on the other hand, the Boscovichian theory would lead me to regard all this matter ultimately, as having no physical length, breadth or thickness, but to be absolute geometrical points—mere centres of force. Either of these hypotheses I may hold, without laying aside my claim to the rank of a philosophical thinker. But if I talk of a supposed Hebrew firmament, or believe that God made all things out of nothing, I must be derided as centuries behind the progress of modern thought!

Apologizing for having allowed my observations to run to such a length, I now call on Professor Young to read his paper.

The following paper was then read:—

ON THE LANGUAGE OF GESTICULATION; AND ON THE ORIGIN OF SPEECH. By J. R. Young, Esq., late Professor of Mathematics, Belfast College.

I AM about to invite your attention this evening to a subject which has, I think, received as yet too little notice from philological speculators in their inquiries into the origin of articulate language.

Much learned and successful research has been devoted to

the consideration of the question,—Is it possible that all spoken languages can have sprung from a single root? Can they possibly be all but so many corruptions or modifications or offshoots of one primitive form of speech?

Professor Max Müller, after a laborious investigation of the matter, upon purely philological considerations, decides this question in the affirmative. His conclusion is, that however dissimilar the various dialects, “they are all nevertheless derived from one primeval language.” (I quote from his Lectures on the Science of Language, Lecture VIII.) This conclusion has been also reached and confirmed by the Rev. Dr. Thornton, and the results of observation which justify it were placed before you, in this Society, in that gentleman’s recent paper on Comparative Philology.*

Still the important question remains,—Whence came this primeval language? Was it of human invention, or was it supernaturally communicated to our first parents? Here,—putting revelation aside, as in every independent investigation we are bound to do,—we have nothing to guide us except reasonable conjecture and the balance of probabilities; and therefore, at whatever result under this guidance we may arrive, we can never pronounce our conclusion to be indisputably and irresistibly true.

But this character of indisputable truth is not stamped upon *any* of our conclusions as to the origin of things, to whatever department of nature our investigations are directed. In every such inquiry it behoves us to proceed, not only with caution, but even with distrust. Whatever conclusion, within the entire range of human research, is arrived at otherwise than by demonstration, or by observation, or by experiment, is not a *scientific* conclusion. Demonstration is confined exclusively to *necessary* truths,—to things that could not possibly be other than what they are. Observation and Experiment, on the other hand, deal exclusively with phenomena,—with things which, for aught we know to the contrary, *might* be other than what they are. Such are the objects with which strict science has alone to do. And it is deeply to be deplored, for its own sake, that in recent times the dignity of science has been usurped by speculative conclusions based upon neither demonstration, nor observation, nor experiment, but upon the unsubstantial foundation of pure fancy,—the appeal being, not to our convictions, but to our credulity.

Yet it is a precept universally admitted in theory, however

* *Journ. of Trans. of Vict. Instit.*, vol. I. p. 148, *et seq.*

widely departed from in practice, that the revelations of science should always be read,—not with a feeling of credulous assent, in the absence of evidence, but with a reasonable scepticism ; while the revelations of Scripture, on the contrary, must be read with an equally reasonable faith. But the modern doctrine reverses the application of these precepts : science is to have all the faith, and the Bible all the scepticism.

If I am required to admit that man is developed from the ape, and the ape from a fish, I am quite ready to admit it, provided I be shown this developing principle in operation,—provided I be shown only a few consecutive steps of the approximating process. I am ready to admit it even, if the propounder of the doctrine seriously tells me that he himself has witnessed this onward and continuous advance from ape to man, or from fish to ape, though in but a single instance. I go further : though neither he nor I have seen anything of the kind, yet I will admit it, if he can only point to the recorded testimony of trustworthy eye-witnesses of the phenomena in bygone times.

If not even one of these items of evidence exist, then the belief in this, or in any other physical theory equally unsupported,—though a few men of unquestionable science may embrace that belief,—may be fitly characterized, not as scientific conviction, but as scientific superstition,—an appellation quite as appropriate as the similar appellation sometimes applied to the extravagances of really religious minds.

If I could not submit to you this evening better and sounder reasons in support of the position that the speech of man came from the Creator of man, than the philosophers alluded to can furnish in favour of *their* position that the human being came from the ape, I certainly should not presume to appear before you. I think and trust, as the event will show, that I shall not incur the charge of arrogance or egotism in preferring these pretensions. Yet, as I have already hinted, the evidence which I shall offer, in support of this position, must not be expected to reach the high character of scientific proof. The inquiry is not one in reference to which the rigid demands of science *can* be satisfied. It is an inquiry out of the range of strict science ; for, as Sir John Herschel truly states, in his beautiful and masterly *Discourse*, “to ascend to the origin of things is not the business of the natural philosopher.”

I shall, however, appeal to that which is of little less authority. I shall appeal to that which, independently of science, is the guiding principle,—not only in ordinary

matters, but even in matters of high moment,—of all rational intelligent beings. I shall appeal to that important though undefined principle called common sense, to the unbiassed decisions of a sound practical understanding, in reference to a matter in which absolute certainty is not attainable.

I have already stated that the great question for our consideration, on the present occasion, is this: Was speech of human invention? This may be divided into two other questions, which, together, embody the same inquiry:—

1st. *Could* man, placed speechless upon earth, without any external aid, have invented articulate language?

2nd. *Would* he, of himself, have originated and elaborated speech, even if he could?

I have just said that (as you will at once perceive) the two questions here proposed may replace the single question—Was speech of human invention? The first of these two may, however, be dismissed: it will be sufficient, admitting hypothetically that man *could* originate speech, if it be shown, with a high degree of probability, that he would never have addressed himself to the task.

The single question then to be discussed is this,—Is it probable, that if man had been placed speechless upon the earth, he would have been urged by necessity to contrive for himself an articulate language?

Now, under whatever circumstances man made his first appearance,—whether he was placed here by a gorilla or by God, is a matter of no moment in this inquiry. Come how he might, he brought a language with him—the language of gesticulation, implanted in him by what is called Nature; and by nature he was prompted, and even constrained to use it. That is my first position. Man has, and was never without, a natural language, a language which is no more an invention of his own, or the gradual acquirement of ages, than his outward manifestations of love and hate, joy and sorrow, pleasure and pain, or any other of the promptings of nature, are conventional signs, agreed upon by social compact, taught and acquired.

Wherever man is found, he is found (unless he be in a condition of idiocy) in possession of this natural language;—he never learns it, he never loses it. It is universal throughout the whole human family. It is employed as a means of inter-communication among the most degraded races of savages, and it is employed in the most polished societies of Europe,—in the animated war-palavers of the wildest Indians, and in the cultivated conversation of courts and palaces. *But* there is

this difference,—the savage gives full and unrestrained gestural expression to his feelings and emotions,—*his* articulate language is often too limited and feeble to supply the place of gesture; whereas we, with our copious vocabulary, can dispense with it; and we not unfrequently use effort to check and suppress what, if we were speechless, would be our only resource, and what, *therefore*, it would be our great object, as social creatures, to cultivate and amplify.

Whenever *we* use gesture,—and use it we do, in spite of all our endeavours to curb nature,—we use it, for the most part, unconsciously; and therefore, to ourselves, it escapes notice. I wish this evening to invite your attention to some of the principal of these natural gestures, to show you what they really are; and, by directing your special notice to what, when engaged in animated discourse, you yourselves do, to show you, by ocular proof, that you unconsciously employ the language of gesticulation to an extent you little suspect; in short, that you use the natural signs of the deaf and dumb, which, in fact, are no other than the natural signs of the whole human family.

[Here Professor Young exhibited various gesticulations and explained their meaning. It was specially noticed, that in all cases where feeling or emotion was expressed, the eye of the observer was steadily directed to the *countenance*, the manual signs being but auxiliary—natural, but subordinate.]

I think it has now been sufficiently shown that, by whatever agency man made his appearance in the world, he came endowed with the ability to communicate with his fellows in a language intelligible to all, a language requiring no conventions to establish, no long and laborious efforts to construct, yet amply sufficient for the expression of all his physical wants, and for social intercourse respecting all the natural objects and circumstances with which he might be surrounded.

Now it must be remembered that, according to theories ancient and modern, the primitive race of mankind was a barbarous race,—a race inferior even to the present natives of the Fiji Islands or of the interior of Australia: without speech it must have been so. It has been said that such a people could teach themselves articulate language, as well as they can teach themselves to make a fire. But the savage is driven by necessity to devise means for kindling a fire. What stern necessity is there to drive him to originate a spoken language, even supposing him to possess the ability? What is there in

his condition, at the present day, that would make him feel the want of articulate sounds, even if he were to lose the scanty vocabulary he now has,—the language of gesture being still preserved? In Major Long's expedition to the Rocky Mountains, there is an account of certain tribes of the aboriginal inhabitants of the country west of the Mississippi, who, though speaking different languages, readily communicate with one another in the common natural language of signs: many of these are described in Major Long's volumes, and, as might be expected, they closely agree with those employed by the deaf and dumb.

It may be said, however, that man, even in this primitive and barbarous condition, would instinctively know that the organs with which he was endowed all had their appropriate offices, and that he would not be *man* without an instinctive propensity to use them. This is true. But I submit, that previously to his having witnessed articulation in others, or exercised it himself, he would not be conscious that he *possessed* organs of speech, as such, at all. The larynx, the tongue, the palate, the teeth, and the lips, he would naturally employ for other and even more important purposes, at least for more important purposes. How is he to know that in addition to those offices these parts of his frame *can*, by certain mechanical adjustments, convert mere voice into an artificial system of intelligible sounds, conventionally to be employed to express thoughts, and actions, and things? His throat is a channel for his food; his tongue and palate,—the organs by which he tastes it; his teeth,—the instruments by which he masticates it; while his lips he employs in the act of drinking. Who, or what, is to tell him that these same organs could be employed, not only for the nourishment of his body, but also for the elevation and enlargement of his mind? Is it likely, in the primitive low condition we are here contemplating him, that he would ever think of these ministers to his physical wants and enjoyments in connection with any intellectual or moral purposes; or of using *them*, with the view of supplanting his natural and significant language of signs by non-natural and non-significant utterances?

There can be no doubt, on the hypothesis that speech was the gift of God to man, that there would have been what may be called a pleasurable instinctive propensity to speak, but this is very different from an instinctive propensity to *invent* speech;—to invent that of which (if in his primitive condition he were without) he would neither have felt the want, nor have known the value.

But if, in spite of these considerations, it be still maintained that savage man invented speech, I would ask,—How comes it that civilized man, when in danger of losing this precious treasure, instead of using every effort to prevent the threatened calamity, always feels a strong propensity to accelerate it? Those who have the misfortune, after they are grown up, to lose their hearing, are always found inclined voluntarily to give up their speech also. They well know, since the avenue to the speech of others is now closed, that, without exercising their own, it will in time be lost and forgotten, and that they will inevitably lapse into permanent dumbness. They *know* this; and yet, by their willing neglect, they seem to say: “Well, let it go;” and, in many instances, they do let it go, never to be recovered. I appeal to facts.

Most persons here have, no doubt, heard of Dr. Kitto, the author of “The Pictorial Bible,” and other excellent works. He was totally deaf, having lost his hearing at the age of twelve years, by a fall from a ladder, at which period he was of course in full possession of articulate language. In his interesting book called “The Lost Senses” he gives this account of himself in the deaf state:—

“Although I have no recollection of physical pain in the act of speaking, I felt the strongest possible indisposition to use my vocal organs. I seemed to labour under a moral disability which cannot be described by comparison with any disinclination which the reader can be supposed to have experienced. The disinclination which one feels to leave his warm bed on a frosty morning is nothing to that which I experienced against any exercise of the organs of speech. The force of this tendency to dumbness was so great, that for many years I habitually expressed myself to others in writing, even when not more than a few words were necessary; and where this mode of intercourse could not be used, I avoided occasion of speech, or heaved up a few monosyllables, or expressed my wish by a slight motion or gesture. . . . In fact, I came to be generally considered as both deaf and dumb, excepting by the few who were acquainted with my real condition. I rejoiced in the protection which that impression afforded; for nothing distressed me more than to be asked to speak: and from disuse having been superadded to the pre-existing causes, there seemed a strong probability of my eventually justifying the impression concerning my dumbness which was generally entertained. I now speak with considerable ease and freedom, and, in personal intercourse, never resort to any other than the oral mode of communication.”—(*The Lost Senses—Deafness*, p. 19.)

This return to speech, however, was not voluntary, but coerced. Two friends who accompanied Dr. Kitto on his first visit to the Mediterranean, conspired, in conjunction with the captain, to disregard every word he said otherwise than orally

throughout the voyage. As no request was attended to, and no inquiry answered, which was presented in writing, he was thus *driven* again to speak.

I will mention another instance,—the case of an accomplished lady with whose writings many persons here are familiar. I allude to the late Mrs. Tonna, under which name, however, perhaps few will recognize the celebrated authoress I am advertising to,—“Charlotte Elizabeth.” The following interesting particulars respecting this lady were communicated to me by her husband, Mr. Tonna, shortly after her death, in a letter which I have the writer’s permission to make public:—

“Mrs. Tonna [Charlotte Elizabeth] lost her hearing at the age of nine or ten. It was entirely gone—I believe from a thickening of the membrane of the tympanum. No sound of any kind reached her, as a sound, although she was acutely sensitive to vibrations, whether conveyed through the air or through a solid medium. In this way the vibrations from an organ, or from the sounding-board of a piano-forte, gave her great pleasure; and from her recollection of Handel’s music, she took great delight in it; and from the vibrations would *recollect* the sounds so familiar in her childish days. You will see some particulars of this in her ‘Personal Recollections.’

“On one occasion, at the age of twenty-two or twenty-three, a new country dance was played: the tune was called the ‘Recovery,’ the rhythm of which is very peculiar. She was as usual at her station, with her hand on the sounding-board, when some friends present expressed a doubt as to the possibility of her forming any idea of the tune. She sat down at once, and wrote a song, which I possess, most perfectly adapted to the tune in all its changes.

“There is a poem of hers beginning ‘No generous toil declining,’ which it is quite difficult to read as poetry until informed that it was written to the tune of ‘A rose-tree in full bearing,’ and to that it is perfectly adapted. The poem is included in the volume of ‘Posthumous Poems’ about to be published, in which it will be plainly seen that most of her poems were written to mental tunes. All conversation was conveyed to her by the fingers—spelling each word, without any attempt at shorthand, which she said always confused her. After repeating to her sermons and speeches from the most rapid *Irish* speakers, I have often been distressed at the apparent impossibility of her having understood me; for I felt that I had repeatedly rather indicated than completed the formation of each letter. Seeing my distress, she would often begin and give me every head of division of the sermon, together with the most striking passages, *verbatim*, as the orator had uttered them.

“We never divided the words, but spelt on the letters as fast as it was possible to form them on the fingers. When in society, I have been repeating to her a general conversation, and communicating the remarks made by each individual, her eye would incessantly range about the room, catch the expression of each speaker’s face, and yet never lose a word of what was said.

Strangers were amazed at seeing a smile on her face at the very instant that a humorous remark was being made. The power and quickness of her eye was truly surprising."

I have made this long quotation from Mr. Tonna's letter, because I thought that, apart from the general purposes of this address, many persons present might feel an interest in particulars, not generally known, respecting Charlotte Elizabeth. But my special object, in this extract, is to draw your attention to a passage in it further confirmatory of the fact I have already mentioned; namely, that people who lose their hearing are content to lose their speech too. The passage is this:—"We never divided the words, but spelt on the letters as fast as it was possible to form them on the fingers." Now this lady still retained the faculty of speech: Instead of employing *it*, why should she, even when conversing with her own husband, habitually use the finger-language of the deaf and dumb?

Dr. Kitto accounts for this repugnance to speak on the hypothesis that the loss of hearing is attended with injurious effects upon the organs of speech, from some mysterious sympathy between the two sets of organs,—the auditory and the vocal; the destruction of the former set occasioning a functional derangement of the latter, or of some of them. And I am amazed to find that so distinguished a physiologist as Professor Huxley, in his recent work on *Man's Place in Nature* favours the same view. It is a mistaken view. There is no necessity to resort to anatomical or physiological considerations to settle the doubt. Deaf-mutes, whether their deafness be congenital or the result of disease or accident in after-life, *can all be taught to speak*, unless there be a malformation of their organs of speech entirely independent of their deafness. I have witnessed hundreds of such persons taught to speak,—to pronounce all the vocal articulations that we utter, and with equal accuracy. Of all these hundreds of deaf and dumb children, I never knew even *one* who had the slightest defect in his vocal organs. The records of the Royal Institution for the Deaf and Dumb at Paris also abundantly testify to the same fact, namely, that although the ear is paralyzed, the organs of speech remain unimpaired.

The propensity to silence on the part of those who, after long familiarity with the exercise of speech, have become deaf, arises, I am convinced, not from any functional impediment, but entirely from the *changed character* which, to the utterer, his speech assumes. To him, as to every hearing person, speech is the utterance of articulate *sounds*, and not mechanical *actions* merely of the organs of speech. These actions, however indispensable to speech, are executed almost uncon-

sciously; our attention is not directed to them, and they go on unobserved; we are wholly occupied with the result, and not at all with the machinery which produces it. With the recently deaf, however, the language which had grown up with him from infancy,—which had become natural to him, and which had always been graced, too, by features of Nature's own,—tones of voice,—upon the loss of hearing, suddenly wears an altered aspect. He has hitherto been accustomed to it, associated with modulation,—cadence,—clothed in all the harmonious drapery of sound. It is now stripped of this, and presents itself to him shorn of its vitality,—a non-natural, lifeless skeleton, formed by artificial adjustments of the vocal organs, but emitting no sound to his own ear.

The fact is, that our vernacular tongue, descending to us, as it were, by inheritance, and acquired imperceptibly in childhood,—and a wonderful acquirement it is,—seems, to the child, as natural to him as eating, or drinking, or sleeping. He scarcely feels conscious that it is an acquirement at all; and even when grown up, he little reflects that the words he uses are all but so many artificial conventions, in themselves all, or nearly all, non-significant; and not only that “a rose by any other name would smell as sweet,” but that any other name would be just as significant, or rather just as non-significant of its fragrance. But when his hearing is gone, and with it all that was really natural in his speech, vocal sound, gone too, he becomes painfully awakened to the fact that nothing but what is wholly artificial is now left to him; and that what were once articulate sounds to his own ear, are henceforth to be, to him, only inaudible movements of the vocal organs.

It is this sudden apparent transmutation of speech, from the natural to the artificial, that creates in the mind of the deaf person the repugnance to employ it. That this aversion must be very great is obvious, since those who entertain it well know the trouble and inconvenience it occasions to all with whom they converse,—forcing them to read on the fingers,—an art in which few are expert, or else to receive in writing, still more slowly executed, every sentence addressed to them.

Now I would ask,—If a highly enlightened and educated people, at great cost to themselves and others, knowing too the full value of speech, cherish this almost unconquerable repugnance to the use of it, so soon as the only touch given to it by nature has become effaced, is it likely that an unenlightened savage community, already in possession of an expressive *natural* language, a language fully commensurate with

all their physical wants and desires,—and other than physical they have not—is it likely that they would apply themselves to the difficult and strange task of inventing, to supply its place, an artificial, non-natural language of vocal articulations? Where would be the incentives—what the motives? They had never witnessed speech,—it did not exist. Whence would originate the impulse?

Is it not more likely that as their experience enlarged and their wants increased, if this sign-language were felt to be inadequate, that they would engraft upon it conventional gestures, just as the deaf and dumb do? If circumstances were favourable to it, or necessity required it, the gestural language of the deaf and dumb might be carried to a much greater extent than it ever has been carried. The deaf and dumb do not congregate together in distinct communities while in their uneducated state: they are isolated, coming into contact with one another only accidentally and occasionally, and never in any considerable numbers. They thus have no opportunity, in that state, of amplifying their language by general compact or agreement. And when they assemble together in institutions set apart for their education, it is the business of their teachers to discourage and suppress the use of gesture so soon as it has served the purpose of facilitating the acquisition of a spoken language. But that gesture-language *can* be greatly amplified there is no doubt, and this is the language that speechless savages would cultivate, and not an entirely new language, a language of articulation, an artificial contrivance they had never witnessed, and one which it is hard to imagine they could have any conception of.

I think it therefore to be a reasonable conclusion that, in the absence of all aid from without, a speechless community would be, and would ever continue to be, a gesticulating community. To gesture they would add inarticulate vocal sounds, but nothing more. And this is my second position.

In further confirmation of it I will merely submit to your consideration an additional remark or two.

A primitive speechless race of men would be but little more than mere animals. Their gestural language, though amply sufficient for their uncivilized condition, would be very inadequate to elevate them to a state of civilization; for gesture alone could never be an adequate exponent of aught but animal feelings, material objects, and visible appearances, a fact which must be especially borne in mind in speculating upon the capabilities of gestural language, to whatever extent it be cultivated. Speech (or the written symbols of it) is indispensable to any progress in moral, religious or intellectual

education. Nobody has ever succeeded, or ever can succeed, in conveying spiritual instruction to the deaf and dumb by gesture, unless indeed *conventional* signs be used as translations of previously-understood written or spoken words, as in the case of the finger-alphabet for instance, which no uneducated deaf-mute can use. Such an isolated race of human beings as we are here supposing might, indeed, become more and more morally *degraded*; but without speech, and excluded from all example and all external influence, they could never morally *advance*. In a late number of the *Quarterly Review* (No. 211) the writer of an article on the Poleyinian Islanders observes that "the present state of these people shows the tendency of men to descend lower and lower in the social scale, as they become more widely scattered and separated into small isolated bodies."

Now if it be true that without speech civilization could not be attained, it is equally true that without civilization speech could not be invented. No people would invent what they had no felt need of.

Here then is a dilemma. Speech is indispensable to civilization, and civilization is indispensable to the invention of speech. How can such a contradiction be avoided on the hypothesis that speech is of *human invention*? "Modern science" may perhaps discover some way of reconciling the apparent inconsistency, but common sense, I think, cannot. And this, be it remembered, is the only tribunal to which I here appeal. Its functions are definite and unmistakable, whereas, in the *modern* acceptation, "science" means anything—except *knowledge*.

In what has hitherto been said, however, the advantages of the ear, even to a speechless community of uncivilized men, have not been dwelt upon. There is no doubt that the possession of the organs of hearing would place them in a position superior to that of deaf-mutes. They could recognize sounds, and would thus be conscious of noises made by themselves or others; of the cries and growlings of land animals, and of the shrieks and melodious utterings of the feathered tribes. Certain of these sounds they would find that they themselves could imitate, and that they could thus, in their description of a quadruped or a bird, or of any natural sounding object, as the rushing torrent, or the moaning wind, add to those peculiarities which address the eye or the organs of touch, the other characteristics which address the ear. The congenitally deaf know no difference between the notes of the cuckoo and those of the nightingale. They can dis-

tinguish one bird from another, in their descriptions, only by the size, the shape, the plumage, the bill, and such-like external features, and by the visible bearing and habits of the individual. A community of human beings without speech, but in possession of the ear, would be superior to the deaf and dumb only in these natural advantages; besides expression of countenance and gesticulating with their limbs, they could imitate sounds, and *call* at a distance. But these additional powers would render the possessors of them even more independent of, and therefore, less urged by necessity to invent, articulate speech. I have not the slightest doubt, if I were brought into communication with a savage on his own soil, (safety, of course, being guaranteed,) that I could enter into instant converse with him, without a single articulate sound being uttered by either of us, and, allowing me only half an hour to feel my way, that I could understand everything he had to communicate, and he as readily understand me, as if we were two persons speaking the same articulate language. The more of the savage he was, the better I could converse with him; and every one who has paid sufficient attention to the language of natural signs could do the same.

It has often occurred to me that many of the tragical disasters which have befallen early missionary enterprise, and our exploring expeditions, both by sea and land, might have been averted if a person having this familiarity with gesture-language had been among the unfortunate party. I have thought that even poor Bligh and his wretched companions would not have been so cruelly repulsed from every island at which they sought succour during their unparalleled voyage of nearly 4,000 miles in an open boat, if one of those nineteen unhappy wanderers had been deaf and dumb; if but one among them could have made their case known in a language intelligible to all.

When Basil Hall endeavoured to conciliate the natives of the coast of Corea, they rejected his overtures, as he thought, by making the sign for cutting throats. A person familiar with gesture-language could have ascertained in a moment whether by this sign they threatened to be the perpetrators or merely expressed a dread of being the victims. From their subsequent behaviour it would seem that they meant to convey the latter impression. On Captain Hall proceeding to land, he says, "This movement the natives did not seem to relish in the least, for they made use of a sign which, though we could not determine exactly to whom it referred, was sufficiently expressive of their alarm and anxiety. It consisted in drawing their fans across their throats, and sometimes across ours, as if

to signify that our going on would lead to heads being cut off; but whether they or we were to be the sufferers was not very clear."—(*Voyage to Loo-Choo*, second edition, p. 11.)

It has been affirmed, both by ancient poets and modern visionaries, that primitive man must have herded with the beasts of the field, feeding on acorns and on the roots he could scratch up with his fingers. This imagined association with brutes could never be. The two parties could not communicate; the language of human gesture, as a medium of social intercourse, could be intelligible only to human beings, who would therefore naturally and necessarily congregate together in a wholly distinct and separate society. A *single* human being, having no such society, could, of course, have no other companionship.

But it is time that I brought this paper to a close. In the course of it I have not insisted on the absolute impossibility of man inventing speech; I have merely aimed at showing, by an appeal to facts and to reasonable considerations, that, even admitting his ability, the improbability of his actually doing so is very great; for I feel less hesitation in affirming that he *would* not do it, than that he *could* not do it; and this because, cast about as I may, I cannot discover anything in the low condition, hypothetically assigned to him, to stimulate him to the undertaking. When I find it to be a fact that the natural language of gesture, which every human being possesses, is amply sufficient for all his social requirements in such a primitive uncivilized state; when I find it to be a fact that when the spoken language of a person who has employed it from infancy, and which has become natural to him—his vernacular tongue,—becomes to that person changed to a non-natural system of organic actions merely, he being conscious of nothing more—nothing that is nature's own,—that this non-natural speech is repulsive to him, that he would rather have none at all, I ask myself in vain, Why should primitive speechless man *invent* artificial language? With a natural and expressive means of intercourse commensurate with all the demands of his then condition, why should he be at the *trouble* even of devising and settling by general compact another language, consisting of symbols purely conventional and artificial? To these questions no satisfactory answers suggest themselves to my mind.

I reflect, too, that civilization presupposes the exercise of speech; and, yet, that a considerable advance in civilization must precede the invention of speech; and that no result can chronologically be antecedent to that which brings it about. I bear in mind, further, that those who never possessed a faculty

given to others care but little about it: a faculty they never had, they never miss. And a faculty that *none* ever had cannot be even conceived, any more than we can conceive a sixth sense, or could conceive a fifth, if we had but four. I well remember conversing, some years ago, with a boy who was born blind; he was about 16 or 17 years old, highly intelligent, well informed, and well educated. I put this case to him—"Suppose a person, having the power to give you eyesight without subjecting you to any pain or inconvenience, should say to you, 'John, which would you rather have—the ability to see, or five pounds?'" He raised his sightless eyeballs upwards, in the act of reflection, for a few seconds, and replied, "I think I would rather have the five pounds"! This is an uncoloured and strictly literal fact. The boy's name was John McCallion, and he was an inmate of the Ulster Institution for the Blind.

From all these considerations I find myself constrained to conclude, quite independently of Scripture, that speech was *not* of human invention. I am constrained to conclude that the universal existence of speech among savage tribes, though in a poor and imperfect form—testifies (as they themselves testify), not to the elevation to which they have risen, but to the degradation to which they have fallen; not to what they have acquired, but to what they have lost. Just as a once beautiful face, though marred by accident or disease—though even overspread by the pallor of death, will still retain some faint lineaments of its former comeliness—so, even in the debased and benighted savage, all trace is not lost of what man once was. Speech, Heaven's direct bestowment, in one feeble form or other, survives the decay of all else, and ever continues a mark and memento of man's high origin.

Yes: reason and Revelation alike tell us that when our first parents trod the groves of Paradise they communed with each other, not in dumb pantomime, but in heaven-born speech; and that they *learnt* to speak just as much as the bee learnt to construct its cell, the spider to weave its web, or the sparrow upon the house-top to build her nest. No mortal instructor taught *them*—they had no rudimentary training to go through—no long apprenticeship to serve. Their lesson was the lesson of an instant, for their CREATOR was their TEACHER.

What this primitive language was we know not. Hereafter, perhaps, we may know. The language of Eden may, in a future state, be our own, if permitted to dwell in the paradise above. And, as the Apostles of old "spake with other

tongues, as the Spirit gave them utterance," so there,—“Parthians, and Medes, and Elamites, and the dwellers in Mesopotamia, and in Judæa, and Cappadocia, in Pontus, and Asia, Phrygia, and Pamphylia, in Egypt, and in the parts of Libya about Cyrene, and strangers of Rome, Jews and proselytes, Cretes and Arabians,”—may all, in one language and one tongue, “speak the wonderful works of God.”

The CHAIRMAN.—I think I may at once thank Professor Young for his exceedingly valuable and logical paper, which I think will be read, as it has been listened to, with the greatest interest. I call upon any gentleman for any remarks he may wish to make on the subject.

Mr. WARINGTON.—In order to lose no time, as we have but little left for discussion, I will at once mention that it struck me, in listening to Professor Young's paper, that there was this flaw running through the whole of it,—that he argued, because people who became *deaf* were not anxious to retain the power of articulation, therefore others, who had not got it, but who were *not deaf*, would not think of inventing articulate speech. But surely all here turns upon the fact of the people being deaf. They could not *hear* the sounds made by them, and so were disinclined to use them as a medium of communication. But now apply this principle to a parallel case. Suppose a man who knew the gesture language became blind, would not he in like manner give it up? You won't find a man use the gesture language in the dark. Even if perfectly certain that another man could see he was using gestures, he yet would not use them, because he could not see them himself. But again, is it quite certain that those who are deaf are always thus disinclined to use articulate language? Let me read a short extract from a chapter on gesture language, written by Mr. Tylor.* He writes thus :—

“Teuschner, a deaf-mute, whose mind was developed by education to a remarkable degree, has recorded that, in his uneducated state, he had already discovered the sounds that were inwardly blended with his sensations. So, as a child, he had affixed a special sound to persons he loved,—his parents, brothers and sisters, to animals, and things for which he had no sign (as water); and called any person he wished with one unaltered voice.”

Mr. Tylor accumulates several distinct cases of deaf-mutes who were thus anxious to use articulate language, although quite unable to hear what was said; he refers also to the most remarkable case of all, that of Laura Bridgman, who though deaf, dumb and blind, was yet so anxious to use sounds that she was obliged to be restrained from making them, because it was inconvenient and painful to those who were near her. Then there is another point in Professor Young's paper, I wish to allude to. He says that savages would not invent language of this kind, because they have no need for it. And if man was created in an utterly savage state, of

* *Researches into the Early History of Mankind.* By E. B. Tylor. Chap. iv. p. 72.

course this is a good argument. But if we take it the other way, that man was not created in a savage state ; then, according to Professor Young's own principles, he was created with wants and feelings, to express which a gesture language would be utterly inadequate—

The CHAIRMAN.—The question is, whether, having been created without language, he would have invented one.

Professor YOUNG.—You are going into a case not contemplated. I have been proceeding distinctly upon the hypothesis, and have discussed the phenomenon, of a community of people sent into the world in a savage and barbarous condition. You are drawing something from a civilized state, which does not affect my argument. Will not that be infringing upon our time ?

Mr. WARINGTON.—I think not, for this reason ; because, if we take only the hypothesis which Professor Young has put before us, we are taking so one-sided a view, that we may be running away with a conclusion which only refers to that one hypothesis, and yet may fancy it refers to the whole subject—

Professor YOUNG.—You must stick to the hypothesis ; do not change it, I pray.

The CHAIRMAN.—I think you are travelling away from the question under discussion.

Mr. REDDIE.—I think it would be valuable to hear this other hypothesis also discussed.

Mr. WARINGTON.—Our subject, I believe, is the origin of language, connected with gesticulation. I want to prove that if man had been (upon another hypothesis) created in a state similar to what we are in now, he would have naturally invented an articulate language, and that therefore the facts which Professor Young advances will not prove anything on this hypothesis. According to Professor Young's statement, which I agree with, gesture language only refers to things physical and material. Then if a man has feelings which he wants to express as to things which are not physical and material, would he not at once employ articulate language ? There is an objection which is raised to this. It is said that all these languages are arbitrary, and that the idea that man invented arbitrary word-language, is too difficult to be credited. But is it quite certain that articulate language, when first spoken, was arbitrary ? We know that written language at the present time is arbitrary, and that the signs we put on paper have not the slightest connection with the sounds or the things for which they stand ; but there is yet nothing more certain than that in the primitive alphabets the signs were used, not merely as signs, but as pictures of the things they were intended to denote ; and therefore that written language has had its origin in picture language, and afterwards became gradually arbitrary. Then why may not the same have occurred in respect to spoken language ? We can see that written language was originally a picture language, in which there was a natural connection between the sign and the thing signified, because we have certain very ancient and primitive alphabets

still existing. But we have not the old primitive sounds, and so cannot say whether there was or was not in spoken language as natural a connection between the sign and the thing signified as in written language. In the case of mutes, however, they *have* articulate signs which they connect with certain things, and are able to put words together (some of the instances go as far as that), and to form compound words. I think these facts go to prove, then, that it is possible,—I do not say that it is certain,—but that it is possible, that man, if created in a high moral condition, would have had power and inclination to invent articulate language.

Professor YOUNG.—I have said nothing to the contrary.

Mr. REDDIE.—I regret that I cannot quite accept the hypothesis of Professor Young, anxious as I am to have it established by all means that language was originally a gift of God to man. But neither can I quite agree with Mr. Warrington in the latter part of his remarks, that if man had been created in a high condition, with the feelings and wants of civilized man, he could have invented language, if he means language such as we have it among civilized races. I do not deny that he would have endeavoured to speak, or that he could probably invent some kind of language ; but it is a very important hypothesis that Professor Young puts before us, namely, that if man was created in the low and savage condition, which it is now the fashion to assume, he would begin with mere gesture language and would be content with it. But be that as it may, I venture to go further and say, that if man was originally speechless he must have been lower than any known savage, and even if we conclude that man in that low condition could invent a spoken language, we are bound to infer that it would only be language such as we do find it among actual savages. And if that be so, we are then still left without any explanation of the origin of the most ancient and perfect languages that exist,—as for instance the Sanskrit,—which never could have been invented by man in this low condition. But as the time of the meeting has been already so much exceeded, I think it will be more valuable, instead of pursuing such speculations, that I should appeal to some further facts, like those which the author of the paper has brought before us. I ventured to give Professor Young's paper to a friend of mine to read—a gentleman who, although he is a "deaf-mute," is in the same public department as myself, and, I may add, a very able man of business. I consider his is a better instance to cite than those adduced by Professor Young ; because Dr. Kitto lost his hearing at twelve years of age and Mrs. Tonna at nine or ten, but the gentleman whose case I am about to cite became deaf at a very much earlier age, and all that he knows of vocal articulation he learnt before he was four years old. Well, I gave him Professor Young's paper to read, and requested to have the benefit of his remarks upon it ; and he has been kind enough to allow me to make use of the letter that he wrote to me in reply, which when printed in our Proceedings will I think be read with great interest, both as an acute criticism upon the paper, and as giving his own experience as regards the supposed disinclination of deaf-mutes to speak. His letter is as follows:—

“ROEHAMPTON, 10th October, 1866.

“DEAR MR. REDDIE,—

“I return, with many thanks, the paper on the language of gesticulation, which you kindly lent me to read.

“The argument derived from that language, on the question as to the origin of speech, is apparently that, *because* there is a natural language of signs sufficient for all ordinary necessities, therefore it is not reasonable to suppose that savages would set to work to invent such a complicated and arbitrary structure as human speech; and it is sought to strengthen the argument by showing that deaf people, although able to speak, have no great inclination to do so.

“I confess that I cannot see the value to the argument of these latter considerations. If we push the argument to its conclusion, viz., that speech and language must have been the gift of God, then that conclusion itself reduces the value of the premises on which it is sought to found it. Speech being concluded to be the gift of God, and there being a natural healthy pleasure in the exercise of all the faculties God has given us, any repugnance to use the faculty of speech must arise from *ill* of some kind or other. If so, the whole point is foreign to the argument.

“That is what I think; nevertheless the facts of my experience are very much at the service of any one who thinks he can make any use of them.

“When I was four years old, I had two attacks of scarlet fever in quick succession. The doctors gave up all hope of saving my life, but I recovered, with the loss of my hearing. Before my illness I had been taught to read, and I understood spoken language as well as any child of four years old. I learnt the finger alphabet for myself when recovering from my illness, and I was able at once to understand what my brothers or sisters told me by means of it. There was not in my case that difficulty which arises with those *born* deaf and dumb, or who lose their hearing before their education has at all begun, viz., the absence of any language, other than the very imperfect one of gesture, wherewith to work. I *had* acquired sufficient knowledge of language to understand the force of a sentence, and to be able to put my words together in grammatical order. That one small fact made a world-wide difference to me.

“Although *quite* deaf, I never did otherwise than *speak* to my brothers and sisters; and to this day I never have said a sentence to any of them by signs or by spelling on my fingers.

“At six years old I was sent to a school for the deaf and dumb, and there I remained till fifteen. At this school once or twice a week there was a speaking lesson; but the main teaching was carried on by signs, and out of school nothing else was used. Therefore I may say, speaking generally, I was dumb while at school, and my speaking ability of course fell off from want of practice. Yet, when at home for the holidays, I invariably *naturally* spoke. After leaving school, (and I may observe in passing, that it is an entire mistake to send any one who has merely lost hearing,

but who possesses language, to a *deaf and dumb* school,) I saw very little of the deaf and dumb, and I gradually got into the habit of speaking more and better.

“The reason why I do not speak to every one is, simply, that every one cannot understand me, and I am reluctant to give people the trouble of trying to understand. Being deaf, I cannot always pitch my voice at the right tone with reference to surrounding noises. I mispronounce some words, and have little skill in modulation; hence I cannot expect to be immediately understood, except for single words or common expressions; but I infinitely prefer being with people who *can* understand me, and I have not the smallest hesitation or reluctance in speaking to them, or to my servants, or others to whom I do not mind giving the trouble of finding out what I say. Most people understand me readily enough, and after a few days’ acquaintance and practice find it hard to believe they ever could *not* understand me.

“Of course I am silent in company; the reason being, simply, that I cannot hold by the thread of the conversation going round. If I do get hold of it now and then, I have no hesitation in saying anything I wish; but of course the thread drops off again directly, unless, indeed, there is some one by who takes the great trouble to repeat to me on his fingers or by writing the main points of the conversation as it goes on.

“I never think of using signs, or of speaking on my fingers, except to persons deaf and dumb. In fact, I hardly ever meet with a hearing person, other than a teacher of the deaf and dumb, who can read spelling or understand signs.

“It is much more difficult to read spelling than to spell. I was much astonished at the statement in the paper that Mrs. Tonna always spelt on her fingers, and did not speak. If the statement rests only on the words quoted, ‘We never divided the words, &c.’ I should be inclined to doubt whether the ‘we’ is not here exclusive of Mrs. Tonna herself. It would be quite true for one of my sisters to say, ‘We never divided the words, &c., *in talking to Arthur* ;’ but not one of my family or friends would understand me if I spelt a sentence on my fingers to them, unless I did it with most emphatic slowness.

“To sum up; although I do not speak to every one, and am silent in mixed or large companies, it does not arise from any kind of ‘moral disability’ or ‘disinclination,’ such as Dr. Kitto appears to have laboured under, but from reasons easily understood, and of which I feel quite certain.

“I started by saying that I did not think the case of the deaf and dumb strengthened the main argument of the paper; therefore, my experiences, which differ from those brought forward, must be equally immaterial to it.

“The conclusions of the paper have my *sympathy*, although I remember reading a very ingenious argument to prove that speech had its origin from men trying to imitate the sounds of nature and of animals, the

mitation standing for the name of the object. It is easy to see how, from these first simple sounds, which a savage might make as naturally as gesticulation, a language might be elaborated; at least there are no such great difficulties as lie in the way of the transmutation of an ape into a man. I thought I had read the theory in Goguet's *Origin of Laws*, but I cannot now find it in that book.

"Believe me ever faithfully yours,

"A. H. BATHER.

"JAMES REDDIE, Esq."

I consider, Sir, that this is an important communication; and with reference to Mr. Bather's want of any disinclination to speak, such as was experienced by Dr. Kitto, I think it may be explained thus. Having as a child only heard up to four years old, he would not be afterwards so conscious of the marked difference between his condition as a person who once had heard, and one who does not now hear; which would probably be acutely felt in the case of Dr. Kitto and by "Charlotte Elizabeth." Mr. Bather's case also is more nearly analogous to that of those who are deaf-mutes from their birth, and who consequently never heard at all. And here lies, I think, the great weakness of Professor Young's argument. He has himself slightly noticed it,—but I think it ought not to be noticed merely incidentally, for it is the most important point of all,—namely, that the theory is only good if applied to a community of deaf people! The argument is founded upon only two cases, and those are of people who did not hear. They, of course, could have no pleasure in speaking, and therefore would not use speech, unless convinced of the usefulness of speaking. I may observe, that although Mr. Bather does not hesitate to speak, yet he speaks in an awkward monotone, and one requires to get accustomed to his imperfect articulation to understand him readily. I am sorry I have not got from him an explanation of one point, where his letter would seem to be discordant with Professor Young's statement, that all those people who cannot hear, may yet be taught to articulate perfectly. But Professor Young has also not told us whether congenital deaf-mutes are disinclined to use that power of speaking which, he tells us, they all may acquire. With reference to the question whether speech could be invented from imitating sounds in nature, I must say, (if man had not a gift of speech originally, and the ideas that come with the power of speaking,) it appears to me that he would scarcely have been able to express with his hands what is meant by such gestures as those which Professor Young has exhibited. But, at any rate, he could surely do quite as much in making signs of various kinds with his tongue, when he had the power of uttering sounds, as he could by merely moving his hands. And people who are not deaf cannot help being aware of their power of vocal utterance, because even children from their birth utter sounds naturally, and man hears every variety of sound in nature all around him, especially the cries of birds and beasts, which he would naturally imitate. I must also say, with reference to those gesture-signs which Professor Young exhibited, that I can scarcely believe that a

single one of them would be intelligible to any person, unless taught their meaning by means of spoken language. Nine-tenths of the gesticulations which Professor Young exhibited before us appeared to me to be rather speech interpreted by signs, than signs significant in themselves; and but for his verbal explanations, I confess I should not have understood their meaning in the least. There is a curious passage in one of Montaigne's Essays, perhaps bearing on the Professor's side, with which I shall conclude. Montaigne considered that beasts may speak, for all we can tell, because, he observes, we can say all we have to say by signs. Then he goes on:—"Quoi des mains? Nos requerons, nous promettons, appellons, congédions, menaceons, prions, supplions, nions, refusons, interrogeons, admirons, nombrons, confessons, repentons, craignons, vergoignons, doubtons, instruisons, commandons, absolvons, injurions, mesprisons, desfions, despitons, flattons, applaudissons, benissons, humilions, mocquons, reconcilions, recommandons, festoyons, rejouissons, complaignons, attristons, descomfortons, desesperons, estonnons, escrions, taisons, et quoi non?"

There we have the same idea as in the paper; but I must add that I do not understand how any savage, who only knew gesture-language, could ever have such ideas at all, or understand one half of the things signified by those words, and the fine shades of thought they often express.

Rev. Dr. IRONS.—I think we are scarcely doing justice to the paper of Professor Young, if we forget he began by telling us he could pretend to no demonstration in such a matter. He merely endeavoured to accumulate all the probabilities of the case; and with respect to those examples of deaf-mutes, they were by no means all his argument,—they were only illustrations which he introduced, like the mythical savage with whom he could communicate, who was not deaf; and I think without at all proving his point, which he never attempted, he suggested the great probability of the difficulty of originating a language, if man had been created a mute savage. And when Mr. Warrington affirms that there is a probability, if man was created in a civilized condition, that he would form a language for himself, I think he is bound, in fairness to Professor Young, to show how he could meet the dilemma which the Professor put before us, that civilization implies language, as much as language implies civilization. Let us meet the issue fairly, and see whether there is a probability, or an improbability, of savages inventing speech. It occurs to me that the illustrations drawn by Mr. Warrington do not apply to the Professor's argument, which was put forward to meet the idea of man being a monkey previously, and gradually becoming man. The primitive men were said to be of the lowest type, and the Fiji Islanders were particularly mentioned as an instance. Now they have no civilization surrounding them to suggest the thoughts like those which might be suggested to civilized mutes by what they see. The very language originating thought and producing high desires could not have been excited if these mutes had been in the position of the Fiji Islanders, or of a still lower class, namely, a people just risen above the monkey.

Rev. Dr. THORNTON.—At the risk of being called to order, I shall first, Sir,

return you my thanks, and I think I may say those of all present (hear, hear,) for your very able and lucid introductory remarks. Everybody must be glad to be told that he may be a Christian and a man of science at the same time ; and that if he reads the Bible, he need not fling away science, or if he studies science he need not fling away the Bible. (Hear, hear.) I beg also to offer a few remarks on the paper of Professor Young ; in doing which, I shall not detain you long.—I would say to the learned Professor, that I listened to his paper with interest ; and if I take the liberty of criticising it, it is not because I deny his facts, or disagree with his conclusion. I think he has stated his argument from probability very clearly. He says it is probable that man would not have supplied a spoken language for himself out of his own powers ; therefore it must have been given him, as he has it, from above. I believe that it was given him from above ; but not for this reason ; and we must be careful, while defending a truth, to defend it with correct arguments ; for a weak argument is an evil ; and therefore, if we bring forward a probability which will not hold water, we are really doing harm to truth. I would suggest to the Professor, whether those signs, which he so clearly put before us, are really capable of forming a language ? I fail to see in them a power of representing complicated objects. I can understand their representing the sun, or the moon, or the stars ; but how represent a special thought, or even a particular animal by a sign of that kind ? It is there that articulation steps in. A man has a certain feeling or emotion, for instance ; he strives to express it, and utters a sound ; but his utterances are inarticulate. What are they ? Sounds not yet reduced to law. When they are reduced to law, they are articulate. There is no more inarticulate sound than “Boo ;” but that in Greek has the meaning of “bull.” There is “O” inarticulate, but it becomes an articulate sound. The original words of human speech were inarticulate sounds, and they were forced by the energy of man’s nature, into something like order and articulate condition. I therefore should say, with all due deference to the arguments that Professor Young has placed before us, that primeval language—speaking of course without consideration of what we know from revelation—primeval language would be a sort of compound of gesture and half-articulate sound ;—gesture to express certain ideas and emotions, and sound to express others. One might multiply instances ; but to select one. In Hebrew, if the lion is represented, I find the word is the expressive sound *ari* ; and in Coptic the Egyptian represents the same animal by *moui*. I find in all such names, in the words employed to express both emotions and individual objects, a transition from the inarticulate to the articulate states of sounds ; and therefore I suggest, with all due deference to the Professor, that his theory has only given us half the truth. Is there not a probability, on the other side, that man would invent an articulate language ? Many may remember the sceptical question asked by Tindal in his *Christianity as Old as the Creation*, relative to the miracle of Balaam’s ass,—how many ideas the ass had ?—and how Waterland points out, in answer, that not a syllable is mentioned about ideas ; it is merely said that the ass spoke ; and he humorously adds that it probably had as many ideas

as asses commonly have,—the number of which, Mr. Tindal might reckon up for himself at his leisure. Now, I do not wish man to be considered as being in the position of Balaam's ass, uttering sounds without corresponding ideas. There is a current of ideas which must pass through the mind of every man, civilized or savage ; and the natural striving of his mental being will be to express those sounds in some way, partly by gesture and partly by sounds, varying from the merely inarticulate to those developed as in the Sanskrit and our own language.

The CHAIRMAN.—I shall now call upon Professor Young to reply to the observations made, though perhaps I may say that I agree with his paper, and think he has most logically carried out all that he attempted to set before us ; a matter which I think in some of the replies has been lost sight of. Professor Young's paper altogether proceeds as an answer to a certain hypothesis which has been brought strongly forward,—namely, that man is derived from the monkey, from the lower orders of creation, and in that position he has invented language. As I understand Professor Young's argument (and he will correct me if I am wrong), he proceeds to answer that hypothesis—his argument is altogether founded upon that ;—and it is no answer to him to state what man would do in a civilized state, or if created in that state ; for it does not touch his hypothesis. His argument is, if man was in such a low position as that, he would take that which is natural and not artificial. He maintains that spoken language is as arbitrary in its character as the signs which the deaf and dumb acquire in the finger alphabet. He shows us that the deaf and dumb possess one language with people who speak, a gesture-language, which would be sufficient for uncivilized man, and that having a natural language, man would not be forced to invent an artificial one. And I think all the arguments of the paper would stand in all their strength if he omitted everything with regard to the deaf and dumb. I do not think that altogether the case of Mr. Reddie's friend so far contradicts Professor Young's examples. It depends upon the different circumstances in which the deaf and dumb person is placed. This deaf and dumb gentleman I suppose was in an educated family, and he found it convenient to keep up the language he possessed, rather than give to others the pain of spelling out their words ; and I can easily conceive that as a child brought up that way, he was forced by a kind of necessity to use language, however disagreeable at the time. Dr. Kitto recovered his language when forced upon him by a similar necessity, and I think the same kind of necessity which caused Dr. Kitto to recover his language would have also caused Mr. Reddie's example to do the same.

Professor YOUNG.—Mr. Vice-President, you have anticipated a good deal of what I should say in reply on this subject. With reference to Mr. Warrington's observations, I have little to say, because he has not kept to the hypothesis on which I started. He instances a case of man in a civilized state, who had got very considerably in advance and ahead of the people I had constructed my observations upon, and I have nothing to say to that. As to the interesting letter that Mr. Reddie has read from this gentleman who became deaf so young, that is one instance in opposition to those two

instances I have given. That gentleman says that he has continued to cultivate his language notwithstanding his loss of hearing. I think you will find that that is rather a remarkable case, because I have had a great deal of experience with persons in that condition. I am sure I have held intimate conversation with at least four hundred deaf and dumb persons, and that is a large amount of experience. Everything I have said in this paper has been the result of that enlarged experience, and not the reflecting upon the matter merely for a few weeks. I have long, from intimate and lengthened consideration of the phenomena presented, entertained the convictions I have come to. There has been a great deal of theorizing on this subject. I cannot but say that much I have heard is purely theoretical, for I do not think a single speaker in reference to this paper has had any experience with the deaf and dumb. They may have had intercourse occasionally with one or two, but as for any amount of experience that would warrant anything like deductions for a trustworthy theory or statement, I do not think that such experience has been possessed by any person who has made observations on this paper. In reference to what has been said respecting a primitive race or community of persons having no speech, but hearing, that they would frame a language, partly gestural and partly vocal, I think, to a certain extent, that is likely. I have not the slightest doubt they would give sound-names to every sounding object, but they would consider it ridiculous to give a sound-name to a soundless object. And as for not giving a gestural name to an animal, I think that is very simple. Every animal I have seen, I can describe by signs. If I want a horse, what have I to imitate but the ambling of the horse? or a dog, what but to imitate the action that we generally perceive in a dog? Or, if a cat, the whiskers and the stroking of the cat; the cow, by the milking operation; thus distinguishing the cow from the bullock. [The appropriate signs were here given.] And I say there is no difficulty in giving a gestural description of any animal that has been seen. The deaf and dumb are extremely expert in this method of description; and I remember an instance in which a deaf and dumb boy explained to his companion that he had for the first time seen a steamboat, and he gave a rough but very ingenious idea of the motion of the boat. This was done by covering the back of the left hand with the palm of the right, advancing the hands thus placed with a wave-like movement, and giving a rotary motion to the thumbs. [These gestures were exhibited.]

The Meeting was then adjourned to 3rd December.

ORDINARY MEETING, DECEMBER 3, 1866.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous meeting were read and confirmed, after which the following Papers were read by the Honorary Secretary in the absence of the Authors:—

ON MIRACLES; THEIR COMPATIBILITY WITH PHILOSOPHICAL PRINCIPLES. *By the* REV. W. W. ENGLISH, M.A., *Mem. Vict. Inst.*

A GREEMENT as to fundamental principles underlying miraculous interpositions of the Almighty is very desirable. We want a philosophy of miracles—a foundation wide enough to admit even the sceptic. Not that I would advocate the abandonment of a single point that is tenable; but, instead of arguing, for example, with a Theistic writer, that “all things are possible with God,” and, upon this foundation, proceed to defend the miracles of the Bible, I would seek rather for some basis that accords with acknowledged principles of philosophy, and take my stand upon that.

In dealing with opponents of revelation it would also tend to the simplification of points at issue, were the various objections urged against miracles classified under appropriate heads. For example, the cloudy array of direct and implied assaults in Mr. Baden Powell’s *Essay in Essays and Reviews*, would appear much smaller if arranged, as they might be, under the three heads of objections drawn from *moral*, *metaphysical*, and *physical* considerations. The question of the historical fact of miracles, and their evidential value, would fall under the first head; the bearing of the nature and attributes of God upon miraculous interposition would fall under the second; and the question of the compatibility of the facts and discoveries in physical science with a belief in miracles, would fall under the third. These questions would, doubtless, be found to interlace in minute discussion; but such a classification would have two advantages,—it would be convenient, and also tend to keep before the mind

facts and principles which we are in danger of undervaluing or forgetting. For example, while Mr. Powell is loud and frequent in praise of what he calls "those grander conceptions of the order of nature, those comprehensive primary elements of all physical knowledge, those ultimate ideas of universal causation, which can only be familiar to those thoroughly versed in cosmical philosophy in its widest sense," he is not above stepping occasionally out of this "grander" position to admit objections from humbler considerations of a *moral* and *metaphysical* kind. Physical science contains in fact but a part, and not the whole, of the scientific principles involved in the acceptance or rejection of miracles.

DEFINITION OF MIRACLES.

It is of primary importance to define what we mean by a miracle. Yet the task is not easy. Like faith, a miracle scarcely admits of strict logical definition. But if we regard miracles as *direct*, *mediate*, and *providential*, a definition may be given that will suit all practical purposes. By a *direct* miracle is meant such as God wrought immediately or without the intervention of second causes; as the act of creation. By a *mediate* miracle is meant such as God wrought through the instrumentality of chosen agents, as Prophets and Apostles; abundant instances of which are to be found in Holy Scripture. By a *providential* miracle is meant such as God wrought by means of second causes, combined in an unusual manner; as the advent of the swarm of flies or cloud of locusts in Egypt,—events that could be explained upon natural principles. Their evidential force as miracles lay in the occasion and circumstances of their production, and particularly in the *foreknowledge* displayed in their prediction and fulfilment at a given time and for a specified purpose. A Bible miracle, then, may be defined—"an event having for its efficient cause the active power of God exercised *directly*, *mediately*, or *providentially*, for the accomplishment of moral ends, among free agents."

All such statements as "violations" of nature, or events "contrary to nature," adopted by Mr. Powell, ought to be discarded. They do not describe a miracle in any sense; for it is neither a "violation" of, nor "contrary" to, nature. The expression "laws of nature" is misleading and ambiguous.

"Nature," for example, is used sometimes to include the active operations of Deity, direct and mediate (*natura naturans*), and in this sense it may include miracles. Bishop Butler used

the term nature in this sense, but not to include miracles. He said,—“The only distinct meaning of the word *natural* is *stated, fixed, or settled*; since what is natural as much requires and presupposes an intelligent agent to render it so, that is, to *effect it continually*, or at *stated times*, as what is *supernatural* or *miraculous* does to effect it for *once*.”* Then, again, “nature” is sometimes used to include simply the works of nature (*natura naturata*). But even here the term is ambiguous and variously modified, for it is sometimes made to include both mind and matter; at other times it is used of matter to the exclusion of mind. “The term nature (said Sir W. Hamilton) is used sometimes in a wider, sometimes in a narrower extension. When employed in its most extensive meaning, it embraces the two worlds of mind and matter. When employed in its more restricted signification, it is a synonym for the latter only, and is then used in contradistinction to the former With us the term nature is more vaguely extensive than the terms *physics, physical, physiology, physiological*, or even the adjective *natural*; whereas, in the philosophy of Germany, *Natur* and its correlatives, whether of Greek or Latin derivation, are, in general, expressive of matter in contrast to the world of intelligence.”†

Then, again, not only is the question of miracles often clouded by this ambiguous term “nature,” but we have another word, “law,” used as vaguely. “All things (said Hooker) that have some operation, not violent or casual,—that which doth assign unto each thing the kind, that which doth moderate the force and power, that which doth appoint the form and measure of working, the same we term a law.”‡ “It is a perversion of language (said Dr. Paley) to assign any law as the efficient operative cause of anything.”§ “The rules of navigation (said Dr. Reid) never steered a ship, and the *law of gravity* never moved a planet.” “Those who go about (said Hale) to attribute the origination of mankind (or any other effect) to a bare order or law of nature as the primitive effecter thereof, speak that which is perfectly irrational and unintelligible; for although a law or rule is the method and order by which an intelligent being may act, yet a *law*, or rule, or order, is a dead, unactive, uneffective thing of itself, without an agent that useth it, and exerciseth it as his rule and method of action.”|| “In the language of modern

* Anal., ch. i.

† Reid's Works, p. 206, note.

‡ Ecc. Pol., book I.

§ Nat. Theol., ch. i.

|| *Prim. Origin. Hom.*, ch. vii.

science (said Dugald Stewart) the established order in the succession of physical events is commonly referred (by a sort of figure or metaphor) to the general laws of nature. It is a mode of speaking extremely convenient from its conciseness, but it is apt to suggest to the fancy a groundless, and indeed absurd analogy between the material and moral worlds. In those political associations from which the metaphor is borrowed, the laws are addressed to *rational* and *voluntary* agents, who are able to comprehend their meaning, and regulate their conduct accordingly; whereas, in the material universe the subjects of our observation are understood by all men to be unconscious and passive. . . . If the word *law*, therefore, be in such instances literally interpreted, it must mean a uniform operation, prescribed by the Deity to Himself; and it has accordingly been explained in this sense by some of our best philosophical writers, particularly by Dr. Clarke.* “A law (said Dr. Whewell) supposes an agent and a person; for it is the mode according to which the agent proceeds, the order according to which the power acts. Without the presence of such a power, conscious of the relations on which the law depends, producing the effects which the law prescribes, the law can have no efficacy, no existence. Hence we infer that the intelligence by which the law is ordained, the power by which it is put into action must be present at all times and in all places, where the effects of the law occur; that thus the knowledge of the agency of the Divine Being pervades every portion of the universe, producing all action and passion, all permanence and change. The laws of matter are the laws which He, in His wisdom, prescribes to His own acts; His universal presence is the necessary condition of any course of events; His universal agency, the only organ of any efficient force.”†

Taking, then, “law” in this, its true philosophical sense, and the term “nature” as including both mind and matter, it will be difficult to conceive in what sense a miracle can be said to “*violate* the laws of nature,” or be “*contrary* to nature.” The laws of nature are not causes, but courses—they are not efficient forces. Yet they are often spoken of in this deceptive sense. They cannot, with strictness or propriety, be confined to the material world. Yet this appears to be the sense in which they are commonly understood when miracles are said to be opposed to them. The mind of man has its “natural” laws, as well as the material world; hence we have a philosophy

* Phil. of the Human Mind, pp. 393-4.

† Astron., p. 361.

of mind as well as of matter. The laws of nature comprise that *mental*, *moral*, and *material* order, according to which all things are carried on. A miracle cannot be "contrary" to mental laws, if free-agency is a fact. It cannot be "contrary" to moral laws, if it is the result of divine energy, put forth for ends that are good. It cannot be "contrary" to material laws, if it is found to have its place in the eternal purposes of God, equally with the succession of day and night, or any of those moral and material laws according to which the world is governed. There may be intersections among the mental, moral, and material laws of nature. There are:—mind acts upon matter and controls it, and the whole nature of man is held subject to moral law. But a miracle breaks no law when it neutralizes or suspends a lower—it falls in rather with the general workings of nature. "We have (says Archbishop Trench) abundant analogous examples going forward before our eyes. Continually we behold in the world around us lower laws held in restraint by higher, mechanic by dynamic, chemical by vital, physical by moral [*mental?*]; yet we do not say, where the lower law gives place to the higher, that there was any *violation* of law, or that anything *contrary* to nature came to pass; rather we acknowledge the law of a greater freedom swallowing up the law of the lesser."* This passage was said by Mr. Powell to "evinced a higher view of physical philosophy than we might have expected from the mere promptings of philology and literature." I hope that we are all desirous of entertaining the very highest view of physical philosophy, that is consistent with truth. I was not myself aware that the "mere promptings of philology and literature" were at all adverse to forming a correct estimate of *any* branch of philosophy. On the contrary, I had always thought that precise terms, and accuracy of expression, were essential to *all* branches of philosophy. Mr. Powell was, perhaps, right in saying that "physical by moral" in the passage from Archbishop Trench, is "not very clear," and I would suggest that "physical by mental" might remove the point of the objection. The question of miracles, indeed, is inseparable from the question of the *existence* and *supremacy of mind*. This is the fundamental point, the key to the right understanding of the subject and the clearing up of its difficulties. Admit the existence and supremacy of mind, and we can account for miracles; deny this, and miracles are not only inexplicable but impossible. And I believe we become defenders or doubters of miracles just in proportion as we retain or lose the

* On Miracles, ch. ii.

fact of the mind's existence and supremacy. The exclusive study of physics is calculated to beget materialistic habits of thought. Physiology and physics have to do with organized and unorganized bodies, and this department of study implies *necessity of nature*, rather than *liberty of intelligence*. The natural bias, therefore, which it is liable to beget in the human mind, is one in favour of materialism, and therefore of fatalism. Its natural counteractive is in the study of mind. Mr. Grove, in his address before the British Association, appeared to betray materialistic habits of thought, if not unduly to exalt physical science. He said, "While in ethics, in politics, in poetry, in sculpture, in painting, we have scarcely, if at all, advanced beyond the highest intellects of ancient Greece or Italy, how great are the steps we have made in physical science and its applications." Now it is only since the time of Bacon that physical science has been studied with any degree of success. "When we reflect then (said Dugald Stewart) on the shortness of the period during which natural philosophy has been successfully cultivated, and, at the same time, how open to examination, the laws of matter are, in comparison of those which regulate the phenomena of thought, we shall (1) neither be disposed to wonder that the philosophy of mind should still remain in its infancy, nor (2) be discouraged in our hopes respecting its future progress."

MIND AND MATTER.

If we believe neither in God, Angel, nor Spirit, miracles are plainly impossible. But if we admit the existence of God and of spiritual beings, and the supremacy of MIND, then miracles are, at least, possible. I would not appeal to Divine sovereignty and omnipotence in support of miracles, because the argument from this source may be questioned by doubters. However true the conclusion, the process by which it is arrived at is not satisfactory. It is an instance of the vicious circle in the eyes of those who have thrown off belief in revelation. It is, therefore, better to seek a foundation, as I think we safely may, among facts and principles in the field of philosophical inquiry.

Perhaps I cannot define very satisfactorily to myself what I mean by mind, as distinct from matter; but I know that I *think, feel, hope, desire, and will*, and I feel an irresistible conviction that my thoughts, feelings, hopes, desires, and volitions all belong to one and the same being, viz., *myself*. These phenomena, I believe, exhibit the qualities of mind, and prove its existence as convincingly as *extension, colour, hardness, &c.*, prove the existence of matter. At least, I cannot feel more

certain of the existence of matter than I do of mind. If I am to draw a distinction, I feel the evidence for mind to be stronger than the evidence for matter; for the former rests upon my own consciousness of subjective facts, while the latter rests upon my perceptions of what is, or what is thought to be, objective. I cannot, then, deny the *Ego*, and claim with any share of reason to believe in the *non-ego*. The *non-ego* is the phenomena exhibited to my senses, the subject-matter of physical science. The *ego* is the phenomena presented by my own consciousness, the subject-matter of mental and metaphysical science. "The evidence for the existence of mind (said Lord Brougham) is to the full as complete as that upon which we believe in the existence of matter. Indeed, it is more certain, and more irrefragable."*

Materialists, however, have doubted the separate existence of mind, notwithstanding its greater rapidity of movement, and the phenomena presented by it. But the attempt has been illogical, the very points in dispute being taken for granted, as a basis to argue upon. If we suppose the substance said to have the qualities of thinking, feeling, &c., to be the same as the substance which is said to have extension, hardness, &c., this supposition only proves the impotence of materialism to grapple with its difficulties. Why should not these two substances underlying the two different kinds of phenomena, if they are to be considered as one and not two, be *mind*, after all, and not matter? To quote Lord Brougham again on this point:—"We only know the existence of matter through the operations of mind; and were we to doubt of the existence of either, it would be far more reasonable to doubt that matter exists than that mind exists. The existence of the operations of mind (supposing mind to exist) will account for all the phenomena which matter is supposed to exhibit; but the existence and action of matter, vary it how we may, will never account for *one* of the phenomena of mind."†

However, I am glad to feel myself at liberty to pass over this point, because natural philosophers have given up the question of substance, and confined themselves to the phenomena exhibited, and the laws deducible therefrom; and we may follow their example, and leave out of the question the nature of mind, confining ourselves to the phenomena it exhibits, and the laws deducible therefrom. The two sciences admit of precisely the same inductive principles, and may be prosecuted safely side by side. The law of gravity in the one

* Discourse on Nat. Theol., p. 56.

† *Ibid.* p. 106.

field has its analogy in the laws of association in the other. Neither field has been barren of fruits, and a student in the one need not undervalue the labours of a student in the other.

It is obvious that miracles are impossible upon the principles of materialism. Are they to be considered impossible or unreasonable upon the principles underlying a belief in mind? This appears to me to be the question, for although doubters of miracles have mainly relied upon materialistic arguments, which, if pushed, would go far towards subjecting mind to matter, or excluding it from our books and papers, still I believe most of them would repudiate all sympathy with materialism. We have therefore to meet objectors who will grant the position which we have taken up thus far in reference to mind.

Now the two worlds of mind and matter, with their separate facts and phenomena, *must* be taken into account in the settlement of the question of miracles, because no man ever contended that miracles were possible apart from mind and free agency. It is preposterous to attempt to settle this question, connected as it is with the power and spontaneity of mind or will, by an appeal to the bare order or course of nature in its material aspect. Yet this is neither more nor less than what is attempted mainly to be done by the opponents of miracles in the present day. - Whatever the value of their conclusion may be, it cannot be said to follow from their premisses. Instead of the conclusion that miracles are scientifically impossible, following, as Mr. Powell asserted, from the "higher laws of thought," I venture to affirm that that conclusion, in his own essay, was drawn in contravention of the first principles of legitimate argumentation.

The supremacy of mind is a thing of daily experience. We know that the laws of nature are under the control of our own will to a limited extent. We are able to control the forces of nature so as to produce what results we please. Matter bows in subjection to the human will. Results are brought about, which in the first instance, it is allowed, are traceable to material or second causes; but when these results are traced backwards, we arrive at last at the human will as their *sole efficient cause*, acting upon the human body, and through it upon external nature. Here, then, we have an *αὐτεξούσιον* or *sui potestas*, which supplies us with the foundation of a legitimate argument from the less to the greater, in favour of miracles. The power of the Supreme Will exceeds that of man by an infinite difference, and the freedom of the Divine Will must be commensurate with Divine power. Miracles, then, as effects

having for their *efficient cause* the active power of God, are not only possible, but, *à priori, probable*, from the limited share of freedom and power which we know by experience we have. We cannot conceive of a God of freedom never exercising that freedom. Providence implies the constant exercise of freedom. Without such an exercise there could be nothing for us here below but fate. But this is contrary to the facts of human consciousness and the results of mental study. Physical science might—if taken alone, it would—lead to fatalism; but the higher science of mind supplies the counteractive to this uninviting, one-sided view of nature, and leads the inquirer onwards to the great law of freedom. We know we are free, and we cannot, without an absurdity, suppose man, who was made in the likeness of God, to be free to control the forces of nature, while He who made man is not so. As to material nature, it is, of purpose apparently, endued with a certain *elasticity*. The orbits of the heavenly bodies bulge and flatten within a given sphere; so do the laws of nature, without any general disturbance, bend before the will of man. This elasticity appears to have been necessary for the harmonious working and general stability of the universe. So may the moral requirements of man have necessitated miracles to instruct him in the knowledge of Divine things. Our social and domestic well-being stands in need of the power and play over matter which we know we have; so may our moral and religious well-being stand in need of that freedom which miracles and the providential care of the great God imply and presuppose. And the fact that we are formed with mind and will, and the power to exercise a certain control over nature's forces for our own happiness and good, warrants the inference that our Maker is not only able but willing to succour and defend us where our own freedom and power cannot reach. He knew from all eternity, doubtless, not only the laws which He proposed to give to matter, but also the wants of His intelligent and moral creatures. He had, doubtless, a care both for the world's general working and also man's benefit. What seems to us *irregular*, as miracles, cannot possibly be so to *Him*, with whom there is no past nor future, but simply an Eternal *now*—an Omnipresent *here*. Miracles are the effects of His own free will and power, and they may fall in with higher and wider laws than mere physical science has discovered or can discover. Every separate department of science may have a partial unity, but there must be a universal science which compares together particular sciences, and ascends to the whole of things. "If there were only

a physical substance, then would physics be the first and the only philosophy; but if there be an immaterial and unmoved essence which is the ground of all being, then must there be also an antecedent, and, because antecedent, an unmoved philosophy." We agree in the doctrine that nature does nothing *per saltum*; theology, a term given by Aristotle occasionally to what he called the first philosophy, has no hostile bearing to physical science, it recognizes to the full the statement *natura non operatur per saltum*; but then it does not exclude mind and intelligence when it seeks a basis for the *unity* of science; on the contrary, it teaches that such unity is to be found solely in mind and intelligence, that is say, in the SUPREME WILL OF GOD.

"Ὁ τε γὰρ Θεὸς δοκεῖ τὸ αἴτιον πᾶσιν εἶναι καὶ ἀρχὴ τις.—
(*Arist. Met.*, lib. i. cap. 2.)

OBJECTIONS DRAWN FROM MORAL CONSIDERATIONS.

Having stated the principles underlying a belief in miracles, it remains that I notice some of the main objections to them, drawn from moral, metaphysical, and physical considerations. In doing this, I must study brevity as much as possible, lest I should exhaust your patience.

Necessity of Miracles.—Lord Bacon said "that a miracle was never yet performed to convert Atheists, because these might always arrive at the knowledge of a Deity by the light of nature." This remark was just. Upon the hypothesis of the fall of man, however, and his consequent need of redemption, miracles were antecedently *probable*. And upon the further hypothesis (I put the case in the least dogmatic form possible) of a revelation having been given, miracles were absolutely *necessary*. Whether Mr. Powell's remark that "Paley took too exclusive a view in asserting that we cannot conceive a revelation *substantiated* in any other way," be true or false, it is self-evident that a revelation could not have been *given* except by miracle. It implies in its very *nature* miracles,—the communication of truth otherwise unattainable. The call of Abram, which I take to be the origin of the visible Church, was supernatural, but not impossible upon the principles of this paper. The communication of sacred truth to be written down and deposited with the Church was supernatural, but not impossible. (I am not here careful to draw any distinction between the supernatural and a miracle.) Revelation began of *necessity* by miracle, was continued and ended by miracle. An outward visible Church, divinely called, and an outward

revelation divinely inspired, are correlates,—the one implies the other, and each implies a miracle;—neither could have been begun otherwise. Whatever, therefore, the value of miracles as mere *evidences* may be, they were at least essential to the *nature* both of a divinely-called Church and a divinely-inspired revelation.

The Evidential Value of Miracles.—The value of miracles as evidences, says Professor Mansel, “is a question which may be differently answered by different believers without prejudice to their common belief. It has pleased the Divine Author of the Christian religion to testify His revelation with evidences of various kinds, appealing with different degrees of force to different minds, and even to the same minds at different times.”* This is a sufficient answer to the objection that Christian writers are not agreed among themselves as to the precise value of miracles as evidences. But as the miracles of the Bible profess to move in the sphere of redemptive work, and are themselves an essential and necessary part of that work, I cannot see how we are to regard them as mere evidences only. There may be a few of the miracles of the Bible less closely connected with the gift and development of revelation than others, but they were all either preparatory to, essential parts, or confirmatory of God’s revelation and will. They cannot, therefore, be viewed apart from the truth itself as mere evidences. The greater part of the hundred or more miracles in the Old Testament, and the most remarkable of them, cluster around the giving of the Law, the Exodus, and the times of the prophets, who were inspired to write parts of the Old Testament.

Present Need of Miracles.—It has been objected that miracles, if needed at all, were never more necessary than at this present time. “When were miracles (it was asked in *Essays and Reviews*) more needed than in the present day to indicate the truth amid manifest error, or to propagate the faith?”† In this question, I think, there are confounded the gift and development of revelation, with a free acceptance of it; the facts of its divine nature and bestowal with its actual propagation. The faith, if it had to be propagated in every age by miracle, would require nothing short of continuous miracles; which is absurd. But it would be very hard to conceive of any miracle which could possibly be of service to those who affirm that “testimony is but a blind guide”—that “the essential question of miracles stands quite apart from any testimony”—that “if we had the testimony of our senses to an alleged miracle, it would not establish it.” The objection,

* Aids to Faith.

† Pp. 125-6.

indeed, is idle in the face of these assertions, for "where Moses and the Prophets" are not heard in faith, we are plainly told "neither would" the objector "be persuaded though one rose from the dead" to convince him. As to the question, "Ought any moral truth to be received in mere obedience to a miracle of sense?"*—I cannot conceive of any antagonism between our moral sentiments and such a display of Divine Power as a miracle implies; but if it is meant to be insinuated that moral perception is completely dissociated from sensitivity, then I can but answer that I know of no theorist in morals who has held such a monstrous and absurd position, either in ancient or modern times. Mr. Powell divorced faith and philosophy, and this last quotation implies apparently a divorce between morality and sense. What the ethical residuum would be, we are not informed. But the spiritual and moral parts of our nature are too much bound up with our material economy to admit of any wild theorizing of this kind. The supernatural is not so far removed as the materialist would have us believe. Though miracles are not now wrought for social and moral ends, we have a constant Providence, and therefore a Supreme Will in constant play and activity—

—καὶ γὰρ τ' ὄναρ ἐκ Διὸς ἐστίν.

That "even a dream is from God" is old, in *profane* authors, as Homer. The revelation of future events is a thing of rare occurrence; but it happens sometimes, and when it does happen, the law of suggestion can no more account for it than the law of gravitation. We know of no other way of accounting for it, than by assuming that it is Deity communicating the future to our minds. The *mode* of communication is not easily explained, it is hidden from us, like the link which binds together cause and effect in physics; the *fact* of such communications, however, is, as Mr. Morell has said, "an internal phenomenon, perfectly consistent" (no doubt) "with the natural laws of the human mind," though, it should be added, not to be explained by them.

The Morality of Miracles.—Miracles being connected with ends that are moral, must be themselves moral in their nature. In the old dispensation, they partook of the severity of the law as well as of its holiness; in the new, they are almost universally examples of mercy and redemptive power. The death of the firstborn sounds a little harsh, but it was no doubt an act of retributive justice, dealt back as a blow in return

* Essays and Reviews, p. 147.

for the death of the male children when Moses was born. It was but a carrying out of the moral law, which sanctions the "visiting of the sins of the fathers upon the children." I would not be guilty of the impiety of calling in question the goodness of God; but I may be permitted, in reply to an objection sometimes urged against the miracles of the Old Testament, to say, that the loss of life by earthquakes, storms, plague, and lightning at unknown and irregular periods, might be and has been brought against the book of *nature* with far greater force than anything said or done in the Bible can be urged against *revelation*. Yet no one who believes in God doubts that the earthquake and storm are parts of His work.

Reason and Testimony.—Mr. Powell said, "testimony can avail nothing against reason." "The question would remain the same if we had the evidence of our senses to an alleged miracle." "It is not the mere *fact*, but the *cause* or explanation of it, which is the point at issue."

By "reason" I suppose we are here to understand the conclusions arrived at from physical science, against which "testimony" is said to avail nothing. Yet this very science itself is built upon "testimony" and observation. The truth is, that all reasoning whatsoever must rest upon authority or testimony of some kind. The *data* of reason do not rest upon reason, but are of necessity accepted by it, on the authority of what is beyond itself, viz., *faith*. But if it were true that "testimony" can avail nothing against "reason" where there is any antagonism, it must yet be *proved* that such antagonism exists when we accept miracles upon proper evidence. This proof, however, is not yet forthcoming, and we may wait with perfect calmness. In the general or abstract, reason itself depends upon faith and testimony for its data, and the postulate that "testimony is but a blind guide" can hardly be a safe one.

OBJECTIONS DRAWN FROM METAPHYSICAL CONSIDERATIONS.

The objections of a metaphysical kind that have been urged are mostly such as are drawn from particular views of the Divine attributes, as the Wisdom, Power, and Unchangeableness of God. The Divine attributes are conclusions arrived at from natural and revealed religion. The Divine Sovereignty follows as an inference from recognized views of the Divine attributes,—it can scarcely be called an attribute of itself, and I would prefer to speak of it as a *prerogative* contained in or deducible from the Divine attributes. I would never appeal

to it, therefore, in any sense otherwise than is compatible with received views of the Divine attributes.

The Divine *Wisdom* has been said to be opposed to miracles, "on the plea that our ideas of the Divine perfections must directly discredit the notion of occasional interposition; that it is *derogatory* to the idea of infinite wisdom to suppose an order of things so *imperfectly* established that it must be occasionally interrupted and violated when the necessity of the case compelled, as the emergency of a revelation was imagined to do."* Putting aside the "interpositions" implied in the belief in a Divine Providence, I do not know how this objection could be made to square with the views of some eminent professors in physical science, with such a passage, for example, as the following from Professor W. Thomson:—

"(1) There is at present in the natural world a universal tendency to the dissipation of mechanical energy. (2) Any *restoration* of mechanical energy, without more than equivalent dissipation, is impossible in inanimate material processes, and is probably never effected by means of organized matter, either endowed with vegetable life or subjected to the will of an animated creature. (3) Within a finite period of time past, the earth must have been, and within a finite period of time to come, the earth must again be, unfit for the habitation of man as at present constituted, unless operations have been or are to be performed, which are impossible under the laws to which the known operations going on at present in the material world are subject."†

Those who deify the laws of nature might do well to consider this passage. It does not fall in certainly with the spirit of this objection to miracles, in answer to which I would make three remarks. *First*, it is founded upon that misrepresentation which persists in calling a miracle a "violation" of the "established order of things." *Secondly*, it confounds apparently *physical* "imperfections" with the *moral* wants of *man*; a course well suited to create prejudice in the public mind, but one which can have no other tendency than that of concealing the truth. *Thirdly*, this very objection urged against revelation, and miracles in particular, lies open, with whatever force it has, against the book of nature and the creed of the Theist who brings it. The "order of things" is charged with "imperfection," if we suppose it to have stood in need of any revelation or miracle. This supposition, it is said, would be "contrary to our ideas of the Divine perfections," "*derogatory* to the idea of Infinite *Wisdom!*" Divesting ourselves, then, of all ideas of revelation or miracle, let us

* *Essays and Reviews*, p. 136. (The Italics are my own.)

† *Trans. of the Royal Soc. of Edin.*, 1852.

think for one moment upon the fact of *absence* or *defect* in the powers and capacities of ten thousand created beings, even in this age, when *progress* has got so far as to have forward man, according to some, from an ape or monkey beginning, to what he is now. The different grades of animals beneath us are *wanting* in that higher enjoyment which, with a more "perfect" nature, they might have had. All sentient and living beings are "imperfect" and limited in their natures. What follows then? Why we have, according to the Theist's objection to miracles, ground to impeach the "Divine wisdom;" the "established order of things" bears marks of "imperfection," that is to say, *metaphysical* evil; for

There's nothing situate under heaven's eye,
But hath its bounds in earth, in sea, in sky.

But we find, besides "imperfection," also *pain*; here again, therefore, the "Divine perfections" are at variance, according to the objector, with the "established order of things," for it is "clogged" with *physical* evil. There are, it is true, compensating considerations; enjoyment may be heightened by suffering, and even death itself rendered easy by a little preparation on a bed of pain; yet the fact of death and previous *suffering* remains, that is to say, *physical* evil. And, further, the Theist has also *moral* evil to "clog" his own system. He is troubled, not only with *imperfections*, with *suffering*, but also with *sin*. Man came into existence like other organized beings, we believe, under a law suited to him as a moral agent; he was endued with knowledge and understanding, with freedom to obey or disobey. But he did not follow the law of his nature—he does not do so now—he violates that law and falls into sin. "What then shall we say to these things? Shall the thing formed (man with a free-will leading him into sin) say to Him who formed it, Why hast thou made me thus?" This charge would be as reasonable as that against "Divine wisdom," against "our ideas of the Divine perfections," on the hypothesis of miracles. "The order of things" is not freed from "imperfections" when miracles are taken out of the way.

As to the *unchangeableness* of God, it has no special bearing upon the question of miracles. The Theist, or the advocate of "continuity," is as much open to its difficulties as the Christian apologist. If God, from all eternity, purposed that the race of man should make progress from an obscure beginning, He may also have purposed that miracles should have their place and use on the great theatre of time. God must have a purpose, and that purpose must be *fixed*; but it may

have conditions which admit of human freedom being played in its own orbit or within prescribed limits. There is, we are sure, freedom even in dependence. The Almighty's omnipotence does not swallow up that limited power which He has assigned to man. His omnipresence does not blot from existence that place which we, His creatures, occupy in space and time; His omniscience does not absorb nor quench that little light which our reason gives us; in short, the infinite does not annihilate the finite; otherwise, dependence would find no place in which to write its name, Divine Sovereignty no creature over which to exercise its just control. The *unchangeableness* of God must, therefore, be viewed in its relation to other things, such as the *Divine purpose*.

There is yet another objection from metaphysics that properly falls to be noticed here. *No testimony, it has been objected, can reach to the supernatural, and therefore no miracle can be proved by the evidence of sense.* This objection was urged for another purpose in a famous atheistical work (*Système de la Nature*) published in 1780. The writer, said Lord Brougham, "began by endeavouring to establish the most rigorous materialism, by trying to show that there is no such thing as mind. The whole fabric is built upon this foundation; and it would be difficult to find in the history of metaphysical controversies, such inconclusive reasoning, and such undisguised assumptions of the matter in dispute, as this fundamental part of his system is composed of. He begins by asserting that man has no means of carrying his mind *beyond the visible world*, that he is necessarily *confined within its limits*. He asserts what is absolutely contrary to every day's experience, and to the first rudiments of science—that we know, and can know, nothing but *what our senses tell us*."* In *Essays and Reviews* the objection against miracles (not mind) stands thus: "No testimony can reach to the supernatural; testimony can only apply to apparent sensible facts; testimony can only prove an extraordinary and perhaps inexplicable occurrence or phenomenon; that it is due to supernatural causes is entirely dependent on the previous belief and assumption of the parties."† The objection, that we "can know nothing but what our senses tell us," appears to me to be the same as saying that "testimony can only apply to apparent sensible facts:" but in the former case it was urged to get rid of *mind*; in the latter, to get rid of *miracles*. But Mr. Powell professed to believe in *mind*; he held that there is a world of intelligence—*νοητόν*, as

* Discourse on Nat. Theol. ; note, p. 235.

† Pp. 127, 128.

well as a world of sense,—*ὁπαρόν*. The difficulty which occurs to my mind is, how, upon the principles of this objection to miracles, he could believe in those grand truths of physical science which he parades so ostentatiously. Were we to confine ourselves to bare facts,—“the testimony of sense,”—even physical science itself must stand still; for how could we arrive at the conception of a *general* law? Generalization involves a principle which experience or testimony neither does nor can give. If, then, we cannot get outside “apparent sensible facts,” if evidence is bounded by the region of the sensible, those very conclusions of physical science which are brought against miracles can have no foundation to rest upon. But if, on the contrary, we can rise to the conception of a general law, and so leave behind us the region of the sensible, may we not also rise to the conception of the supernatural, when we see works performed in the name of God which no man ever could of himself perform?

Mr. Morell, a writer of philosophic acuteness, thinks that Divine or religious truth is not received through the medium of the senses or common understanding, but deep down in our intuitive consciousness; and there may be truth in this so far as it relates to the theory of inspiration; no doubt the highest mental faculties, as the reason and conscience, are the media of Divine communications. And in the case of miracles the presence and aid of God, though *unseen*, may yet be *felt*,—it was so when the Apostle said, “In the name of Jesus Christ of Nazareth, rise up and walk.”* Here the Apostle disclaimed the power to work the miracle himself, and he had “experience,” if not “testimony,” reaching directly to the supernatural. Of course a *spectator* could not have this experience, and the difference between present and past time has, in our case, removed from the region even of the “sensible” to the region of what is only “credible,” the evidence for the miracles of the Bible. But a spectator at the time, or a believer now, in the fact of this lame man’s cure, may ascend by legitimate reasoning to the supernatural as the only adequate efficient cause. The passage translated by Sir W. Hamilton from a German work, and quoted by Professor Mansel, is worthy of being repeated:—“*Nature conceals God*; for, through her whole domain, Nature reveals only fate, only an indissoluble chain of mere efficient causes, without beginning and without end, excluding with equal necessity both Providence and chance. An independent agency, a free original commencement within her sphere, and proceeding from her powers, is

* Acts, iii. 6.

absolutely impossible. . . . *Man reveals God*; for man by his intelligence rises above Nature; and, in virtue of this intelligence, is conscious of himself as a power, not only independent of, but opposed to Nature, and capable of resisting, conquering, and controlling her. As man has a living faith in this power superior to Nature, which dwells in him, so has he a belief in God, a feeling, an *experience* of His existence. As he does not believe in this power, so does he not believe in God; he sees, he experiences nought in existence but Nature—necessity—fate.”

From facts within we rise to thoughts of God. The sensible gives us knowledge of the external world. But the mind, in virtue of its own intuition and energy, rises from effects to causes. When it rises from effects to causes, it does so by reasoning, as strictly and properly so called, as the inductive philosopher in the process of generalization. Distance is not seen; it is inferred in the mind. Anger is not seen; it is inferred from the expression of the countenance. And God, the Author of miracles, is not seen, yet His presence and power are inferred from His works.

OBJECTIONS DRAWN FROM PHYSICAL CONSIDERATIONS.

The results of physical science have been represented as hostile to faith in miracles. Mr. Powell repeated again and again, in round, bold statements, without a fragment of argument or proof, that such hostility does exist. I have not, however, myself been able to discover any argument against faith in miracles from this source. “The grand truth of the universal order and constancy of natural causes” is beside the question.

Things which differ.—Mr. J. S. Mill confounds, in his chapter on Induction, (see his *Logic*,) two things essentially different, and Mr. Powell, in his Essay, has done the same; viz. belief in causation with belief in the uniformity of nature. Necessary and contingent truths are not distinguished. That every effect must have a cause is an intuitive truth, self-evident and necessary; that the operations of nature must be uniform, is neither an intuitive truth, self-evident, nor necessary. Belief in causation is a fundamental law of the human mind; uniformity of operation in nature is a thing simply of experience. We could conceive of nature’s operations being different from what they are without any violation of the fundamental laws of human belief. As to miracles, the question is simply one of *fact*: the Bible affirms that miracles have been wrought, and physical science has done nothing to disprove the Bible’s

testimony upon this point. Physical science does not touch the question as to the *historical* fact of miracles, and it has not attempted to *explain* them. It has left them simply where they were a century ago. I believe in the "grand truth," repeated so often and needlessly by Mr. Powell, "of the universal order and constancy of natural causes." It is "fixed, *in my mind*, so firmly that I cannot conceive of the possibility of its failure," *when left to itself*. A miracle has nothing to do with this "constancy," or reverse, of "natural causes"—it is simply the fact, or otherwise, of *personal agency* producing special results. The phenomena produced by "natural causes," that is, viewed as effects proceeding from merely physical causes, are of *necessity* uniform and constant, being subject to the law of necessity as opposed to the law of freedom; but the phenomena of *mind* or *personal agency* are the reverse—they are *not* of necessity uniform, being subject to the law of freedom as opposed to the law of necessity. It matters not what hypothesis is accepted to explain the efficiency or activity of "natural causes." Mr. Stewart enumerated *six*, and the law of natural selection and struggle for existence, perhaps, might be called a *seventh* hypothesis; but whether we accept materialism, or the explanation that the phenomena of nature result from certain powers communicated to matter at its first formation, or that the phenomena proceed from general laws, or that the universe is a sort of machine put in motion, and so constructed that the multiplicity of effects which we see are all to be traced to one original act of sovereign power,—I say it matters not which, nor what hypothesis we accept; they all come under the law of *necessity*; and are, therefore, foreign to the question before us. Physics without mind may *exclude* the question of miracles; but physics alone can do nothing, either to argue or settle such a question.

The real point.—Does the natural exclude the supernatural? Are natural causes and effects so arranged as not to allow the intervention of mind and personal agency? Gravity draws all bodies to the earth, but man puts forth his hand and arrests the falling apple *at will*. Mr. Powell, however, affirmed that "miracles are inconceivable to reason," opposed to "the primary laws of human belief." But by what primary law of belief we are required to reject miracles without looking at their evidence, is not said. The statements in *Essays and Reviews* are naked and bold enough; but when we search for argument, we find appeals to fact where reason fails, and appeals to reason where facts are wanting. Miracles are not "inconceivable to reason;" we have no *intuitive* principles in

the mind which compel us to reject them. On the contrary, when an effect is produced which cannot be accounted for on natural principles, the mind rises naturally from the greatness of the work to a supernatural cause. Neither have we any *experience* to urge in behalf of the objection to miracles. We have discovered uniformity of working among certain agencies, and we have discovered diversity of operations proceeding from the will of man. If it is replied, God does not work except by His laws in the economy of material nature, we demand in vain from Physical Science either reason or proof for such an assertion. God's will is expressed in His material works—whoever said it was not? But when it is asserted that His will is not expressed anywhere else, we again demand of the physical student reason or proof, and find none. His will, as expressed in His *works*, cannot, it is admitted, be contrary to His will as expressed in His *Word*, or revelation; but neither is it so. There is no opposition; physical science has done nothing to prejudice faith in revelation or miracles. Material nature is elastic enough to admit of the play of the human will, and if it can and does admit of the play of the human will, it cannot shut out the Divine will. The chain of antecedents and consequents, the “grand truth of the universal order and constancy of natural causes,” therefore, presents no argument against miracles as effects proceeding from special causes.

Let the science of physics be cultivated in all its bearings to the utmost extent; but do not undervalue the tools of the workman; do not exclude mind and the higher science of mind. There is both room and need for the study of metaphysics and mental philosophy, as well as of physics. “It must be borne in mind (said the President of the British Association) that, even if we are satisfied, from a persevering and impartial inquiry, that organic forms have varied indefinitely in kind, still the *causa causans* of these changes is not explained by our researches; if it be admitted that we find no evidence of amorphous matter suddenly changed into complex structures, still, *why* matter should be endowed with the plasticity by which it slowly acquires modified structures is unexplained. If we assume that natural selection, or the struggle for existence, coupled with the tendency of like to produce like, gives rise to various changes, still our researches are at present uninformative as to *why* like should produce like, *why* acquired characteristics in the parent should be reproduced in the offspring. Reproduction is still itself an enigma.” Without another science, then, the doctrine of continuity is dark—we lengthen out the chain backwards, it snaps asunder, and we

are left gazing upon a gap which nothing but Deity itself can fill up. We agree that philosophy should have no likes or dislikes; and, while a "glow of admiration" will assuredly be permitted "to the physical enquirer when he beholds his orderly development by the necessary inter-relation and inter-action of each element of the Cosmos," we, too, viewing this necessary chain of cause and effect as *concealing* God when considered alone, as exhibiting nothing but a dark and inevitable fatalism—we, I say, may also be permitted a glow of admiration when we find ourselves set free from the darkness which surrounds this chain of endless causation, to behold in the purer light of MIND and INTELLIGENCE the Cause of all causes, even Him "who stretcheth out the north over the empty place, and hangeth the earth upon nothing."

THOUGHTS ON MIRACLES. By EDWARD BURTON
PENNY, ESQ., M.V.I.

IT has been said that "*Scientific investigation plainly shows that every department of Nature is under the control of laws the most exact and inexorable,*"*—which may well be conceded; nor does it require any depth of "investigation" to arrive at a fact so patent to all observers. We may, therefore, allow it to be an axiom of science, and an "inexorable law" that no effect can take place, in Nature or out of Nature, without an adequate cause; and we add that one of these "inexorable laws" is that the laws which "control" are necessarily, and *ipso facto*, stronger than the Nature "controlled."

It has been said further, that "*the whole course of Nature is a chain of antecedents and consequents, bound together by a necessary and absolutely certain connection entirely beyond the reach of interruption or alteration; and every event that happens in Nature is the inevitable result of the laws and properties of matter and force, which can neither be violated, modified, nor suspended; and beyond these laws and properties Nature knows no other rule; they are alone and supreme.*"*—But the very reverse of this is manifest in every "event in Nature," every one of which is a breach, interruption, or overruling of one chain of antecedents by another. The laws of *inertia* and *gravitation* are broken through by *vegetation*; the chain of consequents in *vegetation* is broken by the *animal* that feeds upon it; and, above all, the *will of man* disposes according to his need, his pleasure, or his caprice, of all the chains of

* Vide *Journal of Transactions of the Victoria Institute*, vol. I. p. 95.

consequents, in every region or kingdom of Nature, mineral, vegetable, animal, or elementary.

That the "laws which rule Nature" are "alone and supreme" may be conceded, relatively speaking, *i. e.*, in respect to the ruling of Nature; but this is merely moving round the circle of cause and effect, antecedent and consequent; the question is, How these laws work, and how the manifold results in Nature are obtained? And the partisan of "science" who has acknowledged that there is a God,* does not pretend that, distinct from material Nature, there is no other ruling power or law. Nature's laws, "ruling Nature," are themselves distinct from and above Nature; and, whether Nature "know" it or not, *we* know that the Intelligence which established those laws and ordained them to work out His unchangeable will, and still upholds them in His hands, causing while yet placing bounds to their mutual action and reaction, is necessarily distinct from and above Nature.

The argument continues:—

"To assert that an event, or a series of events occurred, which are contrary to this uniformity, which are not the result of these laws and properties, but opposed to them, and incompatible with them, is to assert the occurrence of an impossibility, and is simply absurd." †

But we have seen that nothing is more "uniform," in the sense here intended, in Nature, than the constancy of a mutual crossing or counteraction in its laws, and that it is not "incompatible" with these laws that one should be continually over-riding another, and producing thereby a new order of results or chain of consequents, therefore miracles; and that without such opposition and mutual reaction of her laws, Nature's only law would be speedily to die out and cease to be.

In miracles, commonly so called, Nature's laws are neither violated nor modified in themselves; one law is simply over-ruled by another, a new chain of cause and effect being commenced thereby. The power which directs this over-ruling, whether intelligibly to itself or not, is the worker of the miracle. The vegetable germ, blindly exerting the powers with which it is endowed, assimilates the earthy and gaseous elements to itself, over-rules the mineral and atmospheric laws, and works a miracle. The ox which eats the grass, and converts its elements into its own flesh and bones, over-rules the laws of vegetable life, and works a miracle. And, above all, every act of man may be called a miracle, inasmuch as one law of Nature is thereby, and that "inexorably," over-ruled

* *Ibid.* p. 96.

† *Ibid.* p. 95.

by another, and a new chain of cause and effect commenced. This, indeed, may be affirmed of every act or movement of animal life generally; the "uniform course" of Nature being altered by every footfall on its surface.

But man's whole mission upon earth seems to be that he should work miracles. He breaks the "uniform course" and overrules the laws of wild Nature, and turns a howling wilderness into a fruitful field or smiling garden, and subdues the whole animal kingdom to serve his convenience, by the simple process of opposing one law of Nature to another, by the superior power of his own intelligence and will.

Neither vegetables nor animals "know" anything of the laws by which they act or are acted upon; they fulfil their parts by a blind faith in the power implanted in their germs and developed by the counteraction of other powers ordained for the purpose by the Supreme Intelligence.

But man is not precluded from knowing the laws and power by which he works, although the vast majority of men concern themselves to know nothing about it; and the nations and peoples do their Creator's behest, and work the miracles they were sent on earth to work, knowing little more of the secret springs of their own life and action than the animals around them.

Man has been called a *MICROCOSM*, because he unites in himself something of the essences of all the kingdoms of Nature, sidereal, as well as earthly. And it is manifest that this must be so; for, since he is capable of receiving the influences of the sun and the skies, of the atmosphere and the earth, and of the animal and vegetable world living and moving in them, there must necessarily be something in him of the nature of all these things; and the power which we see he possesses to act upon Nature is in itself a proof that he must have visible or secret connecting links homogeneous with that Nature, vital and physical.

Some men are not only conscious of their power over Nature, but exercise themselves in it, and strengthen it to a remarkable degree. We may instance the Rareys, and tamers of wild beasts or reptiles in all countries, who, by faith in their power, and by the exercise of their will, tighten or relax the secret sympathetic links at their pleasure, and make the fiercest of such animals tremble at their look, and end by lying down like lambs at their feet.

Of such are mesmerists, who, by the power of their will alone, transmitted through the secret links which connect them with their patients, send them to sleep and make them do many wonderful things.

All power is of God ; and God has apportioned the use of it to all His creatures according to their kind and to the purposes of His goodness and wisdom. The vegetable and the animal have each power after their kind, according to the work given them to perform, while the secret springs of their action are beyond their ken. But man seems to be master of the springs of his own power (*i. e.* the portion with which God endowed him) : he can strengthen them by exercise, and relax or destroy them completely by disuse ; and he can direct them as he will, either in subjection to inward inspirations of a pure conscience (which is God's gift), or to the wild and lawless allurements of his imagination or his passions.

In conformity with this freedom of choice, and indifferently for good or for evil, we find at all times, and in our own day, instances of men who, by their earnestness, enthusiasm, or faith, have more or less powerfully moved the springs of Nature, and done many wonderful works or miracles.

Religious enthusiasm, so called, has been the means of many wonderful results ; and these results are of a nature according to the *direction* of this enthusiasm or faith ; and may be characterized as good, or evil, or neuter. If this faith is exercised in entire submission to the Divine light, its results are in conformity ; and thus we see how a Moses was enabled to overcome the magicians, and bring his people out of Egypt, and separate them as a peculiar people, a light for the Gentiles till Shiloh should come.

The magicians of Egypt and those of other countries, Fetish priests, Fakirs, Medicine-men, and Marabouts of the present day, work many wonders or miracles, by moving the same springs of Nature (for all their performances are not mere jugglery) ; but their works lack the beauty of those of the Divine order, and are rightly named *occult*, or deeds of darkness.

The CHAIRMAN.—I am sure you will all return a cordial vote of thanks to these two gentlemen for their very interesting papers. I think you will also agree that Mr. English's Essay is one of the most valuable papers that we have had yet brought before us, and I hope we shall now have a useful and profitable discussion on the subject.

Rev. ROBINSON THORNTON, D.D.—I will trouble you with a few remarks on the first of the interesting papers we have heard this evening ; and they will not be in opposition, but rather in harmony with the arguments of Mr. English. They have brought out (but not, perhaps, quite with the clearness I could wish) two very important questions, which we have to consider on the subject of miracles. On this subject there are two grand fallacies, in my opinion, which are constantly urged by those who oppose miracles. The

first lies in the words "law of nature." What is a law of nature? Who enacted that law? What Parliament met together, and by a majority of votes decided there should be that law? Why use the term "law"? Because it is something written down? But you must remember, that though "written," it is not enacted. Where is it written? It is written in our own minds. From the observation of a certain set of phenomena, we find underlying them a certain principle; and we write that down on the tables of our mind or on paper, and call it a "law of nature." But you must not argue that it is to be treated as a human law passed amongst men. It is not something to which a punishment is attached for violation;—it is not vindicated by the Lawgiver—we speak of a law of nature indeed; but there is the fallacy. A law of nature is, we must remember, not something by which, as people would seem to say, the Deity is bound, but something belonging to ourselves: it is a part of our own thought and of our own consciousness. We, having analyzed certain phenomena, find a certain principle, as I said, underlying them, and we register it in our minds as a law. But we have no business to impose it on others; it is part of ourselves. Therefore, when a person says, "I do not believe a miracle takes place, because it is a violation of the laws of nature," he means that a miracle is something which is different from his own especial observation; he merely asserts the limited character of his own observations. If a person tells me that no testimony can be sufficient to make him believe that such a thing as a miracle ever happened, he is in fact saying, "I am so convinced of the superiority of my intellect and of my own generalization, that no testimony shall prove to me there is an intellect superior to mine." We know how that was answered in early times, and a hundred years ago, when Hume brought forward his argument against miracles as being "contrary to experience." The answer was plain. What do you mean by contrary to experience? Do you mean that miracles are not what people observe every day? That is what *we* mean,—something not met with in every-day experience;—but if you mean to say they are contrary to experience in this sense, that no person has ever seen one, you are begging the question; you are assuming what you ought to prove; you say these things did not occur, and when asked why, your answer is the not very convincing one, "Because they did not." The next fallacy to which I should like to call attention resides in the word "Causation." What do you mean by causation? The term is used in two senses, which are apt to be confounded. In the first place, causation is taken to mean, and really does mean, the sequences of phenomena which, as far as our limited observation goes, are invariable. When we find that invariably in our experience one phenomenon follows another, we say the first is the cause of the second. That is the first mode in which the term causation is used. There is another sense in which it is used, and a much higher one, which is this—the operation of superior intellect on inferior existence. Now opponents of miracles confound these two together. They say, no superior existence can have exerted itself in a manner to which we are unaccustomed, upon the works of creation. Why? Not because they deny the power of intel-

lect ; but they argue in the other sense, that no phenomenon has power in itself to alter the phenomenon which follows it. It is on a confusion between these two meanings that I think some of the arguments alleged against miracle are founded. I repeat, therefore, that we should guard ourselves carefully against the confusion which exists in the words "law of nature," and the other confusion which exists in the word "causation." I think we can understand what a miracle really is. It is where a superior intellect asserts itself in order to command the respect of an inferior intellect. The inferior has attained to a certain "law," by such generalization as it is capable of, but the superior at certain times steps in and introduces a phenomenon which is not recorded in that generalization, and by displaying that phenomenon shows its superiority. Let those who reject miracles beware ; because in rejecting them, they say their intellect is superior to any other intellect that can exist. They are, in point of fact, raising matter nearly, if not quite, to Deity.

Rev. JOHN MANNERS.—Since I have had the pleasure of joining this Society, this is the first meeting I have been able to attend, and I wish to make a few observations upon the excellent papers we have just heard ; and first to "men of science" just a few words. I think it has been well said that we are surrounded by a continuation of miracles in nature, using that word in the fullest sense. Let us look at some of these mysterious agents for a moment or two. There is what we call the principle of fire,—there is light, and there is electricity, for instance. Now it really seems to be contrary to the principle of light that two rays or waves should produce darkness ; and yet two undulations of light, one following the other by half a length or a multiple of half a length, do produce darkness. And so with heat :—two waves of heat produce cold. And so of sound :—two waves of sound produce silence. Now, this is in accordance with what may be termed the acting of recondite powers, and is in order and harmony with the general principles by which we are surrounded. I recollect when at Cambridge, after reading the Third Book of Newton's *Principia*, there was something seemed wanting. We talk of the law of gravitation ; but what is gravity ? Newton said, "With regard to what it is, I do not pretend to understand, I won't venture to say ; but with regard to the phenomena, I say, such and such things are produced by it." But when we come to ask—What is it ? How came it about ? What is the origin of all these forces of nature ? How is it that fire should burn ? How is it that this electrical force does pass here and there ? How is it all these effects are produced ? We must answer,—Not *per se*. There must be something that pervades, that directs all these wonderful, beautiful, and glorious powers. I would ask men of science to tell us why, if a little bit of sodium is thrown into water, we see the wonderful effect of fire and light brought into action ? How is it these pieces of potassium and sodium accomplish this ? Why this strange affinity for oxygen that it actually seems to set fire to water ? I want men of science to tell me in plain words *how* these things are produced ; and I want to know why are these things so beautifully harmonized : I want to know *how* it is there is

such order and harmony? It is not enough to tell me, *it is*; we can see that. But we want the living presence; and this living presence (the solution to all the questions with regard to miracles) is the Most High, who created all things according to His own will. Can you tell me how light is produced? Or what, on the other hand, is darkness? Why (for a third instance) are all things in nature circular? Whence these wonderful powers? We use the term "nature," it is true, as if we understood what is natural and what supernatural; but all these things can only be understood when connected with one beautiful order and harmony by the Almighty. Now, for one moment again, to look at our individual selves, it is quite true, what was said in one of the papers read, there must be connected with man somewhat of all the principles of the material and spiritual universe, centred in him in one way or another. How is it that words, for instance, declare "my will," and that my thoughts spring up into ideas, and are embodied in the words I now utter in this assembly? Here are beautiful mysteries, proving that my origin is not mere matter, not a merely temporary thing, not merely an advance on a monkey; but rather is it not in this way, that man is "made in the image and likeness of God"? Man feels that nothing is impossible with Him. When I go to the Gospels, I see the manifestation of the Creator on the earth, in the marvellous things done by Christ's word. When He speaks to the fig-tree, and commands it to bear no fruit; there is a power from Himself which goes forth—the thing is done; and so in all His miracles. He is thus a true light to me, and He solves all mysteries in creation by the mysteries of redemption; He brings to light the things of darkness, and leads me and brings me home to that Paradise which I lost in the Fall. So we say, again, that men of science, if asked the cause of electricity, answer they do not enter into causes, and that we must be content with phenomena. But that is no answer, and I know the best men of science will admit that there must be a mysterious power besides, which they cannot reach. That leads us up to the Eternal. In Him we live and move and have our being; and His living Presence alone is the solution of the whole question.

Dr. GLADSTONE.—I should like to express the great admiration with which I listened to the first of the papers read this evening. The second was also interesting; but I think we ought to avoid using the term miracles in the sense in which it was employed in that paper,—a totally different sense to that used in the first, and not miracles in the true sense of the word. Accepting, therefore, miracles in the proper sense in which the term is employed in the paper of Mr. English, I may perhaps be allowed to make one or two remarks. The first is, that the paper scarcely went beyond showing (that, however, it proved most conclusively) the possibility of miracles. It also stated, that supposing God to give a revelation to man, not only were miracles *à priori* possible, but also probable and necessary, because revelation itself was a miracle. But it appears to me that supposing God is about to communicate anything to His creature man, miracles are, *à priori*, probable in another sense besides that which is spoken of in the paper. It is quite clear, considering the power of man's imagination and the large number of false

religions which have come into the world, that if the Supreme Being wishes to give a revelation to man, He must in some way authenticate that revelation ; He must authenticate it to the man to whom He speaks, in order to give him the power of convincing his contemporaries and successors that he is actually speaking from God. Both for the man's own satisfaction and for the satisfaction of those to whom he is sent, there is required some testimony, something which the man cannot of himself produce ; and it appears to me that there is no notice of this in the paper. Now, I cannot conceive of any better credentials of a revelation than miracles—miracles in the sense which includes prophecy, which is only a species of miracle—

The CHAIRMAN.—It is so stated in the paper.

DR. GLADSTONE.—If we look through the Bible, we shall find, I think, that miracles are spoken of almost universally in that way. They are the testimony which God has given to His servants ; and when there has been no revelation there has been no miracle. Trace throughout the whole history of the Bible, and I think you will find this is almost always the case. There may be a few instances in which miracles are wrought, not for testimony, but to preserve the Church, and for certain purposes of goodness towards man ; and it is possible we may extend the use of the word miracle to some of those cases of recent times, wherein God seems to have interposed in the history of the Church, so as to bring about what appears as a miracle, in answer to prayer, or to serve some great purpose for the extension of the Church. I do not know exactly, but it is matter for consideration, how far the great change of heart that is wrought by the operation of God's Spirit should be regarded as a miracle or not. As to what has led to such observations upon miracles as Mr. Powell put forth, I think I can better understand that feeling, perhaps, than the writer of the Essay. There is no doubt in my mind it has arisen from the great attention paid recently to the uniformity of Nature's laws. Now, that has an effect upon the mind, if we consider it too exclusively. We begin to feel that a miracle comes in as something interfering with the grand march of Nature ; that it belongs to something alien, which does not come within our philosophy. We know this can be upset most thoroughly by reasoning such as has been brought forward this evening. And what is the result of this ? It shows us how difficult it is to perform miracles ; and therefore, supposing we have, on the ground of sufficient testimony, proof that miracles have been performed, it proves with increasing force that those miracles are not the action of chance or of evil spirits, but of Him who rules all things.

MR. WARINGTON.—I may say that I think the first paper read this evening deals with the question of miracles more fully and impartially than I ever remember hearing it before treated of. I do not mean, that the subject is exhausted, nor the matter put everywhere in the best point of view, for it strikes me it might be expressed better and clearer ; but that there is no one element necessary for the right understanding of miracles overlooked. The remarks I have to make refer to some expressions of preceding speakers, and a few points in the paper which I think will bear a slight amendment. First,

as to the preceding speakers Dr. Thornton argued, that because we could not assert our generalizations, on which our conceptions of law were founded, to be complete, we had no right to assume there were any laws at all ; and therefore to assert any event to be opposed to natural laws was impossible—

The CHAIRMAN.—I think Dr. Thornton stated nothing of that kind. I do not disagree with your statement, but it is only fair for me to say so, in justice to Dr. Thornton, who has now left the room.

Mr. WARINGTON.—Dr. Thornton stated that our knowledge of phenomena was necessarily imperfect in every case ; and he seemed to think that as that fact made our generalization equally imperfect, therefore we could not regard the generalization as equivalent to law. I ask is that true practically ? Of course, I agree with him theoretically, but not practically ; and the question of miracles is a practical question. We have no absolute demonstration that miracles were performed ; we have merely a certain number of probabilities. We cannot then demand demonstration against miracles if we cannot give it for them—I mean mathematical demonstration. For what does our knowledge depend on ? For instance, I heard Dr. Thornton speak. How did I know what he meant by what he spoke ? Simply from a limited amount of observation as to what certain words signified. I cannot pretend to lay down as a fact that those words never could mean anything else. My generalization is imperfect. I cannot say it is a mathematical law that a certain word means a certain thing. I have only probability to guide me ; I take that and act upon it ; and I am practically right. Theoretically, however, I am not certain of the meaning of the words said to me ; yet, practically, I am right in acting as if I was. Just so with miracles. It is quite sufficient if the objector can show us a certain amount of probability against them without being able to give demonstration, for that is impossible. This is the great fallacy that runs through Mr. Mozley's otherwise able book on miracles. He has assumed that because all laws of science are founded on imperfect generalizations, therefore they cannot be taken as proper reasons for coming to any conclusion. If that is admitted, we have no real reason for coming to any conclusion on any subject ; because in every case our reasons are simply dependent on probability, and not on mathematical demonstration. Then,—to take a point mentioned by a speaker before Dr. Thornton,—Why do not men of science inquire into the reason of things ?—

The CHAIRMAN.—It was not asked “Why do not men of science inquire into the *reason* of things ?” You are imputing an expression never used by Mr. Manners.

Mr. WARINGTON.—I mean the reason why bodies have certain properties—why laws exist. I understood he asked why men of science did not go further, and ask why bodies have certain properties ? If it is the fact, however, that we are unable to go back to this primal cause, is that any reason for our not taking the amount of scientific knowledge we have, as a fair ground and basis of reasoning ? Can we arrive at the primal cause of anything ? No. In any subject, the instant you go back to what is the primal cause why such and such a thing is, you are at sea ; and therefore there is no blame to

physical or natural science, if it also fails in this particular. Thus there is no valid reason why the deductions of science may not be used in considering miracles. I notice this point, because I am loath to see arguments put forward which will not bear scrutiny. There are so many at the present day who are inclined to scrutiuize everything put forward on behalf of miracles, that it behoves the defenders of miracles to be cautious what arguments they use. Then to come back to the paper itself; there was one point which seemed to be a little overdrawn—that which referred to the unchangeableness of God. Mr. English argued, because man was free, God must be free; because man in his freedom did not always do the same things, but his actions were varied, there must be a larger latitude of freedom and of variableness assigned to God. If you look at the two statements, the parallel seems striking; but go lower, and it seems to me the parallel drops out. Why is it, that man having a free will, produces variable results? Because his knowledge is imperfect, and he does not know what is best for himself. If his knowledge of nature was perfect, if he was perfectly aware what was the best thing to be done, his will would be unchangeable; he would do one thing and never swerve from it, and with all his freedom of will there would be absolute uniformity. Is not that the case with God? Has not God not only perfect freedom, but also perfect knowledge, perfect acquaintance with what is best? Does it not therefore arise from the nature of God, that His work is uniform and unchangeable, just as that from the nature of man his work is un-uniform and changeable? It seems to me that this point was overlooked by Mr. English. I am quite aware that he adduced reasons further on in his paper, which account for God's interference with the uniformity of nature, but I submit that this one point of comparison was overdrawn. Then I will make two further remarks; first, on the essence of a miracle. What is the essence of a miracle? It is, that it contradicts the uniformity of nature; for if not, it would be no miracle at all. And further: that it not only contradicts the uniformity of nature as seen in outward phenomena, but as the result of scientific law. For if we can show that miracles thus regarded were not contrary to nature, but were really in harmony with law, they would at once cease, upon this view, to be miracles at all. Therefore, it was essential to the very nature of miracles that they should be contrary to law; and so when advocates of miracles endeavour to reject the idea of a violation of the uniformity of nature, they are really cutting their own throats. One word more, as to the purpose of miracles. I take it that every miracle was performed, not as matter of evidence for another thing, but as matter of evidence in itself. I think that point has been too much overlooked. When you find in the Gospel history one miracle following rapidly after another, you cannot say each was performed as an evidence of something beside itself; but you can say that there was always an object for the miracle *in itself*,—a direct object, which we must hold as the true one, the indirect object merely as a subordinate one. I believe these two points have not been thrown out in the paper itself, nor in the remarks of those who have spoken. I do not say they are original: it struck me however that they

were of sufficient importance to make it worth while to add these remarks.

Captain FISHBOURNE.—It strikes me that Mr. Warington has misunderstood Dr. Thornton. Dr. Thornton said this;—that we observe phenomena and deduce a law from that; but this was a “law,” he said distinctly, with reference only to us, and not binding upon the Creator; that it was, after all, the law merely of our finite faculties and observations, and might not be true theory, but that by further observation we might arrive at the fact that we had not known the law at all, and therefore our arguments would fall to the ground. He specifically said that the tendency to measure the Infinite by our finite conceptions was tending to deify man and lower the Deity. That I think was his view; and surely that is the tendency of such reasoning.

Rev. Dr. IRONS.—I should be sorry that a subject of such importance should come before us without receiving grave consideration, and you will readily believe that it is one which could not but have occupied my mind frequently in the closest way. I feel that much that Mr. Warington said was extremely valuable; but from one part of his speech I must beg to differ, because his view seems to me almost to destroy the very essence of volition in the Deity. I suppose it is quite competent for the All-Perfect Being to make His own creation according to His own choice, and all “very good.” But I cannot conceive of the All-Perfect Being being so fixed in one volition as to be unable to make another creation. That seems to me to be almost an Atheistic conclusion. I must be forgiven for saying that, because I am sure nothing was further from Mr. Warington’s thoughts than any such conclusion; but it seems to annihilate God, if we deprive Him of volition or choice. Passing from this, which was the principal if not the only point from which I differ, in Mr. Warington’s remarks, I would address myself for a few moments to the great question which is before us; because if this Institute is in any degree to affect the general course of thought in the scientific world, or the world of literature, it must deal carefully and closely with such a subject as the present. It appears to me that we overlook the fact that the whole course of discussion and controversy on this subject seems as if intended to place the advocate of Christianity at a disadvantage. It is assumed at the outset that there is one and only one “order of nature.” In the next place, it is taken for granted that the order of nature is linked together by inexorable consequence,—a law of causation absolutely inviolable. Then it is concluded that any revelation that comes forward must put in the foreground a violation of that order of nature as the very guarantee which it produces for itself. And lastly, it seems to be assumed that we are bound to accept the word of any violator of a law of nature, as though the power of his violating that law constituted him a teacher for our consciences. On all these points, I take my stand. I decidedly object to that way of putting the whole question. I do not think that there is only one law or order of nature. We may grant that there is already ascertained by the observation of mankind one general and pervading physical law, as we term it, extending not only throughout

this world, but, according to the remotest observations which we have made, reaching to the most distant objects. But there is another order of nature besides that which regulates the starry system. The order of nature which there prevails is surely entirely distinct from the laws of right and wrong in the human conscience, for example. There is a moral order of nature—an entirely different thing from that material or external order of nature. I do not say they come into collision, but I mention that moral order of nature to show my position, that we are wrong in assuming there is but one order of nature, and that all things are ruled to happen in one way. I point to the laws of right and wrong, of justice, generosity, and truth, between man and man, which cannot be altered or changed by our mere will or caprice ; for what is equity here cannot be *unequity* elsewhere. By the general conscience of mankind these laws are acknowledged ; and therefore, I say, there may be other orders of nature besides that moral order of nature. I entirely dispute the assumption, as unfair to the whole subject, that there is but one order, and that a physical order of nature. But not only do I object to that assumption, but to the assumption, for which we have not yet I think sufficient data, that the physical external order of nature is bound together by such inexorable principles of causation as that it is utterly inconceivable that any natural laws should reverse or change. Now it is perfectly conceivable, I do not say it is probable, that the doctrine of Mr. Hume in the last century may eventually be accepted as truth in philosophy. Mr. Hume affirmed there was no such thing as efficient causation in nature,—that one event lies by the side of another like two stones in a quarry ; and Mr. Mozley, in the book referred to by Mr. Warrington, has actually assumed Mr. Hume's principles ; he has taken the very doctrine of the sceptical philosopher, and has argued for the doctrine of miracles from Mr. Hume's premises. He seems to me, however, thus to destroy the very foundations of theology in his eagerness to construct an argument for miracle. Mr. Mozley says :—“Philosophers now are agreed that there is no efficient connection between one event and another.” That is his argument ; and thus he destroys the whole ground for believing in God Himself, or the Great First cause. Anything more monstrous I could scarcely conceive. Yet the *Quarterly Review* has praised his lectures, which are sceptical, and the University of Oxford, I am sorry to say, has received them with almost unmixed applause. I ask any gentleman present to give himself the trouble of reading the first two of those lectures to test what I have said. I am only referring to this, however, to illustrate the proposition that it is entirely an assumption, an unfair assumption, that efficient causation is beyond all relaxation defended *ex necessitate*, by theologians more than others. If any party in the scientific or theological world has an interest in defending it, I should say it is the scientific men ; but if they repudiate it, that is their affair. They will find it difficult to proceed without it. In the next place, suppose we were to grant these two concessions, then we have to meet a third difficulty. If we grant there is but one order of nature, and yet find morality must be in some way twisted into the physical order of things ; and if we concede that there is efficient causation which

cannot possibly be evaded ; still the third difficulty in our pathway is this, that this invasion of the necessary efficient causation of things is absolutely to be fastened upon us as a condition of revelation. I see not, if it pleases God to give us revelation, why He may not give it us with or without miracles, as He pleases. I am not prepared to bind myself down beforehand to any such philosophy as this, that if it pleases God to reveal Himself to man, He shall and must of necessity work a miracle to convince man. No : the difficulty in my mind at once is this, that if there be such a necessity, then every man who has an interest in revelation can demand a miracle for himself in particular. If the thing *ex necessitate* belongs to revelation, and if it must be guaranteed to man's mind in that way, we might all demand miracle. We shall at once acknowledge there is a difference between seeing a miracle and having a record of it handed down through very distant media, requiring a great deal of testing. I cannot conceive of miracles wrought eighteen hundred years ago, in order to be tests of faith for us in the nineteenth century, as standing on the same footing exactly as miracles wrought before our own eyes. So, if men are determined to put theological argument on such a basis, they may require a miracle for each of us. But, supposing these assumptions and difficulties were got over, we come at last to this. Where is the necessary connection between the working of a miracle and the convincing of man's conscience of right and wrong ? For if we admit our own records, if we admit the Holy Scriptures, we shall see that miracles are very far from being confined to good agents. Pharaoh's magicians are said to have wrought miracles as well as Moses. I do not see how, on purely natural principles, there should be any connection between the working of a miracle and the truth of the doctrine of the man who worked it.—Now, thus far we have been speaking of miracles without at all defining nature, and I have not heard anything like a definition of what we mean by nature. We come here upon a wide subject, which our scientific men seem to me to take a great deal of pains to avoid. I recollect that Cuvier, in the beginning of his *Animal Kingdom*,—I think in the first chapter,—takes pains to describe what he meant by nature. He meant the properties, first of all, distinguishing any individual being ; so that the properties of a man or of a stone are not the same. The nature of one is not confounded with that of any other. We know what this means ; the human being has human nature ; and however difficult the definition may be, I am not prepared myself to find fault with this definition, that the nature of an individual is that which constitutes him with certain properties, so that he is what he is. We are taught in Scripture that God's nature (I speak with reverence) is best defined "I am that I am." But, beyond this, Cuvier says there is a law of relation which prevails, connecting various natures or classes of being. That is the all-pervading law which he calls general nature. This individual and this general law of nature ought to be thoroughly apprehended by us before we can speak of exceptions to the law. Put before any man anything astonishing, and, if ignorant, he will think it a miracle. If he does not know very well the laws of his own being and of general being, he would be likely to err on that subject ; for we cannot

arrive at any clear conception of a miracle unless we have a wide acquaintance with nature—

MR. REDDIE.—May I interrupt the Reverend Doctor? I think we had better assume that we do know something about nature, and discuss miracles; or I do not see when we shall draw our arguments to a close.

THE CHAIRMAN.—I am exceedingly interested in what I am hearing; but perhaps Dr. Irons will be kind enough to bring his argument more to the subject of miracles, for time presses.

REV. DR. IRONS.—I feel there is justice in Mr. Reddie's suggestion, that the course on which my mind was entering, might take further time than is convenient to-night. I will now, therefore, confine my observations to a narrower compass. I was saying we cannot understand a miracle, unless we form to ourselves an idea of what we mean by nature; and here seems to me to be the great difficulty in which this whole discussion is involved. People assume that a miracle is a violation of a law of nature. That is somewhat premature. Why may it not please Almighty God to perform other actions more astonishing and more surprising than anything apparently yet performed by Him? Miracles may or may not be what they seem to us to be, "violations of the law of nature," but I shrink from saying that God violates His own laws; I do not like that way of putting it. He performs, let me rather say, supernatural things; but any being who performed a wonderful thing, if greater, wiser, and mightier than myself, would seem to me to be doing something surprising—in other words, a miracle; and we are not in a position to say how far what is so done is a violation of natural law, or whether, if it be so, it is not also in conformity with some higher law. I will now condense in a sentence or two the practical conclusion to which this argument should lead. A Divine revelation, we may be sure, will speak for itself. We believe God has given two revelations: we acknowledge that God has spoken by Moses and Christ. There are the Jewish and the Christian revelations. Let any man look now at the Jewish people, he there will see what a standing miracle that people is. I defy any one to study their history, without feeling there is something more in that history than is the result of natural causes. It is a miracle. There is a real revelation. It is a miracle quite apart from the miracle of the Red Sea, or others that were wrought, as recorded in the Old Testament. The language itself, the existing Jewish nation and institutions, are absolutely supernatural. You cannot look in the face of the people at this day—they are living like the burning bush, unconsumed from age to age—without feeling that God really did a supernatural thing in taking that family and stamping a character upon it for Himself and for us. They may deny revelation, or own it; there they move, and wherever they exist, they tell that God has done it. So also the Christian revelation. I do not appeal for its proof to any one of the recorded miracles of the New Testament; I appeal to the thing itself. There was (the world said) a young man, a Galilean, put to death in the reign of Tiberius. In the reign of Constantine, that young Jewish peasant was *worshipped*,—worshipped through-

out the Roman world! That is a miracle;—let the infidel make what he can of *the fact*. We point now to the simple words of that same Jesus of Nazareth, that the gates of hell should never prevail against the system He was going to found; and we are quietly confident; we know, come what may come,—*ruat cælum*,—science and human knowledge and power, and “heaven and earth shall pass away,—*but His words shall not pass away.*”

Mr. REDDIE.—I must apologize to Dr. Irons for interrupting him. He will quite understand that it was only because our time was pressing, and I was anxious to bring him back from very wide questions as to general nature to the subject of miracles. Taking his concluding observations, however, I must say that I do not think that even they quite bear upon the precise question we have before us. They are most interesting and important, I admit; and no doubt, in a certain sense, the propagation of the Christian religion and the existence of the Jews among the nations, are what we might call, in common parlance, “standing miracles.” But we are now discussing “miracles” in the ordinary sense, as signified by a precise word, having a definite meaning. The question is not one of the super-naturalism of revelation, or of grace; neither is it a question of the marvels of nature, many of which were referred to by Mr. Manners in very eloquent terms. A stranger present might suppose that nobody here understood what we were talking about, or really knows what a miracle is; and yet every common person in Judea knew what a “notable miracle” was! In order to discuss our subject, we do not require to know all the laws of nature. Nobody ever alleged either that miracles were violations of all the laws of nature, or that they are standing violations of any natural law. Such a statement, if ever put forward, would be inconsistent with simple fact. We have only to deal with miracles as exceptional violations of distinct and simple laws, with which we are perfectly well acquainted. For instance, the very first miracle that our Lord wrought, was to convert water into wine. Now, we know that by the laws of nature, water will remain water, and we cannot even *conceive* any “higher law,” of any kind whatever—I put it to the most fertile imagination of the most imaginative man of science or modern theologian—we cannot, I say, conceive any possible “law” by which water could ever become wine. I must further say, that I think it is a great mistake to attempt to defend miracles upon any such principle as that they may perhaps be the results of other “laws.” The very gist of them, the very object for which they were wrought, (and I think, in saying this, I shall yet gain the assent even of those whom for the moment I oppose,) was to show that they were wrought independent of all law, by means of the direct power of God. Even the very opening sentence of our paper, speaks of them as the “miraculous interpositions of the Almighty;” and that is exactly what a miracle is. I must, however, quarrel somewhat with Mr. English’s more formal definition. He divides miracles into three classes, direct, mediate and providential; but I venture to say that only one of these classes is what we have properly to deal with. As an instance of a “direct miracle,” he takes the act of creation as being the direct act of God. Well; if so, then every marvel of nature, such

as our own existence, is a miracle. Of course our life is marvellous,—all God's works are ; but still this is not what we mean by a miracle—

The CHAIRMAN.—I think that the creation of matter out of nothing is a miracle.

Mr. REDDIE.—As a fact, when we speak of “the miracles of Scripture,” we do *not* include creation. Bishop Butler properly argues that creation is antecedent to law ; but the “miracles” we speak of were wrought after creation, and so they come after law ; and therefore they are not the same as the “miracle of creation,” if you will call creation a miracle—

Rev. Dr. IRONS.—They might belong to another law, although not that law. I pointed out two laws at least.

Mr. REDDIE.—I am prepared to maintain that miracles do not belong to any “law” whatever ; and I shall be glad to hear what can be said in reply, when I have finished my argument. Then we come to what Mr. English calls “providential miracles”—the swarms of flies and of locusts in Egypt. Now, I say that these, but for the intervention of Moses in having put forth his rod and summoned them, as it were, and they having come when called, would not have been miracles at all. A cloud of locusts or a swarm of flies now, however great, would not be considered as miraculous ; and, in fact, such things are not in themselves miracles. Besides, if we take the whole facts of the case, these miracles, as defined by Mr. English himself, simply resolve themselves into what he calls “mediate miracles,” for they “were wrought by God through the instrumentality of a chosen agent,” Moses. Those “mediate miracles,” I contend, are the only “miracles” we have to deal with ; for I know of nothing which is commonly called a miracle, except what has been wrought in that way.—But it is a mistake to suppose that scientific men have invented the statement that miracles are violations of the laws of nature. It is the language of our own orthodox and best theologians. And on that point I must agree with Mr. Warrington, I must differ from Mr. English, and I must defend Mr. Baden Powell. It is not often that I find myself on the same side of an argument with that writer ; but truth is truth ; and I think I shall be able to prove him right, and, in justifying him, I shall give such high authority for the statement that miracles are necessarily violations of the laws of nature, as will not be lightly disputed by any theologian present. That language, in fact, was only adopted by Mr. Powell, and not invented by him ; for, in addition to the passage Mr. English has quoted,—in which Bishop Butler says that “the only distinct meaning of the word natural is stated, fixed or settled,”—there is another passage in the *Analogy* (Part II. chapter 2, § 2,) which defines the word *miracle* in these terms :—“A miracle, in its very notion, is relative to a course of nature, and implies somewhat different from it, considered as being so.” In other words, if it were not contrary to nature, it would not be a miracle. But to turn water into wine is a miracle. You may deny the fact of the miracle ; but if you admit it, its character is unquestionably this, that it is contrary to that stated course of nature by which the water would remain *in statu quo* : it is a violation of this ordinary course, or “law,” of nature ; and

I can find no difficulty about "the expression 'laws of nature,' such as our essayist and some previous speakers seem to have felt. Mr. English gives the instance of the hand, by the human will, arresting the fall of a stone; and he speaks of our being "able to control the forces of nature" by our will; while Mr. Penny says that "every act of man may be called a miracle." Well, I am as much a part of "nature" as the stone is; and though my powers are different from that which presses down the stone, and from any inorganic force in nature; still, to exercise my power to arrest the fall of a stone which is not too heavy for my strength is no miracle. I must protest against this confounding of terms. The use of philosophical disquisition is not to confound and confuse, but to discriminate and analyze. Were I to arrest the fall of a stone a ton in weight, of course that would be considered superhuman; but whether it was truly supernatural or not might be a question, as we know that some men have *naturally* extraordinary strength. If I were to say I could do this, although it was known that previously I could do nothing of the kind, and if I attributed this power to God, people might well believe it to be a miracle. I further think that Mr. English made a mistake in attempting to find a theory of miracles, or an argument in support of them, that would include the sceptic. And I not only think he has failed in this attempt, but that it would have been a pity if he had succeeded. I say so, because in this matter "the sceptic" means the denier of the power of God—not merely a sceptic as to revelation, but rather an atheist,—and it would only be doubly irrational to believe in miracles and not in Deity. I am glad also to find that throughout the paper (the whole tone and main arguments of which I agree with, though obliged thus to criticise,) the real view of the writer crops out in spite of his intention to discuss the question "without reference to the omnipotence of God"; for in one place he speaks of miracles as "God's miracles;" in another, as having for "their *efficient cause* the active power of God;" and, in fact, throughout his paper, as summed up in his concluding words, you will see that his whole argument has really reference to "the Cause of all causes;" and I must say I should not know the use of miracles at all if they did not especially and purposely point in that direction. But I think I now have nearly done with criticism as far as it must appear to be adverse to the paper. There is, however, one incidental passage I must notice before I proceed further to substantiate the general drift of the paper by a new argument not hitherto advanced. The passage I refer to is where the Almighty is described as being "an Eternal Now—with whom there is no past nor future." I am aware that this has become a mode of speaking of Deity which might almost be said to be fashionable; but I must object to it, if meant to be taken literally. At all events, as we cannot be supposed to comprehend Deity, and if we cannot ourselves understand how "past, present and future should be as one"—if to us such a notion is absolutely unintelligible—and if this notion is merely a conception of our own applied to Deity, then I must protest against it; and I will point to a single passage in Scripture which is entirely in opposition to this view. Christ as God is described as "Alpha and Omega, the beginning

and the ending"—“which *is*, and which *was*, and which *is to come*—the *Almighty*.” So there is a Scriptural definition that expressly applies the past, the present and the future to God’s very existence; and surely the very idea of eternal duration implies the past and future *as much as* the present.—Now I come to my new argument, and to what I consider the best way of treating this subject. We have not, as I have said, to deal with the laws of nature generally. Miracles never professed to set them aside; but yet they have never happened without violating some particular and ordinary law. For instance, take the second miracle of our Lord in Cana of Galilee—the healing of the nobleman’s son. I am aware that the fact, that some of our Lord’s miracles were performed by the imposition of hands, has led to some foolish modern speculations that perhaps they were all accomplished by some kind of mesmeric operation. But, in this instance, any such notion is at once refuted; for here Christ only speaks a word, when at a distance from the person healed; He merely says, “Thy son liveth.” There is no medicine, no natural means, not even a touch employed: only a word, and the natural progress of the disease is at the instant arrested. Now, I put it to any man, whether this can be even imagined to be the result of anything but the mere fiat and will of Deity? And then, when we come to consider the great majority of Christ’s miracles, what were they? Did they violate or infringe the laws of nature? Yes; but *what* laws? Not the mere physical laws which are invariable; but those that affect moral agents, and are, I may say, out of gear. There is evil as well as good around us: the moral system, we know, has gone wrong; and, as a consequence, some of the physical laws of nature, especially those that affect moral agents, are also awry. Now, Christ’s miracles were mainly wrought to put these straight;—not to violate or infringe God’s original laws of nature, but to vindicate and restore them to what they were at first. Evil is permitted in this world, but its author is not God. The laws of nature affecting moral agents are *not* “invariable” and congruous. For instance, there is health and disease, beauty and deformity. Let me interrogate any sceptic upon this point. Do you call disease natural? But, if so, is not health also natural? But they are contradictories—health and disease are opposites;—and which of them was God’s original law of nature? When Christ told the man with the withered hand to stretch it forth, and made it whole with a word, was that to violate an original law of nature? No; it was to restore one which was already violated, to set right a law of nature that had gone wrong. Philosophers, whether they choose or not, in some cases, only to recognize the physical laws affecting inanimate things, cannot shut their eyes to the existence of those other laws and operations which affect moral agents. They cannot deny that health and disease, though both in a sense natural, are nevertheless at issue, and contrary and conflicting. They may not ignore the existence of moral evil and of disease. They must go into that question if they will discuss miracles. It is not a matter of choice that they may overlook these things, and only regard such laws as those of light, heat, electricity, or gravitation; about which we are always changing our opinions after all, and are perhaps most profoundly

ignorant, with the greatest professions of knowledge. Besides, the "laws of nature" which miracles have infringed are not reconдите, theoretical "laws," but *obvious* and ordinary laws. And it is a serious mistake to attribute everything in *nature* to God, as if there were no evil or opposition to God's will in the world. But I will give you the express testimony of our Lord Himself to this view of the subject, that His miracles were wrought to interfere not with God's original laws of nature, but rather with Satan's perversion of them, and with the evils arising from the transgression of man and the sin in the world. For what did Christ say when He healed the bowed-down woman? He asked, "Why should not this woman, *whom Satan hath bound*, lo these eighteen years, be loosed from her infirmity?" To set her straight, then, was not to violate God's law, though it was to violate what was then a "law of nature," but of *nature diseased*. No; it was to set aside a law of nature which had its origin in the power of Satan, and to vindicate and re-establish God's original law of health and strength. But surely that is the very drift, the very essence of all the miracles of Christ. What were the disciples of John the Baptist to tell their master? "That the blind receive their sight, the dumb speak, the deaf hear, the lepers are cleansed," &c. Well, whether blindness is natural or not, at all events, when a man is born blind, it is the law or rule of nature that he should remain so; and Christ violated that law of nature. But if you do call blindness natural, surely you will admit that it is nature a little out of gear; or else seeing would not be natural. I am quite sure, if we had a Socrates here, and if some of our sceptical philosophers were bound to answer his interrogations as they used to do of old, and not shirk answering questions, he would soon put them into an untenable position when speaking about the uniformity of nature's laws, if we include those laws which affect moral agents. It is a remarkable fact that there are few miracles in Scripture which deal with physical laws alone, I mean apart from moral agents. The first of our Lord's miracles was, however, one,—that of changing water into wine; and you cannot imagine how such a miracle could be performed except as being the fiat of the Divine Will. But if we consider that it was to give the blind sight, to restore hearing, to heal disease, and generally to help those who were afflicted, that Christ's miracles were done, we must see that it is no objection to miracles that they are violations of what we call nature, but that that is even their merit, and that instead of being violations of the original laws of God, they afford the best proofs of God's power and goodness in vindicating His own laws of nature, which once were all and only "very good." So Christ, as "stronger than" "the strong man armed," cast out devils "with the finger of God," and so infringed the power of evil. These are miracles that, I may say, define themselves by their character as Divine; and they have nothing in common with lying-wonders, or jugglery, or any deeds of darkness. Before I conclude, I should like to quote another passage from Sir Matthew Hale's work on *Man*, in addition to the very brief citation from it in Mr. English's paper. I think you will be interested in hearing it. It contains the very same idea that runs through the paper; and you will see that both

authors know, after all, what are the laws of nature which miracles infringe ; and that it is only a mode of speech when they say that nature is not violated:—

“For although the Divine wisdom hath with great stability settled the laws of His general Providence, so that ordinarily or lightly they are not altered, yet it could never stand with the Divine administration of the world, that He should be eternally mancipated to those laws He hath appointed for the ordinary administration of the world. Neither is this, if it be rightly considered, an infringing of the law of nature, since every created being is most naturally subject to the sovereign will of his Creator ; therefore, though He is sometimes pleased by *extraordinary* interposition, and, *pro imperio voluntatis*, to alter the *ordinary method of natural or voluntary causes and effects to interpose His own immediate power*, He violates no law of nature, since it is the most natural thing in the world that everything should obey the Will of Him that gave it being, whatever that Will be, or however manifested.”—*Prim. Orig. of Mankind*, p. 36, folio ed., 1677.

From the whole tenour of this passage,—“the law of nature” being used in the singular, and explained to mean “the Will of the Creator,” while it is admitted that “the *ordinary method of natural causes and effects*” is altered or infringed,—it would seem that the author did not intend to deny (in the modern or literal sense) that “the ordinary courses (or laws) of nature are violated” by the “extraordinary interposition” of “God’s own *immediate power*.” But, if he did, then another passage in Sir Matthew Hale’s work shows us that he could not stick to his own proposition ; for the truth crops up in him as in Mr. English’s essay, and enables us to see that miracles must refer us to Deity and the Divine Will, and not to mere imagined “higher laws.” He says :—

“In that administration of special Providence which is *miraculous*, God commanded the fire not to burn, stopped the mouths of lions, and *prohibited the natural operation and agency of natural causes*.”—*Ibid.*, p. 41.

If Dr. Thornton had remained here, I would have told him that the Author of nature does vindicate His laws, when not miraculously suspended ; for if Dr. Thornton were to put his finger in the fire, he knows that naturally, and without a miracle, it would burn. I will now only say, in conclusion, that I think Mr. English’s paper a most valuable one, although in some respects I differ from him, and have been obliged to criticise his arguments. But I am glad to think that Mr. English himself is of opinion that fair criticism can never do any harm.

MR. WARINGTON.—May I say one word in explanation of my remarks ? I am quite aware that the expressions I made use of as to the unchangeableness of God, if taken by themselves, would be capable of the construction of Dr. Irons. I made them simply in correction of what I thought was an exaggeration the other way in the paper, saying at the same time that Mr. English had urged reasons quite sufficient to account for a change in the action of God taking place.

MR. REDDIE.—Let me also add one word which I omitted as to the miracles of the loaves and fishes. Christ fed 5,000 people with five loaves,

and 4,000 with seven loaves, and how many baskets of fragments remained ? Twelve and seven. Now, had it been by any "law" that the food was multiplied, the basketfuls over would have borne some proportion to the original quantities of food and the numbers of the people, whereas it was just the reverse ; and our Lord seems to have drawn special attention to this circumstance, as if by anticipation to refute this theory of possible "higher laws."

Rev. Dr. IRONS.—In this order of things, that would be so ; but is there no other order of things ?

The CHAIRMAN.—A very important subject has been brought before us, if not the most important subject that could be brought, because it is one now coming before all the scientific, and all the thoughtful minds in the country. It is the one of all others that thoughtful men now want to hear about. Some men require to have their faith strengthened, and others to be converted to a right faith in the matter. I must say I do think a great deal of the discussion about miracles arises from the infirmity of our human intellect, and the great difficulty we have in defining things ; or, when defined, in reasoning strictly upon our definitions. It may be, and it has been said against the theologian, that he does not give a strict definition of miracle ; but I want to know where we have strict definitions, even in science ? If we are to wait for knowledge on most scientific subjects until we have strict definitions, I maintain we shall find we have but little knowledge left. I would ask physiologists what is their definition of life ? I have heard the best-reputed physiologists of the day confess that they could give no definition of life ; and we may be excused if we can give no very correct or logical definition of miracles. We have to regard certain facts and phenomena which are brought before us in Scripture ; and, if from God, we should conceive they would be such things in their nature as to force themselves, not upon the attention of the philosopher merely, but of every observer. I think a great deal of the argumentation against miracles has arisen from the definitions which men have given of miracles. A miracle in itself, taking the word in its ordinary sense, means something wonderful ; and we can understand, with the author of the second paper, how everything around and about us that is marvellous is to some extent also miraculous—a thing to be admired and wondered at. But on the point under discussion, in what way does Scripture speak of miracles ? They are spoken of in Hebrew, I believe, under three or four distinct words ; in the Greek Scriptures by as many, and we find these terms used co-relatively and synonymously, and translated in our version by the words "miracle," "signs," and "wonders." Miracles are signs, or wonders,—that is, signs or wonders of such a character that the most casual observer sees there is something in them more than man can do. There is no definition in Scripture about nature or violation of laws of nature ; but there is something that strikes the observation, and shows the presence of supernatural power. That is the scriptural character of a miracle. I think it is that character of miracle which the defender of Revelation is called upon to defend. He is not called upon to defend Hale's definition of

miracles, or Butler's, however much we may bow to their great intellects. But then we must remember there is another aspect of miracles in Scripture. Scripture brings before us the important fact that these, what we call in common language supernatural events, which force themselves on the mind of the observer as from something higher than man, emanate not from a good source alone, but many also proceed from an evil one. I think this was distinctly brought forward by Dr. Irons and another gentleman, and it is important for the consideration of the subject. I believe that Satan did take our Saviour by a miracle from the wilderness where He was, and placed Him upon a pinnacle of the Temple. I believe that by as great a miracle he also showed Him on a high mountain, whither he conveyed Him from a pinnacle of the Temple, all the glory of this world in one moment of time, though I may have but a very faint conception what the marvellous deed was. And I know that the same Scriptures have also told me, for my instruction and my warning, that the time will come when signs and wonders—the same terms used precisely in the original, for the good miracles of Christ and His followers—will be used by the Father of Lies for the purpose of deceiving even the elect. But I am afraid I am breaking the law I laid down for others. It is late, and there is a great deal I should like to say on this subject of miracles from the point of view which seems to be the grand stand-point of many natural philosophers. I believe their difficulties arise from a misconception and misuse of the term "law of nature." I may give such a definition of a law of nature that a miracle is no violation of it at all; or I may give you another definition, such as Mr. Reddie has given, in which there is a violation. There are things, which we need not be acute physiologists to know; for though the most advanced could not tell exactly what life is, the merest tyro could distinguish, in most instances, a living from an inanimate, or an organic from an inorganic object. There is a general sense of the term "nature" which may lead us to acquire a definite idea of the expression "law of nature." What is the distinction between a work of nature and a work of art? You might find it hard to define them; but if I brought before you a brick, or any other work of man,—any work of art, a microscope, a telescope, a watch, a chronometer, or anything like that—you would have no difficulty in saying, "That is a work of art, and not a work of nature." What do you mean by a work of art? It is the result of the human mind acting upon the productions of nature—

Dr. IRONS.—That is the definition of Cuvier.

The CHAIRMAN.—We have that definition, and it appeals at once to our intellect. I know, if I wanted to puzzle a man, I might bring a certain thing and say, "Is that animal or vegetable, animate or inanimate, living or dead?" and if you take an extreme case, you might puzzle any one. I might, for instance, bring a model of a crystal, which I might cut out of a certain substance, and it would be a work of art, and contrast it with a work of nature, a real crystal. Let us reflect upon a work of art. It leads us up to something, it teaches us a power in mind, (and I think that is the definition Dr. Thornton wanted to express)—power in man's mind controlling the powers

of nature ; but we use these terms in a subordinate sense. This conception of a "work of art" leads to that of a "work of nature." If I go to the highest conception of nature, I must go to this, that the law of nature ends in the will of Deity, and that is the highest. If the law of nature ends in the will of Deity, no miracle can be contrary to that law, because all the miracles of revelation are wrought in perfect accordance with the will of the Deity. If we grant Him infinite knowledge—His own book says He foresaw these things, that they are done and must be done, because all along determined upon in the counsels of the Almighty—therefore miracles are in accordance with that higher and grander view of the law of nature. But there may be a lower view ; there is something so distinct in miracles from the ordinary transactions that occur in the world, that the one thing differs as much from the other, and infinitely more, than a work of art from a work of nature. All our Saviour's miracles, all those of the Bible, are of this class. But we must remember other miracles which were wrought for evil, and therefore you must import, if you follow the Scripture, moral considerations when you come to questions of miracle. Our Saviour Himself does it. The Jews said of Him, "By Beelzebub he casteth out devils." They did not deny the miraculous effect ; that was admitted by the people. But how did He defend Himself ? "Look at the works I do ; they are not wrought for the power of evil, but for good. I appeal to my works ; did any man ever do the works I have done for evil ? If so, Satan is fighting against himself. But I am fighting against Satan." And here you have the moral responsibility of every man who saw these miracles, of choosing good from evil. There the moral responsibility was forced upon man, whether he would accept or reject revelation. Now let us go back to the consideration of what natural philosophers tell us of the laws of nature, and see how confined are the notions they can give us. A law of gravitation, or any other law of nature, is nothing more than the general expression of the observation of a succession of phenomena in a certain order of sequence. It is nothing more than that. If you can group a certain class of phenomena and their sequence, and express them in mathematical terms, you say you have a law. For instance you say that ponderable matter everywhere and always attracts ponderable matter with a force varying directly as the mass and inversely as the square of the distance of the attracting matter—that you call the law of gravitation. What do we call the law of reflexion in light ? A ray of light, if it strike an object so as to be reflected, will be reflected always in the plane of its incidence, and make the reflected angle equal to the angle of incidence. We talk of the law of refraction—we say that a ray of light, except its incidence is perpendicular, will have its direction changed, though it will remain in the same plane ; but according to what we call the law of sines, the sine of the angle of incidence will be to the sine of the angle of refraction in a certain ratio. We might be disposed to regard this as a universal law, and it was supposed to be so, until it was found that the law was broken, and that there was a class of substances which divided the ray into two parts, and one followed the ordinary law and the other the extraordinary law. Now, all the

philosopher can do is to point out certain phenomena and include them in some general formula, and when he has included a certain amount of phenomena in one hypothesis, he calls it a law. Now it is assumed, and that I maintain shows the fallacy of the argument against miracles from natural philosophy,—it is assumed with regard to any related fact in the world's history, that we can say from what we know of these laws, such and such a thing could not occur. That we can say, for instance, a man could not be raised from the dead—such an event could not occur. Now I am prepared to maintain, upon strictly mathematical and philosophic principles, philosophy cannot say that; that it cannot even tell us that such a law as that of gravitation is universal. It is said, as a grand triumph, that we know it proceeds to the last planet discovered; it is said it proceeds to the binary stars. Are you sure, with regard to the latter, that it is the exact law? Are you sure it is a law not varying directly as the distance? We will now test this assumption by mathematics or mechanics. If I put on the 1st horizontal row of wheels of the calculating machine in Somerset House, the number 41, under that the number 2 on the 2nd row, and again the number 2 on the 3rd row; the machine could then be set to produce a certain series of numbers for thousands of terms, in due sequence, according to a certain mathematical law; each term in succession being calculated and recorded in stereotype by simply turning the handle of the machine. A mathematician ignorant of the numbers originally placed on the machine, and looking only at the recorded results, would find the series 41, 43, 47, 53, 61, &c., printed in succession. Observing every one of these numbers to be primes, that is numbers indivisible by any other number but 1, he might assume the machine to be set so as to record prime numbers only. The correctness of this assumption would increase in probability till the 40 and 41² terms were reached, when it would be broken by the appearance of numbers not primes. Again the mathematician regarding the law of sequence of these numbers might find that they could all be included in the general algebraical formula x^2+x+41 , by giving successive integral values to x from 0, 1, 2, 3, &c., upwards. This would enable the mathematician to predicate the numbers I had placed on the machine. But I will now give you a case in which he could not do so. I might start by putting on the machine, once for all, such a series of numbers that the recorded results should be the squares or cubes of the numbers 1, 2, 3, &c., in due sequence for any number of terms I pleased, but that at some predetermined term, say the 7,345,671st, the law should be broken. The odds that this breach of law should occur, so far as observation could determine, would be estimated mathematically by millions to one against its occurrence. In this case, contrary to the example I gave in the instance of the prime numbers, nothing in the sequence of the numbers, or in any mathematical formulæ which would express that sequence, could give the mathematician the slightest clue as to the possibility of the occurrence of this breach of continuity in the law of sequence. Now when man is observing the laws of nature, he does not know what is put on the original machine of the universe. There is no interposition

of man, who merely reads the results on the machine; and no natural philosopher can say that any event cannot possibly happen. If he tells me it cannot, I have a right to say, "For aught you know, the Maker of the machine determined at that particular period to meet a certain moral exigency, which He foresaw, and supplied by this operation taking place." I say that Babbage has triumphantly proved such violations of the observed laws of nature to be possible; and (we must always bear in mind) that such events may or may not be miraculous. We read that Herodotus was told by the Egyptian priests that the sun rose twice in the twenty-four hours. "Well," the philosopher may say, "it is not true, it is contrary to the law of gravitation." I say there is nothing whatever in the presumed improbability derived from any succession of phenomena, however great, to show that we can absolutely and mathematically assert that such an event, whether miraculous or not, could not have occurred. If I am told that God heard the voice of man, and caused the sun and the moon to stand still, could I say that that was not one of the things God provided for? There is nothing in natural philosophy to compel me to deny it. When attempting to argue against this miracle, Dr. Colenso tells me the earth could not have stood still on its axis—that its motion could not have been arrested without everything on the earth being hurled into space. But I ask how was the earth to be stopped on its axis? It must be by a power which acted upon the motion of the earth. Now, I maintain that that power would equally apply to the trees and everything else on it. Let me take the rough comparison which Dr. Colenso mentions:—You are in a railway carriage, and a collision happens, and you are thrown forward. Why? Because you are independent of the carriage; but if you were tied in the carriage, and made one with the carriage, you would not be hurled forward. I would ask Colenso to explain by his philosophy, why, when we consider the earth's great velocity, every particle of the ocean at the equator is not hurled into space? It is owing to the gravitation of the earth. This same gravitation would so hold the trees and houses to the earth, that anything stopping the motion of the earth would likewise so stop their motion, as to prevent their flight into space. I would only mention that to show that when men deny miracles as contrary to natural philosophy, we can get sufficient demonstration from mathematics to show that miracles are more probable than improbable—that they contradict no laws which the mathematician or observer of nature is bound to believe; and I thoroughly agree with the important consideration brought forward by Dr. Gladstone, that the unhappy state of men's minds is from confining their attention to the inorganic world. As you rise from inorganics to organics, there are phenomena which would show that all the arguments raised against the miraculous are fallacies. It was well put by Mr. Reddie with regard to our Saviour's miracles, that when you rise from inorganics to organics, the philosopher is bound to admit perturbations and interruptions; that disease is an interruption of the law of health, and that you cannot use the word law in the same sense here as you use the word law with regard to inorganic matter; that

you can have no disease of gravitation, though you have disease of life. But there is a higher thing than even life—the soul of man. Reason is still higher, and rises to higher laws ; and when you find in the moral world there is disease, and remember that the miracles of God wrought in Scripture were to take away sin and its effects, then I say, the Christian can be a scientific man, and receive all the miracles recorded in Scripture, and yet study, with intense admiration and devotion, the works of his Creator ; he need have no fear in investigating them, and he may believe that the works of nature and revelation are in the most perfect harmony the one with the other.

The meeting was then adjourned.

REPLY BY THE REV. W. W. ENGLISH.

To make my views clearer, I would wish to add a very few words. The distinction between mind and matter, and the supremacy of the former over the latter, are points that underlie every essential part of the subject. The will of man is a faculty of the human mind, a *sui potestas*, and the arresting of the falling apple *at will*, is an illustration of the supremacy of mind or spirit over matter, though not a *miracle*, because here the human mind controls matter simply within its own prescribed *limits*. Satan or evil spirits controlling matter within their prescribed *limits* are a further illustration of the same fundamental point. To us their acts, when they exceed what falls within *our* limits, appear, and no doubt are, really *miraculous*, in the true sense of the term ; a miracle being, as Butler and Mr. Birks contend, “relative” and not absolute. The great Spirit of God controls matter and its laws, within His own *limits*—that is to say, without limits ; for He can have none, except such as would be inconsistent with His goodness. To Him there can be no such thing as a miracle—nature, if it includes Deity, (and I see not how it can *exclude* it,) comprises all that is *possible* as well as actual. I am not sure that my short paragraph on what I termed “*the real point*,” bearing upon objections drawn from physical considerations, is of itself sufficiently clear ; but I thought it would have appeared so, in the light of what I said in reference to mind and matter. I have sought to find no theory by which to account for miracles apart from God. I have endeavoured simply to show by a chain of reasoning, that we can account for miracles upon principles apart from the Bible, or an appeal *directly* to God’s sovereignty and omnipotence. Bishop Butler does not disagree materially with anything I have said on the subject. Those “higher laws” I referred to, are *moral* and not physical—those principles, in short, according to which all things are wisely governed. Miracles may be real or apparent infractions of material sequence, but they are, nevertheless, fulfillments of “higher laws” of moral government. Much confusion arises from confining the term law too exclusively to what it can only figuratively

be applied,—*matter*, and not allowing it to be really and properly applied to that from which the term itself is borrowed,—*mind* and *moral agency*. Butler says a miracle is something *different* from a settled course of nature; he does not say it is something *contrary* to it, nor that it does not range under “higher laws” in the scheme of Divine Government. God cannot, it seems to me, act “contrary” to Himself, nor “violate” His own ways or acts; but, in saying this, I do not mean to confine Him to material sequence. In using the terms an “Eternal *now*,” and saying that with God there can be neither past nor future, I did but use the language of the great Augustine, Toplady, and philosophical writers of the present century. God’s own definition of Himself, “I AM,” is very near to an “Eternal *now* ;” and as our notions of past and future are got from our connection with matter, I can conceive of the disembodied Spirit being unconscious of the lapse of time altogether. With it “a thousand years may be as one day ;” and when we read in Holy Scripture, “which *is*, and which *was*, and which is *to come*, the Almighty”—I would say that God here speaks, as St. Paul elsewhere affirms, “after the manner of men.” It only remains for me to thank the members of the Institute for the kind way in which they listened to my paper.

ORDINARY MEETING, DEC. 17, 1866.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous meeting were read and confirmed.

The HONORARY SECRETARY announced that Mr. Alfred J. Woodhouse, M.R.I., had been elected a member of the Council.

The following Paper was then read :—

ON THE GENERAL CHARACTER OF GEOLOGICAL FORMATIONS. By EVAN HOPKINS, Esq., C.E., F.G.S.,
Mem. Vict. Inst.

ALTHOUGH it may not be the intention of the members of the VICTORIA INSTITUTE to support any geological theory, or, indeed, any of the 'doctrines of physical science which may be promulgated from time to time, I presume that papers describing the general *facts* of geology will be acceptable, inasmuch as they will furnish materials and data by which unreasonable speculations may be fairly met and checked.

Had the public at large been better acquainted with the leading facts of geology, many speculations with reference to the world would never have been entertained. It is not sufficient to point out the absurdity of some geological speculations: we should also be prepared to show what are the actual conditions of the surface of the globe, founded on direct observations, in order to satisfy the inquiring mind and lead it in the right direction. The object of this paper is to give a brief description of geological formations according to my own experience, as well as the experience of others, in various parts of the world, which I trust will be of some service in discussing and elucidating questions connected with geology, when they are brought forward at our meetings as arguments bearing upon the Mosaic account of the creation or the origin of the earth. The first step towards establishing the order of deposition of the *Sedimentary* rocks was made about the commencement of the present century by Mr. William Smith. He discovered, during his surveys in England, that there were

apparent sequences in the order in which the beds had been laid down; that the different strata could be distinguished by their fossils; that this order of succession of different groups was never inverted; and, further, that they might be identified at very distant points by their peculiar organic remains. This classification of the sedimentary rocks became then established, each division being marked by its peculiar fossils. The founders of the Geological Society of London thus directed their attention to this theory of deposition, and the active members of the Society have almost exclusively confined their attention to this view of the science from that time to this day.

The ideal geological sections have made this order of deposition familiar to all who have paid any attention to geological works. The ascending order of the sedimentary beds is as follows:—1st, Cambrian and Silurian; 2nd, Old Red Sandstone; 3rd, Carboniferous; 4th, New Red Sandstone; 5th, Lias; 6th, Oolite; 7th, Chalk; 8th, Tertiary. As far as the sedimentary beds of England are concerned, these sections might be accepted as representing the general order and character of the beds, provided they are not made to appear to cover each other over the whole area. Although this order of the beds is not inverted, they are not of equal extent, and are merely found in patches here and there, and partially overlapping each other, where the beds are reduced in thickness and taper away. Hence the sections which represent the beds as uniformly piled on each other, and as of equal extent, from the Silurian and Cambrian below to the Tertiary above, are erroneous. With regard to the Silurian formation, it has not only absorbed the Cambrian, but actually also embraces (very improperly) the *primary* slates. The first mistake made by geologists, in establishing this classification of the fossiliferous rocks, was in assuming that this variety of beds was *universally the same in all parts of the world*. They further erred in attempting to assign to each system a distinct creation, and in naming the series of beds in other countries according to the English type, without demonstrable proof of their correspondence. This hasty and very incorrect generalization, together with the assumption that the fossils were all remains of extinct species, different from those now existing, have caused a very great injury to the progress of geological science, by giving encouragement to extravagant theories.

A mere glance at a geologically coloured globe will show how insignificant, for instance, is the extent of the area of the carboniferous formation as compared with the entire surface of the earth. The same may be said of every other division of the sedimentary series, from the Cambrian below to the Tertiaries

above. As investigations have been extended to distant regions of the earth, more especially to South America, South Africa, Australia, New Zealand, and India, other combinations of beds have been brought to light, showing the total absence of almost two-thirds of the grand series represented on the ordinary geological sections of Europe. Again, instead of finding beds indicating distinct creations, as assumed at one time, the formations present the appearance of a gradual transition of one variety of fossiliferous beds into another as the rule, and those indicating apparent distinctions as the exception. Daily researches show that no real breaks exist between the remains of one formation and another, as was once supposed. We now learn that those forms of animal life which roamed over parts of the earth before man came to encroach and exercise dominion over them, were not destroyed before his arrival, but continued to co-exist with him, though in other localities, until the time came when they were to make way for man and domestic animals more suited to new conditions of life and to man's requirements.

Let us commence in the South, and reflect on the general character of the sedimentary deposits of Chili, Australia, New Zealand, and Tasmania in the south temperate zone. Chili is covered with a great thickness of gravel and sand-beds, in which are found marine remains of existing species. The plains of Patagonia present the same appearance: nothing but thick beds of gravel deposited on the edges of the primary crystalline rocks, as is seen by a transverse section from Rio Santa Cruz to the base of the Cordillera, and in another on the Rio Negro. Beds of recent shells are found as high as 1,300 feet from the level of the Pacific along this coast; and the apparent freshness of the shells indicates that all these deposits are comparatively of very recent date.

In the south of Australia, Tasmania, and New Zealand, are found some carboniferous strata of inferior kind and very limited area. These are deposited on the broken edges of the primary slate. The general superficial deposits are composed of loose gravel and sand, partially cemented here and there by ferruginous matter. These beds contain the same kind of shells as those now seen on the coast, and the bituminous beds inclose fern-trees with leaves of the same character as those now growing on the banks of the Yarra Yarra river and in Tasmania. In Equatorial America the sedimentary beds are better developed, and more numerous than in the south, and they can be examined on their escarpment from the plains of Mariquita to the plains of Bogota; that is, from about 800 feet to 9,000 feet above the level of the sea.

The plains of Mariquita are more or less covered with thick beds of *gravel*, in which are found fossil trunks of coniferæ, fern-trees, corals, and the remains of crocodiles, similar to those now flourishing in that zone. The old sedimentary beds resting on the primary base contain deep-sea shells and corals, similar to those seen along the beach on the Chilian coast. As we ascend the series, we find there seams of coal, containing in the inter-stratified black shale impressions of fern-leaves, but not very abundant. Above these are argillaceous beds inclosing a variety of shells and the remains of fishes. On these, again, are deposited several calcareous beds containing fossils in abundance, such as ammonites, hamites, &c., some of which were described and figured in the *Journal of the Geological Society* by the late Professor Forbes in 1844. These fossils were collected *in situ*, and presented to the Geological Society by me in 1843. Amongst them were eight new species. Finally, the upper part of this great sedimentary formation forms the plains of Bogota, where we find again deposits of sand and gravel containing the relics of gigantic ammonites and oyster-shells. I examined the eastern flank of this branch of the Andes to the sources of the rivers Orinoco and the Amazon, and found very extensive beds of similar character to those seen on the other side; but all their organic contents, with the exception of the ammonites and hamites, were of the same description as those now existing on the coast of South America. I have obtained from white clay seams, impressions of leaves with their green and yellow colours partially preserved, which indicates that the formation could not have been of great antiquity. As we proceed northward, we find the sedimentary beds much more developed than they are in the south, and containing tropical remains, even in high latitudes. If we take Nova Scotia, for example, we find the lower beds enclose only a few deep-sea shells, somewhat similar to those still living in the south. These are covered by the carboniferous beds, in which are entombed tropical vegetation, such as fern-trees, calamites, &c., with reptiles of the existing tropical character; and on these coal-seams, again, are various beds of sandstone-clay and gravels.

I need not dwell further on this subject, as I trust I have sufficiently shown that, although the *order* of the sedimentary beds is never found inverted, their development in different countries is not the same; and the periods of their deposition have been very variable, and that, therefore, they cannot be correlated as to their ages.

THE FORMATION OF THE PRIMARY ROCKS.

The preceding observations refer exclusively to the formation of the *sedimentary* beds, in which organic remains are enclosed. I shall now proceed to describe the fundamental crystalline rocks, on which the sedimentary rocks have been deposited, and in which there are no organic remains.

On reference to the ordinary geological sections, it will be observed that the primary crystalline rocks, which have a more or less laminated structure, such as the gneiss and argillaceous schists, are represented as sedimentary beds, like the superincumbent mechanical deposits; and their general vertical position has been attributed to a tilting action produced by upheavals, &c. During my residence and travels near equatorial America from 1834 to 1842, and again from 1844 to 1848, I had an opportunity of inspecting, surveying, and carefully studying the true character of this vertical structure of the fundamental crystalline rocks, in ravines, and in natural sections, from the surface to 3,000 feet deep. I then discovered that this structure did not arise from the subdivision of sedimentary beds, but had originated from a semi-crystalline action of the primary base upwards, in the direction of the grain; and that vertical cleavage planes gradually and imperceptibly became developed in the subterranean base during the changes and the transitions of the granites into the schistose rocks. I further found, by very extensive surveys across the three branches of the Andes, and for some hundreds of miles from south to north, that this structure was not only more or less *vertical*, but that it had also a *meridional bearing*. Having fully satisfied myself of this great fact, which, as far as I was then aware, had not been noticed before, I referred to the observations of others, thinking that such a striking phenomenon could not have escaped attention.

I naturally concluded that if such great facts as this vertical and meridional order in the structure of the primary rocks had been observed, the subject would have been pursued, and some hypothesis founded thereon. On referring to geological works, I found the following observations:—

Von Buch remarks that “the structure and cleavage-planes of the laminated granite, gneiss, and schist run in a south and north direction, in a position deflecting little from the perpendicular, in Norway, Sweden, and Finland. . . . The same order of structure was observed by M. Boué in Auvergne, and in many parts of Spain, Portugal, and Africa.”—“When I arrived on the coast of Venezuela,” says Humboldt, “and

passed over the lofty littoral chain and the mountains of granite gneiss that stretch from the Lower Orinoco to the basin of the Rio Negro, and the Amazon, I recognized again the most surprising parallelism in the direction of the beds (crystalline bands); that direction was from S.S.W. to N.N.E."

During my survey of the Isthmus of Panama and Veraguas, where the same vertical structure is observed, the Californian gold discoveries were made. American geologists surveyed that gold region, and in their official reports I find the following observations:—

"The auriferous gravel and clay are deposited on the edges of the primary slate rocks. The fundamental rocks are composed of bands of granite, chloritic and micaceous slate, and have been traced running on their edges in a north and south direction for hundreds of miles."

On my arrival in Australia in 1852 I surveyed a very large area of the gold districts, and found the same order of structure in the primary rocks as I had observed in South America and other places. I then published a pamphlet, with illustrated sections of the vertical and meridional structure of the Australian rocks, which was much appreciated by the gold-diggers.—But I shall quote from others who have travelled in Australia, though not geologists, this further account of the general appearance of the exposed crystalline rocks of that country:—

"A great portion of the Australian quartz ridges," says Mr. W. Howitt "runs from north to south over the hills of the gold regions. . . . The clay slates and other rocks are all perpendicular. . . . Some action has taken place which has left them standing *edgeways*. . . . They are always true to the north and south direction, and are nearly as good as a compass where they prevail; and you may trace them for twenty or thirty miles at a stretch, and, no doubt, they extend across the colony."

The official reports of the Gold Commissioners of New South Wales furnish similar descriptions. They all agree in representing the structure of the primary rocks as more or less vertical, and with a uniform bearing north and south. I therefore venture to maintain that the crystalline rocks have not been formed in beds, like the superincumbent sedimentary deposits, but that they have been produced by a semi-crystalline action under the influence of some universal power, which has given them the order of structure which they now present; and which is plainly exhibited in all deep natural sections of all the crystalline rocks in all parts of the world.

I communicated these results of my geological researches in

South America to the Fellows of the Geological Society in 1843, accompanied with large sections of the Andes. I then showed, by means of real geological sections, that the primary slates were not sedimentary beds, but the result of a semi-crystalline action, and that the structure presented a most beautiful geometrical order; that the crystalline rocks were ever active, and that the whole series crystallized from water, and did not present any indication of igneous action or dry heat. These views appeared so novel at the time that but few considered them worthy of attention. I then published the results of my investigations under the title of "Geology and Magnetism,"* so as to place them on record.

In 1850 I again, on my return from South America and the Isthmus of Panama (which I had been surveying), read a paper at the Geological Society, reiterating my former opinions, on the structure of the primary rocks and their aqueous character. An abstract of the paper was published in the Journal of that Society. My views were again strongly opposed, but more especially as regards the aqueous nature of the granite. I then saw it was useless to bring forward such geological facts in opposition to the prevailing igneous theory. Nevertheless, I again brought the subject forward in a long paper, with abundance of illustrations, before the geological section at the Meeting of the British Association at Glasgow in 1855; also in the Institution of Civil Engineers, where it gave rise to a discussion, which was prolonged for three evenings. This paper and my general views were much appreciated by mining engineers, who were acquainted with the true character of the rocks below. About that time, or soon after, Messrs. Daubrée and Bischoff made known their observations on hydrothermal action, or the influence of *water* in the formation of rocks. The result of their investigations was that the minerals which enter into the composition of granite were admitted not to have been formed by crystallizing from a state of fusion, but that they have been derived from liquid solutions, or formed in the wet way.

Professor Ramsay was one of the most determined opponents of my views regarding the aqueous nature of the granite. It is but justice to that gentleman to state that, in complimenting Messrs. Daubrée and Bischoff on the result of their investigations, when President of the Geological Society in 1862, he remarked that "he could not pass over the papers and observations of one of their own members (Mr. Hopkins) on

* *Geology and Terrestrial Magnetism.* By Evan Hopkins, C.E., F.G.S., (Lond.: Taylor & Francis, Red Lion Court, Fleet Street.)

this very same subject, which he had brought before them from time to time, many years before the investigations now referred to were undertaken." He also added, "That he believed that geological science was on the eve of a great revolution."—In the anniversary Address of Mr. Hamilton, President of the Geological Society last year, he made the following observations:—

"Recent investigations have upset the ancient theories. It was formerly supposed that the crystalline rocks, particularly granite, owed their origin to igneous action. Now, it is well known that these granites are chiefly arranged in layers. The granite passes into gneiss, and the gneiss into mica schist and talc schist, and this is again closely connected with the green and grey slates; and it is well known that many of these rocks, formerly considered as plutonic, are really metamorphosed rocks."

These remarks refer principally to the order of the structure, and notice that granite is divided into bands, and changes into the slaty structure, as was described in my sections, and explained in my papers written in 1837 and since.

I shall now quote Mr. Hamilton's observations, in his last annual Address, with reference to the igneous theory, which I had opposed for so many years, and which at length is being given up as untenable:—

"Another point," observed Mr. Hamilton, "to which I would invite attention is one of greater difficulty; it requires the serious aid of chemistry, mineralogy, and the laws of physical forces. The study of the older crystalline and metamorphic rocks has of late years greatly occupied the attention of many of those geologists who have examined the chemical and mineralogical conditions of formations. We are told that heat alone could not have produced the results we see; that water was an essential element in all these metamorphic operations; and we find, in the works of Sterry Hunt, Daubrée, Evan Hopkins, Delesse, Desor, and others, that even a high temperature was not necessary to produce these changes. Many of those results which have hitherto been considered as the effect of igneous action, are now believed to be owing to chemical action. It therefore appears that the time is come when it is desirable to investigate this question,—whether the theory of central incandescent heat is tenable? Whether the plastic conditions of the earth, to which its oblate spheroidal form has been attributed, be not owing to an aqueous rather than to an igneous origin? Water is an essential element in every rock, not only mechanically but chemically; and without attempting to revive the doctrine of Werner, it may be questioned whether we have not sometimes been disposed to overlook the importance of the part it has played in the construction and solidification of our earth."*

* *Quart. Journal of Geo. Society.* May, 1866. Vol. xxii.

Mr. Hamilton, in making these observations on the influence of water in the formation of rocks, appears to have been under the impression that it was reviving the doctrine of Werner. This is a misconception of the *modus operandi* of the semi-aqueous action in the subterranean base, and shows that geologists, with all the advantages of modern discoveries and experiments in hydrothermal action, have not yet been able to comprehend the subject in its true light. The chemical or electro-magnetic wet process of crystallization, the production of metals from solutions, and the aggregation of crystals into large and compact massive rocks, must not be confounded with the old, crude *mechanical* theory, called the "Aqueous," introduced by Werner. It is as different from that, as the formation of a crystal is from that of a brick or a sediment. The one operates by attraction and chemical action, and the other by mere mechanical deposition or precipitation. The former action produces the crystalline rocks, and causes their upward crystalline growth, and the latter produces the superincumbent beds of deposits from substances held in suspension, and carried to lower levels by water.

THE FORMATION OF CORALS.

Before I went to South America, I had been taught to believe that corals were *built* by marine animalculæ, in a way somewhat similar to the formation of the honeycomb by bees.

I have had the opportunity of studying the growth of corals, in great variety and magnitude, on the shores of South America, the coast of the Isthmus of Panama, in some of the islands of the Pacific, in the Red Sea, at Singapore, Ceylon, in the coral islands of the Indian Sea, and on the coast of Australia, but I never detected a single case of a coral being *built* by animalculæ. I have seen, as it were, plantations of corals, cultivated for lime. I have seen their stems transplanted, and have watched their growth, both the mushroom and the arborescent form. The former appears to grow in the water like a fungus or sponge, and the latter has a growth and development like arborescent crystals, such as aragonite, &c. In fact, corals are not *built up* by insects, but are formed and grow like vegetation, having a beautiful internal structure, like the fibres, rings, and medullary rays of the trunks of coniferæ, &c. There are siliceous as well as calcareous plants found growing in the sea, but I shall not on this occasion dwell longer on these formations. My object in thus noticing

the coral growth is to show how much we have yet to learn with respect to the formations and the productions of the earth.

THE GRADUAL FORMATION OF ISLANDS AND CONTINENTS.

We have abundant evidence that the continents were not suddenly formed in their present shape: they gradually acquired it by progressive enlargement of the crystalline growth, and successive elevations and depressions.

Australia presents a good example of this terrestrial action. The wharfs at Melbourne have risen six feet above the level of the sea during the last twenty years; *i. e.*, a rise at the rate of four inches per annum. The coast of Lacedpede Bay has upheaved eighteen feet in the last sixty years. This slow rate of upheaval, if it has continued during the last five hundred years, would be sufficient to raise two-thirds of Australia above the level of the sea. Indeed, a large portion of the interior of that country is still covered with lagoons of brackish water, and the whole of the low lands are strewed over with marine shells, similar to those seen on the bordering coast.

The upheaval is by no means uniform. In Western Australia it is less than in the south-east, and in some parts on the north the land is subsiding. The flat country in Western Australia is strewed over with beds of oysters and cockle-shells, of the species still existing in the adjacent seas, and these are found in various terraces, from two to twenty feet above the level of high-water mark. The remains of a vessel of considerable tonnage have been discovered in a shallow estuary near Vasse Inlet, which is now shut out from the sea. New Zealand, like Australia, is likewise more or less covered by comparatively recent beds of sands and gravel, containing marine shells similar to those now existing in the adjacent sea, occasionally mixed with the remains of terrestrial animals which have only recently become extinct, some of them having been seen alive in the last century.

The elevation of Tasmania is comparatively of a recent date. A great portion of what now constitutes the site of Hobart Town had been under water at a not very remote period. This is proved by the extensive deposits of comminuted shells, all of recent species, which are met with, for miles, along the banks of the Derwent. Some of these deposits are at an elevation of upwards of one hundred feet above high-water mark, and from fifty to one hundred yards from the water's edge, plainly showing thereby that a very recent elevation of the land has taken place. Judging from the condi-

tion and comparative freshness of the shells and corals, the emergence of Tasmania from the sea could not be assigned to many centuries. Indeed, the general aspect of the southern part of Australia indicates comparatively modern upheaval, at first rapidly and then somewhat slowly, but, probably, subject to periodical increased intensity in the subterranean forces, as observed on the coast of Chili.

In the Bay of Panama, along the banks of the river Bayano, I have seen several terraces of marine beds, from the coast to about fifty feet above high-water mark, of comparatively recent origin. Since the town was built the upheaval has been sufficient to render the port worthless excepting for small boats and canoes. Hence the subterranean action is never at rest, and is constantly, although imperceptibly, rising or depressing the surface of the earth. The fundamental base of the dry land is composed of an aggregation of crystals, formed into masses of rocks of various degrees of compactness, from mere pasty consistency to the hardness of quartz, presenting various structures, from the compact granular to the laminated formations known by the names of granites, porphyries, gneiss, and schistose rocks.

The predominating crystals of which the fundamental base, or the primary rock, is composed, are quartz, felspar, mica, talc, hornblende, chlorite, schorl, carbonate of lime, sulphate of lime, fluor spar, &c., &c. Besides these conspicuous crystals there are also disseminated in the primary rocks, either in minute grains or in solution, all the known metals; and these are often seen gradually developed by crystallization from their solvents in subterranean *vacuities*, caverns, mineral veins, &c., and the aggregated crystalline compound becomes active *en masse*.

The crystals of which the primary rocks are composed could never be the production of incandescent matter, as they all require a certain proportion of water in combination for their formation, to which their transparency is in many instances referable.

Thus, crystals of sulphate of lime are of a glossy transparency, and of regular figure: this is due to water; heat them and they crumble into a white powder. Quartz contains from 5 to 20 per cent. of water; felspar from 3 to 10 per cent.; and many compounds as high as 45 per cent. of water. All the rocks, the most solid and compact, lose a large proportion of their weight on being exposed to the sun, and many decrepitate when exposed to strong heat: the weight thus lost being water. Indeed, there is scarcely a substance known but what is either found in solution, or may be dissolved in an

aqueous compound. The apparent insolubility of quartz was at one time the argument held in favour of the igneous theory, although silica was found in solution. Silica is now artificially dissolved, and can be obtained as plastic as clay; therefore there is not a single case connected with the materials of which the globe is composed to warrant the assumption that they originated from fire. On the contrary, all the observed facts confirm the belief that the crystals first came forth and grew from water, and that the lands have gradually risen from the deep.

The evidence of successive elevations and depressions is so manifest as not to require further remarks. The evidence is equally strong that the various deposits of organic remains have not only been lifted from the deep, but have also been carried *en masse* from clime to clime at a slow rate, inasmuch as the deposits of the northern hemisphere, as far as the Arctic region, contain all the organic productions of the world. This subject, however, will have to be treated separately, in connection with the probable ages of geological formations founded on astronomical data.

SUPERFICIAL CHANGES.

The changes going on over the face of the earth are much more rapid than the public at large appear to be aware of. The deposits in deltas are frequently formed in great thickness, in a comparatively short time, by mountain torrents, floods and avalanches. The great region between the rivers Orinoco and the Amazon is intersected by rivers, and covered here and there with shallow lagoons, subject to periodical floods. This country is so overloaded with thick and gigantic vegetation as to render it impenetrable to bulky animals. In these regions man is considered as a being not congenial to such a state of nature. The earth there luxuriates in its gigantic palms, fern-trees, club-mosses, and various rank and succulent plants. The crocodiles, sharks, iguanoes, &c., are masters of the rivers; and the jaguar, pecari, tapir, boa, and a variety of reptiles, rove and infest the banks, and the high grass surrounding the lagoons, nothing impeding their increase; and are almost the sole possessors of the country—as in the imagined primæval world—without fear and without danger of being disturbed by any human being. Were this region to sink 320 feet, the whole surface would be covered by the Atlantic ocean, and the eastern declivity of the Andes would become again what it was before, a shore of the ocean. In many parts of the country are large plains partially covered with gravel,

and periodically subject to droughts, rains, heavy floods, inundations, and denudations. Some of the lagoons become dry, and the thick mud at the bottom, when in a moist state, incloses alligators and other amphibious reptiles during the dry season. They remain entombed like eels, in a somewhat dormant state, and come to life again in the rainy season if the dry lagoons be not in the interim too thickly covered by gravel. In the upper regions during the rainy seasons landslips occur daily, and large masses of forests and trees of colossal dimensions are brought down, and the banks of the rivers and the lower plains become frequently strewed over with the *débris*. Some of the large marshes and lagoons are often changed in a day into plains of gravel, and the sandy plains are converted into lagoons teeming with life. The delta of the Amazon exposed to these periodical floods comprises an area equal to one-half of England.

I remember a great flood and an avalanche which occurred on February 19th, 1845, on the eastern flank of the central Andes. Immense masses of ice and boulders gave way on the upper part of the Paramo de Ruiz, in latitude 5° north, and came down the ravines in awful torrents of muddy water, with ice, large granitic and porphyritic boulders, broken fern-trees, &c., laying waste many square leagues of the hot plains below. The destruction of human beings, animals and property was immense. Two or three rivers in the plains were choked, and their channels changed; and over many square miles of the fertile plains were deposited several feet of sand and gravel, inclosing trunks of trees belonging to the upper cold regions mixed with those flourishing in the hot countries below. The tobacco, sugar and guinea-grass plantations were completely destroyed, and upwards of 1,000 natives perished by this glacial deluge, or avalanche, in less than twelve hours. The quantity of sand and gravel deposited on that day was estimated at upwards of 250 millions of tons. The ice and boulders brought down from the snowy region to the hot plains below killed a very large quantity of fish and reptiles. The beds of sand and gravel may be still seen occupying a very large area, and in places clothed with rank vegetation, but the catastrophe is almost forgotten amongst the inhabitants. Were an ardent young student of geology, trained in the recently-accepted geological theory, to visit this district now, and examine the formation, he might possibly conclude that it belonged to the glacial period, and was of very remote antiquity. I could mention various and extensive changes which have taken place in the interior and along the coast of South America since the Spanish conquest, but I need not

dwell on them on this occasion. I shall conclude with noticing some of the changes which have been, and still are, going on in Africa and Asia.

M. Charles Martins, of Montpellier, gives the following account of the physical characters of the great Sahara, or desert, in the province of Constantine :—

“ We entered a district composed of grey, blue, yellow, and red marles, associated with conglomerates and limestones, cut up into deep ravines by the torrents which, during the rainy season, descend from the rock-salt mountains. These ravines, from fifty to sixty yards in depth, were so close to each other that it would have required several days to reach the foot of the mountain, distant only a few miles in a straight line, through this labyrinth of gorges separated by sharp narrow ridges. Let those geologists who wish to describe the erosive action of pluvial waters set aside the wretched examples they quote to illustrate their argument ; let them visit Algeria, and gain their inspirations from the ravined district of Djebel-el-Mela and the mountains of the Kabyle. There they will see how the erosive power of water is able, under our very eyes, to transform a level plain into a mass of mountains as varied and broken in their forms as those which have been caused by the elevation and fracture of strata.”

The Sahara itself is a dried-up sea-bottom. No correct estimate can be made when the inland sea disappeared, but the indications presented by the marine deposits favour the idea that the event was not very remote. M. Martins observes :— “ When it took place, the Mediterranean existed as it is now, for we find in the Sahara the shells of the same mollusca which still live on its shores.” Indeed, a very large area of the Sahara is still below the level of the Mediterranean Sea, from which it is separated by an isthmus of sand and gravel. The communication having been thus closed, the inland sea-waters have been absorbed and evaporated. “ Were this isthmus broken through, a large area of the Sahara would again become a sea.” These changes bordering the African coast appear to have been brought about more from the influence of prevalent winds and currents, tropical rains, and the sand-storms of the desert, than from any great upheavals. Drifted sands in eastern Africa have overwhelmed the temple of Jupiter Ammon and the villages on the west side of the Nile, and have thus converted the scenes of habitation and cultivation into a barren, sandy desert during the last three thousand years. Look at Thebes and behold its colossal columns, statues, temples, obelisks, all desolated and dilapidated. Yet its hundred gates were celebrated by Homer, and its magnificence praised during its decline even by the Romans. It and other great cities, including Carthage, flourished within the last

3,000 years. The drifting of the sands of the Nubian desert produces remarkable changes in a comparatively short time. The encroachment of the Nubian sandy desert is irresistible, and the population is gradually emigrating to Lower Egypt. Where the land has been abandoned, the advance of the sand on the cultivated districts is becoming more apparent. About sixty-five miles north of Wadi Halfeh the desert has covered a great alluvial plain, which had formerly been under cultivation, and is approaching the river, so that the trunks of the palm-trees are completely surrounded with sand for upwards of fifteen feet from their roots. Although rain seldom falls in Nubia, yet, when such is the case, the fall is remarkable for its violence, as testified by the magnitude of the water-courses and the heaps of boulders, gravel, and sands. I could mention numbers of other changes which have been brought about during a few centuries, of the same character as those which geologists have ascribed to many thousands of years. Even the cities of Pompeii and Herculaneum, which have been discovered entombed in the vicinity of Vesuvius, were all but lost to history. Had it not been for Dion Cassius incidentally noticing their destruction, about a century and a half after the catastrophe (which occurred about 1,785 years ago), their ages would, doubtless, have been computed as of many thousands of years. If, then, these changes have been so much overlooked in the centre of the civilized world, we cannot expect to obtain complete accounts in other and less favoured regions.

Had it not been for the records of Holy Writ and of profane history, the relics found in the mounds of Nineveh would, doubtless, have been assigned to countless ages past, like the mounds in the basin of the Mississippi, which have been computed as 50,000 years old. Two thousand five hundred years ago Nineveh flourished in all its grandeur. Never did any city equal it in greatness and magnificence, yet it is now buried in oblivion, and its site overwhelmed with sand. Where is Babylon, the glory of kingdoms? The very ground on which it stood is a scene of desolation—drifted sands and pools of water. Yet this great capital of the Chaldeans was in all its splendour as late as about 2,200 years ago.

The scenes of our terrestrial habitation are not permanent, but ever changing. I have appealed to demonstrable facts; but the alleged myriads of years required to effect such changes are purely imaginary, totally unworthy of those who seek the fundamental facts of science; and they ought not to be used as the foundation of arguments against the veracity of the Mosaic record. It is my firm persuasion that the more closely we study the actual conditions of the earth and its true geo-

logical changes, setting aside all rash speculations, the stronger will become our convictions of the substantial truth and marvellous accuracy of the Holy Scriptures; in the account of the Creation in *Genesis*, and in other allusions to the facts of nature throughout the sacred text.

The CHAIRMAN.—I need scarcely call upon you to return thanks for this valuable paper, the more valuable as it is bristling with facts, gathered from a very extensive survey of the globe. It is not a paper made up from researches in geological works. It bears the impress of actual investigation, and of such investigation as few men have opportunities of making. I cannot but conceive that the vast mass of facts brought before us must be of very great value in the records of this Institute, and that they will be quoted from those records by many with great satisfaction.

Professor OLIVER BYRNE.—I have been viewing this subject from a different stand-point to that of Mr. Evan Hopkins; but I think that the conclusions and calculations I have come to will establish without much doubt the truth of his observations, carried further down than he was able to see. Astronomers say that this earth has six motions—the annual, diurnal, precession of the equinoxes, solar nutation, lunar nutation (established by theory and not by observation), and the collapsing of the planes of the equator and ecliptic. I say there are only three—the annual, diurnal, and the right motion of the earth's axis. I have travelled over the whole country Mr. Evan Hopkins has surveyed; I have been in South America and up the Nile, and had an opportunity of seeing that he is perfectly correct in his statements, as far as I could investigate. But the mathematical reason of all this is simple indeed. The earth being an oblate spheroid, revolving on its axis, has a protuberance at the equator, making the diameter there twenty-six miles greater than the diameter through the poles. If this earth was a perfect globe, the action of the sun and moon upon it—as a perfect globe—would have no influence to change the spinning position of the body. It is not a change of the whole body, axis and all, but a swinging of the body upon a consecutive axis, that changes the latitude of any place. There are twenty-six miles of a bulb always changing their position; and the action of all the particles must be perpendicular to tangent planes and in the direction of the plumb-line, from this combined motion. The fact is, that sand being loose, it nearly obeys the same laws of motion as a fluid like water; but the hard rock of the earth changes altogether and all at once. This protuberance progresses continually round the earth; and twenty-six miles of a mountain moving on consecutively, causes all these changes. And that this motion of the earth is in existence can be proved as easily as anything in the multiplication table. Then if we take and examine the changes that have taken place in sun-dials—the one dug up in Herculaneum for instance,—we find that the position of the dial at the time it was in use, would not tell the time correctly now. Take another instance—the city of Philadelphia, in our own time:—Market Street and Broad Street

cross at right angles, and the instrument with which Philadelphia was laid out is still in existence ; yet the whole city of Philadelphia has moved in accordance with this law. The bases of all churches, laid out east, west, north, and south, have changed. There is not a single observatory in the world in which an astronomer has taken his latitude where such astronomer does not differ from his predecessor ; and that this does not arise from errors is proved, because the difference is always in one way. It is very extraordinary that all the "errors" run one way, and in every place, according to this law. In our own country, on the plains of Norbury, in Wiltshire, the Druids erected their stones in an ellipse, to receive the rays of the sun at the period of the summer solstice ; but it is now $12\frac{1}{2}$ degrees from that position. You can get any number of facts to prove the soundness of Mr. Evan Hopkins's views, that the rocks are perpendicular, and that changes of position take place ; and that not so much time as millions of years is required, as some suppose. It would not take 500 years, under certain circumstances, to change the whole country altogether, or even to raise the whole of the bed of the Pacific Ocean. Geologists tell me that insects are there building upwards from the bottom at the rate of $4\frac{1}{2}$ inches a year. Fancy insects doing this over the entire bed of the Pacific ! No. It is the foundation rising. We are gradually going out of our present latitude ; and so our climates change, and everything else changes in accordance.

Captain FISHBOURNE.—I may mention a fact which is rather relevant to this discussion. When, in the reign of the Empress Catherine, the city of Krasnajask was discovered in Siberia (it is some twenty-five years since I read the narrative, but to the best of my recollection that was the name), M. Pallas, a Frenchman, was sent to report upon the discovery ; and he found amongst other things sun-dials, but the gnomons were not set at an angle to suit the latitude. His explanation was that these sun-dials had been imported from a previous centre of civilization, and that the people were ignorant of their inaccuracy. But that, of course, is not likely ; for if they used them they would have found that they would not give time correctly. This would quite agree with the supposition of Mr. Byrne, that the situation itself had altered in latitude ; and so that the sun-dials found there were suitable to the place—to the city of Krasnajask, when it was in its original position, and when founded.

Mr. REDDIE.—As bearing upon some of the views put forward in the paper read by Mr. Hopkins, I will quote a paragraph which I observed in the Dublin *Daily Express* of the 20th of November. It states, that at a meeting of the Royal Dublin Society,

"Mr. Robert H. Scott read his translation of a paper by Professor Oswald Heer, of Zurich, 'On the Miocene Flora of Atane-kerdluk and North Greenland.' The paper was interesting both from a botanical and geological point of view, and it went to prove from fossil specimens of forest trees at Atane-kerdluk, in North Greenland, especially the *Sequoia sempervirens* (red-wood), that the climate of Greenland had formerly been thirty degrees higher than at present ; the ordinary temperature of the locality being now twenty-one degrees, while the most northern latitude in which that plant

now grows in Europe is about fifty-three degrees. The paper concluded by stating that it would be impossible, by any arrangement of the relative positions of land and water, to produce for the northern hemisphere a climate which would explain the phenomena in a satisfactory manner. It must only be admitted that we are face to face with a problem whose solution, in all probability, must be attempted, and, doubtless, completed, by the astronomer."

I have now in my hands a paper which I am about to read, after a few words of explanation. It is written by a gentleman, a practical chemist, who had heard that Mr. Hopkins's paper would be read here this evening, and among other things that it would call attention to the now impugned doctrine that granite is an igneous formation. A friend of mine, and a member of the Institute, now present, knowing that this gentleman had been engaged in making experiments on granite, and that his conclusions were opposed to those of Mr. Hopkins, let him know that we were about to discuss this subject; and I requested that he might be invited to send us a paper giving his results, that we might hear both sides. He had said that he supposed we did not care for "facts" in this Institute; to which I replied that *facts* were what we especially cared for. I am, therefore, about to read what he has sent me,—not as a regular paper, that has been presented in the ordinary way and passed the council,—but I wish to bring it before you with this explanation; and I wish myself individually to do so, all the more, because I have, in the *Scientia Scientiarum*, and on other occasions, called public attention to the fact that the theory of granite being an igneous formation had been given up by geologists. I believe Mr. Hopkins was one of the first, if not the very first, who impugned that doctrine; for he did so nearly thirty years ago. It is certainly now acknowledged by Sir Charles Lyell, and Mr. Hamilton, the President of the Geological Society, and indeed by all "authorities" among geologists, that it was an error to suppose that granite is an igneous crystallization, or that the centre of the earth is now in an incandescent state, heated up to 195,000 degrees of temperature, as had been deduced from the nebular hypothesis. I cannot, however, say that this paper (which is by Mr. Lewis Thompson, M.R.C.S.), carries conviction to my mind. I rather think Mr. Hopkins will claim some of its facts as being rather upon his side, but that is the author's look-out. I only wish to put the arguments forward, even although I am not convinced by them, because we do wish in this society to hear all sides of every question we take up. But Mr. Thompson, I must add, although he does not believe in the aqueous formation of granite, is by no means a supporter of the nebular theory; and he endeavours to destroy that hypothesis, while believing in the igneous formation of granite. So that if Mr. Thompson's experiments are sufficient and his reasons sound, we shall have the nebular theory twice slain—first by water, and now again by fire! But let us hear Mr. Thompson himself. His paper is as follows:—

The object of the present paper is to institute an unprejudiced comparison between certain well-established facts and a particular theory of the formation of the earth, known as the "Nebular Theory." According to this theory,

the earth was at one time an immense volume of white-hot vapour, which, by loss of heat and subsequent condensation, was resolved into a globular mass of white-hot fluid, that slowly cooled down, and after an enormous lapse of time became the solid compact sphere upon which we live. Much of the argument in favour of this nebular hypothesis has been drawn from the fact that the substance called "granite," and which forms a great part of the crust of the earth, bears upon it distinct evidences of igneous fusion at some previous period of its existence. Admitting, then, the fact that much of the granite of the earth was once in a perfect state of fusion,—I ask, does the solidified granite of the present day afford, as it ought to do, undeniable proofs that it has cooled down and become solid in the extremely slow and gradual manner implied in the nebular theory? Now, I have examined a great number of specimens of granite from various parts of the world, and so far from supporting the nebular theory, they all tend to show the extreme inaccuracy of that theory. Such, at least, is my opinion; but upon this point I leave every one to form an opinion for himself, merely remarking that the experiments and results I am now about to relate may be, and I hope will be, repeated and verified or contradicted by many other inquirers after truth. I have said that granite ought to afford undeniable proofs of the rate at which it has cooled down and become solid from the fused condition, and I will here explain in what those proofs consist. Granite is made up of an aggregation of three or four different substances, which merely cohere together, and have been designated by mineralogists as felspar, quartz, mica, and hornblende. But if these substances were once in fusion, and then constituted one uniform fluid, it is clear that in cooling they must have obeyed the existing laws of chemical affinity, and have arranged themselves into their present relative positions before the period of actual solidification. That they did obey the ordinary laws of chemical affinity has been proved by their analysis, which shows that they have been formed in accordance with the rules of atomic proportion; and that the law of gravitation was then in force will not be denied by the nebular theorists, since it is upon this law that their whole theory rests. If, then, the substances constituting granite, that is to say, the felspar, quartz, mica, and hornblende, segregated themselves during the period of fusion, and were at the same time subject to the law of gravitation, it is beyond doubt that they would arrange their respective positions as regards each other in the exact order of their gravitation, or, as it is called, in accordance with the attraction of gravitation, just as we see a piece of lead sink in water, and oil swim upon its surface. That the said process of solidification was not rapid but extremely slow requires no illustration, for this constitutes a part of the nebular theory; consequently, there was abundant time to meet the requirements of gravitation. But it may be urged that perhaps the gravitating power of all these substances may be alike and uniform, consequently, there might be no disposition for any one of them to sink under or to swim upon the others, and therefore, if felspar, quartz, mica, and hornblende possess exactly the same specific gravity, a melted mixture of them would probably cool down into just such a regularly arranged granular mass as is exhibited to us by an ordinary piece of granite. Here, then, was a practical question: are the components of granite all alike in specific weight, or are they different? It is now more than two years ago since I set myself down to investigate this matter, and during that time I have examined granite obtained from almost every quarter of the globe—from Siberia, Norway, Saxony, Scotland, Ireland, Cornwall, the Mont Cenis Tunnel, Upper Egypt, the Himalaya Mountains, the Cape of Good Hope, Australia, New Zealand, Patagonia, California, and Nova Scotia. As a result of this labour, I am enabled to say most authoritatively, that not only do the components in question differ in their specific gravities, but that this difference is sufficiently

great to render the production of granite under the conditions of the nebular theory an utter impossibility. In fact, had the cooling and solidification of granite taken place in the slow and gradual manner indicated by that theory, it is certain that the felspar, quartz, mica, and hornblende would have arranged themselves into at least three separate and distinct layers, having not the least resemblance to granite. The uppermost of these layers would have been felspar, the next quartz, and the lowest would have consisted of mica and hornblende. Such a view, be it observed, is in strict accord with the laws of nature, and, in making the assertion, I become only the exponent of that force which is known as the attraction of gravitation. By an average of all my experiments I found the specific gravity of granite to be 2.654; that of felspar derived from granite 2.45; that of quartz 2.63, and that of mica and hornblende to vary from 2.82 to 3.17. If, therefore, we suppose a mixture of felspar, quartz, mica, and hornblende fused together into one fluid, and then left to cool gradually for many days under the influence of gravitation, it is undeniable that these ingredients would separate and form distinct layers exactly in the order which I have pointed out, just as mud under the same influence falls to the bottom of water, and cream rises to the surface of milk. Viewing, then, the incredible time assumed in the nebular theory for the cooling and solidification of the whole globe, it ought to follow in the face of these different specific gravities that the separation of the felspar, quartz, mica, and hornblende should be found most complete and perfect; whereas in granite we find nothing but evidences of an imperfectly crystallized and hastily cooled mass. The evidences of chemical absurdity in the nebular theory do not, however, stop at this point. By that theory it is asserted that after the vapour period the earth remained for many ages in the form of a fluid sphere, subject meanwhile to the influence of gravitation, so that all the heaviest and most fixed of its elements ought to have settled down towards the centre of the globe. As, however, we find, even in the outer crust, highly ponderous bodies like gold and platinum, we have a right to infer from the above theory that the portion of the earth under that crust is composed of matters having an enormous specific gravity. But we know by experiment that platinum is more than twenty-one times heavier than an equal bulk of water, and, following out the nebular hypothesis, we are compelled to conclude that the specific gravity of the whole globe is at least equal to that of platinum. Nevertheless, it has been proved by the most careful calculations that the whole earth, viewed as a planet, cannot be more than five or six times heavier than its own bulk of pure water; so that it is impossible for its interior to be filled with substances heavier, or even so heavy, as gold and platinum.

Having satisfied myself that granite could not have been produced according to the slow nebular notion, I determined to try what effect rapid cooling would have upon fused granite. For this purpose a cavity was chiselled out in a lump of Aberdeen granite, and a piece of granite from the Himalaya mountains in India was placed in this cavity. The piece in question weighed 740 grains, and, by the action of a powerful oxy-hydrogen blow-pipe, it was fused in less than five minutes into a fluid, having the consistency of thin syrup, and being then allowed to cool, in less than two minutes it became solid. When quite cold, the fused mass was detached and examined. Its resemblance to the mineral called obsidian, proved most striking, so much so indeed, that when compared with a sample of dark-coloured obsidian from Iceland, it was only with great difficulty identified. To granite it had not the least resemblance, and as I had entirely repudiated the idea of the production of granite by slow cooling, so now I abandoned all thoughts of a rapid cooling process; consequently nothing remained but a supposition that some length of time, though not a long time, had been employed in the granitic formation.

Looking round for something analogous to this in the processes of our manufacturing industry, I was not long in discovering one which not only resembles, but most singularly illustrates that formation. It is a process in which a fused fluid is employed, composed of different substances, having different colours and different specific gravities exactly as in the case of the components of granite; and this fluid can be cooled down rapidly or slowly, or in a way that lies between these extremes; and the results of these different rates of cooling and solidification may be watched and recorded. The substance in question is the article known by the name "mottled soap," which, as any one may see, has, when recently cut, very much of the appearance of Scotch granite. This substance on being taken from the copper, is a fused fluid, and if a portion of it is cooled rapidly, it concretes into a homogeneous solid of a dark uniform hue, somewhat like our artificial obsidian; if, however, the fused soap is cooled very slowly, the dark-coloured portions of it, which are also the highest in specific gravity, all fall to the bottom, and leave the upper portions quite white, and free from any colour or mottling. The art of making mottled soap consists in so arranging the time of cooling, as to allow the dark-coloured parts to gather themselves together in little masses, by the time the whole of the soap is so cooled as to begin to solidify, and thus prevent the descent of the heavy dark portions. The imperfectly crystallized state of granite, and the uniform diffusion throughout its whole substance of the dark and ponderous particles of mica and hornblende, all bespeak a result so identical with that produced by the above process, as to leave no doubt on an unprejudiced mind of similarity in the cause of their production. Now, it so happens, that the period of time in which the separation of the "mottle" and thickening or solidification of the soap takes place, is from twenty-four to thirty-six hours; and if I had never read in the Bible anything to guide me as to the time employed in the solidification of granite, I should have unhesitatingly fixed upon the above hours as the only period in which granite could possibly have been formed. That at the creation it was formed by the agency of the ordinary laws of nature, I entirely deny, for by these laws the interior of a large mass of non-conducting material like granite could never lose its heat so rapidly as to prevent crystallization; in proof of which, we see in extensive eruptions of volcanic lava that require years to cool, there are produced large, distinct, and well-defined crystals of basic felspar, to which mineralogists have given the name "Leucite," from their white colour; and this alone might serve to satisfy us that granite had not been slowly cooled.

With regard to the theory which considers granite to have been formed by solution from water, I feel that very little need be said. There are certainly many strong arguments of a chemical nature that stand in direct opposition to such a hypothesis; but I shall content myself by bringing forward only one objection to it. It is this, that all the water in our planet is quite insufficient to dissolve the solid portion, even if that solid portion were as soluble as common salt. A saturated solution of common salt consists of twenty-seven parts of salt, and seventy-three parts of water; consequently these would require to be the relative proportions of land and water according to this preposterous assumption of solubility. But if the specific gravity of the whole globe be 5.5, then these twenty-seven parts, or in other words the solid portion of the globe, must have a specific gravity of 17.7, which would seem to indicate that nearly all the solid matter was pure gold. In reality, however, granite, if it be soluble at all in water, is so to a very trifling extent; and to assume that it can be dissolved in 1,000 times its weight of water is therefore, to say the least of it, greatly favouring the water hypothesis. But, if the whole of the solid matter of the globe had ever been dissolved in 1,000 times its weight of water, then from the gravity of the earth it follows that the specific weight of

that solid matter must have been 4,500 times greater than that of water, and more than 200 times heavier than platinum! As to the action of water at high temperatures and under enormous pressures, it would seem that the originators of this idea are ignorant of the fact that water can only be heated up to a certain point under any pressure, without ceasing to be water. Thus M. Cagniard de la Tour long ago proved by experiment, that ether contained in a sealed-up tube and heated, became wholly converted into vapour in a space twice its original bulk, and with a pressure of between thirty-seven and thirty-eight atmospheres: alcohol did the same, exerting a pressure of 119 atmospheres; and water became altogether vapour at a temperature below that of melting zinc. To talk, therefore, of the action of red-hot or white-hot water, is simply ridiculous.

I have now arrived at that stage of my undertaking in which nothing more remains than for me to describe the simple means employed for determining the specific gravity of the constituent parts of granite, and I do this with a pleasant hope that others will be induced to repeat my labours. To ascertain whether the granite contained combined water, the sample was placed with some chloride of calcium for twenty-four hours in the exhausted receiver of an air-pump; it was then carefully weighed and heated red hot, but in no instance did any loss of weight occur; therefore granite does not contain combined water. The granite was next reduced to a coarse powder, and 500 grains of this were put into an ordinary 1,000 grain specific gravity bottle, which, being filled up with distilled water, was weighed, and the weight so found deducted from 1,500 gave a result to be used as a divisor of the 500 grains of granite, from the product of which the specific gravity of the granite was found. And I will here remark that this mode is more accurate than the common plan of weighing in water a single piece; because there are always fissures and sometimes cavities in minerals, and these fissures remain filled with air and buoy up the mineral so as to vitiate the result. To obtain the specific gravity of felspar, quartz, mica, and hornblende, the same process was followed; but much trouble requires to be taken for the purpose of separating these components of granite from each other. It is not difficult to separate the mica and hornblende from the quartz and felspar after the granite has been coarsely powdered; but it requires a strong light, good eyesight, and much patience to pick out the mica from the hornblende, and still more to separate the quartz from the felspar; and this last constitutes, in fact, the greatest difficulty in the whole proceeding.

Having read this paper, I must now once more repeat that it does not carry conviction to my mind. Without attempting to criticise it throughout, I shall briefly notice one or two of the points wherein it appears to me to be defective. Mr. Thompson promised us *facts*; but he has only given us the result of a single experiment. And what does it teach us? Not, in my opinion, what he draws from it. He melts a few hundred grains of granite and lets it cool; and he obtains something like obsidian. He tells us this fused granite cooled rapidly; and he *assumes* that had it cooled more slowly it would have cooled into granite, instead of obsidian. I must demur to that assumption. The experiment appears to me only to prove that, if the materials of granite were ever in a state of fusion, the result would be some homogeneous matter like obsidian, and not granite. He thinks the result would have been different if the fused granite had been more slowly cooled. But he has not verified that by experiment. He has given us no facts to prove this conclusion. I will notice another point where the reasoning does

not satisfy me. You will remember in one part of his paper Mr. Thompson objects to the predominance of water in the earth, and states that if that were the case, then the specific gravity of its solid parts must be nearly that of gold. Now, were that so, not only should we have a new *Plutonic* theory! but it would really after all be only in accordance with what was stated in the address of Mr. Grove, as President of the British Association, last August—namely, that instead of the heaviest matter of the earth being near its surface (as we have long been taught), it is probably more solid and heavier as it gets nearer the centre. But apparently Mr. Thompson's sole reason for rejecting this, is merely that it is contrary to the Newtonian theory as to the mass of the whole earth; for it is upon that theoretical assumption, and not upon *facts*, that the whole reasoning is based. It is enough for me to point out, that at any rate, that theory has not stood in the way of Mr. Grove propounding, as now most probable, what is not only contrary to the Newtonian doctrine as to the earth's mass, but also to the nebular notion that the earth's centre is filled with matter in a state of igneous fluidity. In conclusion, I am obliged to say that if we consider that MM. Daubrée and Bischoff made certain experiments with granite which convinced them that it is a watery crystallization, and also that they have brought over the leading geologists to this view, although it was contrary to all their preconceived notions and previous teaching, I think it was incumbent upon Mr. Thompson to have noticed the experiments of these eminent chemists, and, if he could, to have shown where they were defective and faulty; and not merely to have made a detached and single experiment of his own, which appears to prove very little, and even that little, in my opinion, to be rather against what he deduces from it.

Mr. HOPKINS.—I can see clearly, from the observations of Mr. Thompson, that he has been making experiments from cabinet specimens of granite. Suppose you were to make experiments from cabinet specimens of wood, to ascertain something as to the sap of a tree in its living state, you would obtain very strange results! Now, if you want to ascertain the real constitution of granite, you should study the granite *in situ*. For instance, in one place you may have a granite undergoing change. That granite is composed of hornblende, felspar, mica, and so on, and is undergoing lamination. If you take a piece of that granite, and cut a block of it, and weigh it, you will find that it loses weight after exposure to heat, just the same as minerals. We allow so much for water, and we call that water *mechanically* combined. Granite is saturated with water; it is always saturated, and is not a mere dry block.—

Rev. W. MITCHELL.—May I ask you, Mr. Hopkins, to answer one question, as you are well acquainted with deep mines, Whether you can go to any depth where you do not find water; and whether water is not the greatest enemy of the miner?

Mr. HOPKINS.—It is the most difficult thing the miner has to contend with, and you cannot go to any depth without finding it. Wherever you go, you come to water, whether in granite or any other formation. With refer-

ence to the constitution of granite, if you take separate crystals, you will also find that each crystal has a certain proportion of water *chemically* or *mineralogically* combined ; and if you drive it out, the crystal becomes opaque, and loses weight, the quantity varying from two or three to twenty per cent. Without water, crystals are not formed, especially rock-crystals. Again you may have granite, with gold in saturation. In another place you will find the gold becoming gradually developed out of the granite as the granite undergoes changes, and coming out like large round balls. Elsewhere you find a little gold in dissemination, but not like the *other*. There is change constantly going on ; the condition of the rocks is never stationary, but it either changes into lamination, or into fractures, something like the bark on the trunk of a tree. Now, I say we have such an immense accumulation of facts, that we ought now to insist upon facts ; and not go on trying to find out what is in the centre of the earth, and so on. Let us attend to facts as we find them, and see what we really have ; and let us leave theories for the future. I will add one or two words with regard to minerals. I have no hesitation in stating that I will go to any rock and say what it contains by looking at it. If you let me see a good surface of it, I will state whether it contains gold, silver, tin, and so on. I am speaking as to the metal the rock will contain, and not as to the quantity of the metal, for that will depend on the amount of deposits and accumulations, but I am referring only to the nature of the constituents.

The CHAIRMAN.—I shall only make a few observations from my own point of view, in confirmation of what Mr. Hopkins has said with regard to the formation of granite. In doing so I may express some of my objections to the theory advanced by Mr. Thompson. The experiment performed by the latter gentleman on a small scale, as Mr. Hopkins has reminded us, is wrought out by nature on the most gigantic scale. Wherever we find active volcanoes, we find them melting granite, or some other primary rock. Lava, obsidian, pitchstone, and such-like volcanic products, are but molten primary rocks. Now I ask what analogy do any of these substances bear in their structure to the so-called primary rocks ? Are they anything like granite, for instance ? Mr. Thompson admits that the structure of granite could not be formed from any of these substances by slow cooling. That I take to be an important admission. I cannot believe it is produced by quick or any intermediate rate of cooling. We have not to go far even in London for a practical demonstration of the structure of the primary rocks. Our bridges and public buildings show us that granite is composed of well-formed crystals of several distinct minerals, interlacing one another in every direction ;— crystals of quartz, mica, and felspar. On London or Southwark Bridge you may see crystals of the latter substance as large, or larger, than your hand, presenting to the casual observer the appearance of large fossil bones. The constituents of granite not only contain water chemically united to them, but they also contain water mechanically diffused,—a fact which can hardly be reconciled with their production by crystallization from a molten mass. Now let us consider the crystalline constituents of granite—we have crystals of quartz,

consisting of silica in a state more or less free from admixture with foreign substances. Then we have the crystals of mica and felspar, the most composite of mineral substances. These three substances are distinct from one another in crystalline and chemical composition. But then the micas and felspars admit of the greatest and most puzzling varieties of chemical constitution; one chemical element taking the place of another, without altering the crystalline character of the mica or the felspar in which the change of composition is found. We may have some conception of the composite structures and varieties of these minerals, when we state that nearly all, if not all, the metals and the mineral constituents of the sedimentary rocks may be found in the granites or other primary rocks. We have potash and also soda felspars. In the micas as well as the felspars we have not only the principal constituents, silica and alumina, but also soda, potash, lime, iron, magnesia, and water, replacing each other with most puzzling variations. We all know how gold is diffused through the quartz of some kinds of granite. The microscope is said also to reveal native iron among the constituents of granite. Doubtless all the metals and other minerals found in the cracks and crevices of the primary rocks were once in combination with these rocks. But I never could form any clear conception of the origin of metallic and mineral veins till I read Mr. Hopkins's work on the subject. Very high geological and mineralogical authorities used to speak of gold as the most recent of all the metals;—how more recent than others, I could not conceive. Some went so far as to imagine some recent geological event, when, as it were, a golden shower had fallen from heaven to earth! The experiments of Daubrée and Bischoff have proved the mechanical and chemical combination of water in granite. Though the authorities of the Geological Society were not convinced by Mr. Hopkins, their faith in the igneous origin of granite was first shaken, I believe, by my friend Mr. Clifton Sorby's microscopical researches. By investigating microscopically the minute bubbles in crystals, he was able to determine whether the crystal was formed from an aqueous or some other liquid solution, or produced by cooling from a molten mass. With regard to Mr. Thompson's assumption of the insolubility of silica in water, the geysers in Iceland afford a direct refutation of this. How, again, without the solubility of silica, can we account for the formation of silicified woods, without injury to the most delicate vegetable fibres? Dr. Bowerbank has shown that the most delicate structures in sponges (which he had found destroyed by decomposition only a few hours after the death of the sponge), are faithfully and perfectly preserved in the flint. Before electro-metallurgy was discovered, we could form no idea as to the method nature takes to separate metals from the rocks through which they may be diffused. We have now, however, learnt the power of electricity in separating metals from the aqueous solutions of their salts. Soon after the discovery of this fact, a copper electrotype was produced without any artificial battery, by imbedding wires in two different strata of a mine, and using the galvanic current thus produced. Here then we have a demonstration of the electro-magnetic action of the earth, and of its power in the formation of mineral products. This

goes far, in my opinion, to show that Mr. Hopkins's hypothesis of the formation of metallic veins is one well supported by facts which come under our observation, analogous to those he attributes to the natural magnetic currents of the globe, operating constantly, though almost imperceptibly, on a large scale.

The meeting was then adjourned.

ORDINARY MEETING, JAN. 7, 1867.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous Meeting were read and confirmed; and the Hon. Secretary then announced the names of the following Members and Associates who had been elected since the first Meeting at the commencement of the Session:—

MEMBERS:—Benjamin Bond Cabbell, Esq., M.A., F.R.S., &c., &c., Bencher of the Middle Temple, J.P., and Dep.-Lieut. for Middlesex, 52, Portland Place, W. (*VICE-PATRON and Life Member.*)

William Henry Elliott, Esq., 10, Claremont Crescent, Surbiton Hill, S.W. (*Life Member.*)

Thomas Ball, Esq., Bramcote, Notts; Charles Lloyd Braithwaite, Esq., Kendal, Westmoreland; John Colebrook, Esq., M.R.C.S. Eng., late H.M. Madras Army, 31, Moore Street, Chelsea, S.W.; Rev. William Reyner Cosens, M.A., Oxon. et Cantab., Incumbent of Holy Trinity, Westminster, 10, Bessborough Gardens, Pimlico, S.W.; Rev. M. Davison, 5, Lansdowne Place, Lansdowne Road, Hackney, N.E.; Charles Deacon, Esq., 5, Orsett Place, Westbourne Terrace, W.; Thomas Foljambe, Esq., M.A., J.P., and Dep.-Lieut. for West Riding of Yorkshire, Acomb, near York; Alexander Gailey, Esq., Harengy Park, Hornsey, N.; Sydney Gedge, Esq., Mitcham Hall, S.; Bruce Goldie, Esq., Russell Street, Chelsea, S.W.; Thomas Gray, Esq., H.M. Civil Service, Assoc. I.N.A., 9, St. Martin's Road, Stockwell, S.; John Hall, Esq., Bondicar House, Blackheath, S.E.; James Peddie Harper, Esq., M.D., Edin. Univ., M.R.C.S.E., Clydesdale Villa, Windsor, Berks; Rev. Sir W. R. Tilson-Marsh, Bart., M.A., Oxon., Oxford and Cambridge Club, Pall-mall, S.W.; Arthur C. Rainey, Teigumouth, Devon; John Henry Sadler, Esq., 34, Norfolk Road, Brighton; John Shaw, Esq., M.D., Viatoris Villa, Boston, Lincolnshire; William Stewart, Esq., of Glen Stewart, Prince Edward's Island, 12, Cottage Road, Eaton Square, S.W.; James E. Vanner, Esq., Stamford Hill, N.; William Vanner, Esq., Stamford Hill, N.

ASSOCIATES ; 1ST CLASS :—Rev. George Ranking, B.C.L., Cantab., Beulah Road, Tunbridge Wells ; 2ND CLASS :—Mrs. Curteis, Aldenham, St. James's Road, Tunbridge Wells (*Life Associate*) ; Mrs. Harward, Chesham House, Nelson Street, Ryde, Isle of Wight ; Mr. Thomas G. Salt, 7, Downs Park Road, Shacklewell, N.E.

The above Members and Associates were elected upon the Foundation List.

The following Associates have also been elected for the current year :—

ASSOCIATES, 1ST CLASS :—Joseph Delpratt, Esq., 54, Queen's Gardens, Hyde Park ; 2ND CLASS —Mrs. Flint, 34, Arundel Gardens, Kensington Park, W.

The following books were announced as having been presented to the Society :—

Adam and the Adamite. By Dominick M'Causland, Esq., Q.C., M.V.I.
From the Author.

Sermons in Stones. By the same. *From the Author.*

The HONORARY SECRETARY then stated that he had much pleasure in announcing, that the Foundation List, as now printed, corrected to 31st December, 1866, contained 276 names, viz. :—

2 Vice-Patrons,
10 Life Members,
224 Members, Annual Subscribers,
3 Life Associates, 2nd Class,
37 other Associates, 13 1st Class, 24 2nd Class.

276

He also observed that the total assets for the year, in Donations and Subscriptions, including the donations of sixty guineas each from two Vice-Patrons, amount to £368,—of which the sum of £500. 10s. is from Annual Subscriptions.

PROFESSOR KIRK then read the following Paper :—

ON THE PAST AND PRESENT RELATIONS OF GEOLOGICAL SCIENCE TO THE SACRED SCRIPTURES.

By the REV. JOHN KIRK, Professor of Practical Theology in the Evangelical Union Academy, Glasgow; Author of "The Age of Man Geologically considered in its bearing on the Truths of the Bible," &c., &c.; Memb. Vict. Inst.

IT seems too like presumption for an "outsider" in Geology to undertake such a subject as this. We are reminded of a young man who had been trained in the country as a cartwright, and came to town seeking employment as a joiner. He was asked if he had ever made a window, and replied that he had not, but that he had made a harrow, which he said "was very like it." We fear that the present paper will be only too like the writer's former "harrow," to pass well for the window which is required. It will lack symmetry, and its joints will admit, all too freely, the "cold winds of criticism." And yet the glorious sun, whose radiance is truth, may condescend to shine through it.

Geology is literally the "word of the earth." Not a word which the earth speaks, but the word which is spoken or written concerning the earth.

A word is a symbol of thought. It is only in so far as geology expresses *thought* regarding the earth, that it is anything. It is not the structure of the globe itself—nor is it the absolute truth regarding that structure—neither is it the expression of that truth. It is only the expression of that *imperfect thought* by which the structure of the earth is represented in the minds of men. He who is aware of this, will guard against the idea that Geology is any part of that supreme knowledge to which all other thought must ultimately bow.

When we take up Geological Science in this view, it lays itself out to us in three great divisions. There is that thought in which what are called the *facts* of the science are represented, then that representing the true *inferences* drawn from the comparison of these facts, and, last, the conjectural ideas that are allowed to represent themselves, but do not represent any other reality. If we wish to illustrate the first of these divisions of thought by an example, we may take up

a piece of rock, composed, we shall say, of sandstone, which has just been broken from the solid bed in the side of a hill. In that piece of rock, and as it lay in the mass of the mountain, you see the form of a shell. The words which express the thought of that fact form a part of that which is fundamental in geology. Apart from this kind of thought there is nothing real in the science.

In that which is called a *fact* of this character, you have three things; first, the material rock with its shell-form; then the thought representative of that object in the mind; and third, the words which express that thought. The piece of rock is the same to all who see it; the thought representing it in one mind is probably, so far, unlike the thought of it in every other; and the words expressive of such thought are both varied and changeable. Yet, from the nature of the rocky fact itself, there is at least a possibility of such repeated observation as issues in the all but perfect agreement of informed minds, as to the thing itself. It is the expression of thought regarding such facts, about which the truly scientific mind is ever most careful.

But to proceed to another example. You are on the seashore; and observing a portion of the sand which the tide has left exposed, you see that true shells, as they have been left by the molluscs that dwelt in them, are imbedded in that sand exactly as the form you have seen is imbedded in the rock. As yet we assume that you do not reason on the *relations* of those objects—you only observe them as they lie. Your thoughts represent little more than that which has reached you through your senses, sufficiently cogitated to present the objects to your mind. We shall suppose that you go on observing objects of this character, you are treasuring that kind of thought, out of which all geological science must be formed.

But there is, as we have said, a second and very different description of geological thought. You bring together the form of a shell which you have observed in the rock, and a real shell which you observed in the sand; comparing them, you perceive that, in many respects, they are not alike. They are indeed similar, but also strikingly dissimilar, and you begin to *reason* or to *infer*, that is, to form certain thoughts which represent relations of objects rather than the objects themselves. You then leave the thoughts representative of the mere facts for totally different thoughts, and enter a region in which difficulties and dangers greatly increase. It is then that you begin to realize what Steno, one of the ablest of geologists, wrote about two centuries ago. He says, addressing

the Grand Duke of Tuscany,—“Most Serene Duke, it often befalls travellers in unknown countries, that, hastening through a mountainous tract unto a town standing on the top of a hill, they think it hard by, as soon as they come in sight of it; the manifold turnings and windings of the ways thereto retard their hopes unto a trouble. For [at first] they have only a view of the nearest tops, but they cannot guess what is hidden by the interposition of those high places; whether they be lower hills or deep valleys, or plain fields, because with their flattering hopes they measure the distances of places by the eagerness of their desires.” It is not the sight of the hill-tops, nor even that of the town beyond them, that gives the traveller difficulty and the danger of error, but the effort to *infer*, or to form the thought which will truly represent the unseen distances between. “So,” says this learned Dane, “Having once or twice seen those grounds out of which are digged up *shells* and other such-like things cast up by the sea, and found that those earths were the sediments of a turbid sea, and that everywhere we might estimate the number of times how often the sea had been troubled here and there, I hastily not only imagined by myself, but confidently affirmed to others, that the whole business [of accounting for them] would be an inquiry and work but of a very short time.”* There was no difficulty to Steno as to the facts; but when he undertook to produce the true thoughts which would represent the relations of those facts, he found himself encountering the real labour of science.

And yet it is not in the field of patient inference from facts that either great difficulty or danger may be said to lie. If we are satisfied to accept the certain thought which fairly compared facts gradually give us, and to wait patiently for the increase of such true light, we may learn an incalculable amount of relative truth. Much that cannot be seen will be as real to us, and even far more powerful and precious in its influence over us, than anything that is seen. For example, we may observe how a shellfish lives and dies in the bed of the sea at the present time, leaving its shell in the sand, and observe also the form of a similar shell imbedded in a rock, which is now high above the level of the sea. We may note that this shell-form is so imbedded as to indicate that the creature to which the shell belonged lived and died in the very sand of which that rock is composed, just as the modern one lived and died under the present waters of the ocean. We

* I quote from an interesting old volume entitled “*The Prodromus to a Dissertation concerning Solids contained within Solids, &c.*” By Nicolaus Steno. Englished by H. O. 1671;” pp. 1 to 4.

have now got a great amount of relative thought, and we may go on till we believe, without difficulty and without danger of error, that the sea at one time flowed over the rock in which this shell-form lies imbedded. So long as the facts are duly observed, and the inferential thoughts derived from their comparison are manifestly related to the facts, and beyond reasonable doubt, so long we are gathering real science in its two great branches of trustworthy instruction.

But, as we have indicated, there is a third kind of geological thought, which is of a value very different from that of the other two. This consists of speculation, which, so far as discovery has gone, has no realities to represent. The universe of waking dreams, to which this introduces us, consists of all the possibilities of falsehood as well as of all those of truth. It is the region from which, we humbly think, true science warns us away. That which *is*, and *so may be known*, as distinguished from that which *is not*, but *may be conceived*, is the proper object of science. It is very important, when we would trace the relations of geological science to the Sacred Scriptures, to consider whether we mean the relations of our first two divisions of thought, or the relations of that so-called Geology, which is chiefly composed of conjecture. Because of the extremely speculative tendencies of scientific men, it has become painfully necessary that we should sift most carefully that which is presented, even by the highest authorities, as geological science; so that we may be able to distinguish between truth which is the logical result of real discovery, and doctrine held as above all price, but which may be abandoned to-morrow by those who are to-day its most earnest advocates. Because of the fond partiality, too, with which favourite hypotheses are almost worshipped, and on account of which every opposing idea is disliked, it is needful that we take up, and examine with great care, views that have been scouted by scientific leaders and their followers as worthless.

Almost all truth has been thus treated for a time by the rulers of public opinion during whose reign it has been discovered. To those who have not yet attended to the evidence from which it really springs, and who are more in love with speculation than with real science, every new truth will appear conjectural, it may be even preposterous; while conjecture, which has no evidence whatever to support it, may seem highly reasonable, only because it happens to accord with some preconceived notion.

It is in connection with this part of our subject that we come upon the phrase "negative evidence." At first sight one would naturally imagine that this means really "evidence."

But it means nothing of the kind. Such evidence as could, with any degree of propriety, be called "negative," must be such as would nullify some apparently positive evidence opposed to it. That to which we are geologically introduced has no such effect. The "negative evidence" of popular geology is only that to which we are told the Irishman appealed, when, on being confronted with a witness who saw him commit the crime laid to his charge, said he could bring a dozen who *did not* see him do it! For example, what were called the "oldest rocks" were termed *azoic*, because it was held that no relics of life had been found in them. And, as it was held also that no relics of life had yet been found beneath them, it was concluded that *there was no life on the surface of the globe when they were formed*. The support of this great doctrine was "negative evidence." In other words, it was not known that there were no relics of life in such rocks—there was no evidence of such a negative; on the contrary, very worthy testimony had been borne to the effect that such relics had been found—still less was it known that there never had been such relics of life in these old rocks; there is now, at least, pretty strong evidence that such relics existed, though they have been obliterated in the alterations of the strata in which they were inclosed. It was only generally unknown whether or not there were such relics of life in these rocks, or under them. We need scarcely say that all conclusions built on ignorance, under the name of "evidence," are utterly unworthy of science.

We have only too strong reason to dwell on this conjectural aspect of the fashionable geology of our day. It is not as if only details, here and there, were turning out false, while grand principles remain evidently sound. If we do not err greatly, the speculative geological mind is escaping out of one great mistake in *principle*, and that only by leaping into another as great, because its leaders are careless as to the true nature of their reasoning. When their evidence is not "negative," or, in plain words, not *nothing*, it is so utterly inadequate as to leave the ideas supposed to be proved by it, as purely conjectural as if they were altogether matters of fancy. For example, look at the measurement of time believed to be required for the upheaval of land. "*Two feet and a half in a century*" is a scale of upheaval adopted for the whole world during all time! Why? Only because there is apparently some reason to think that the coast of Norway, taking the north and south of that coast together, and striking the average, is rising at that two-and-a-half-feet rate! The observation of this mere scrap of the earth's surface, and that during a very brief period, is taken as if it furnished a sufficient standard for measuring the

rate of upheaval over all portions of the surface of the globe, during all ages! Such is a grand instance of conjectural chronology as given by one of the greatest of geologists.*

As another instance, I take the following from the same high authority; in this case, an estimate of time required for the growth of strata. A mass of rock, sixty feet thick, is described as composed of layers so thin, that "thirty are sometimes contained in the thickness of an inch." Observe the "*sometimes*;" for we notice in the same description, that there are "occasionally" layers of flint, carbonaceous matter and marl, each, as it seems from the statement, "about an inch thick." We have no means given of estimating the "sometimes," nor the "occasionally," that are manifestly of so much importance in the case. Between the layers, of which thirty occupy an inch, there are marks of plants that have been flattened and carbonized, and "sometimes myriads of small *Paludine* and other fresh-water shells." Here again we observe the "*sometimes*." For these thin leaves are spoken of as each "a page of history representing a certain period of the past." And we are evidently expected to draw the inference that these rocks that have grown in ancient lake-bottoms, were formed "with extreme slowness." We are also told that masses of the same sort of rock, two hundred feet thick, are found in the neighbouring hills.† Well, how shall we calculate? Say that we give each bed of shells a year to grow, and forget the "sometimes," and the "occasionally" also. One inch of rock gives thirty years; a foot of rock, 360 years; sixty feet, 21,600 years; 200 feet, 72,000 years! Here, then, is a magnificent idea. But what if a bed of such very small snail-shells should not take a month to grow? What, if some of the flattened plants might be floated and laid on the surface of the lake-bottom every day? What, if the heat at noon and the cold at night, affecting the muddy water, might account for the layers? Each of them would then represent but a day, and thirty of them only a month. What if the "sometimes," in which the snail-shells occur, should be very few times, and the "occasionally," which qualifies the occurrence of layers an inch in thickness, should be really very often. How do our 72,000 years dwindle down into a very brief period indeed! If we take for example any pond into which muddy streams are flowing, it is surely anything but according to experience and observation among those who should clean such places out, that they take ages to

* Lyell's *Antiquity of Man*, edition 1863, pp. 58, 178. Sir Charles advances this two-and-a-half-feet scale in exceedingly cautious language, but argues upon it as if it might be fairly assumed.

† Lyell's *Elements of Geology*, edition 1865, page 229.

silt up. The slightest change in the inflowing water, or in the temperature of the pond itself, causes a change in the character of the silt, and, consequently, a layer in the mass forming in the bottom. As to larger bodies of water, Page says that the clayey mud of the great Chinese rivers is estimated as borne down at the rate of *two million cubic feet in an hour!* The Ganges alone carries 700,000 cubic feet every hour into the Bay of Bengal!* Must such work take tens of thousands of years to deposit sixty feet of muddy strata? In the face of the most common facts, it is surely anything but scientific to magnify duration into measureless vastness, when looking at a rock which has been formed by such means.

So much for the three great divisions of what is generally understood to be geology. It seems well that we should have the true nature of that which passes as the science clearly before us, ere we attempt to trace its relations in any direction.

Sacred Scripture is the Word of God. It is a word which He speaks, rather than one spoken concerning Him. It is the expression of thoughts which He desires to communicate to men. It is, we think, really an expression of a portion of His own thoughts, although that expression is necessarily cast in the mould of human language, and these thoughts are necessarily made to take a form such as allows them to enter the human mind. When thus viewed, the Sacred Scriptures present us with several divisions of very important matter for consideration.

First of all, we think it necessary to note a very important distinction between what is called "the Book of Nature," and the written revelation contained in the Bible. The created universe is, no doubt, in a certain sense, an expression of divine thought, and as such, it is a "Book" which may, and ought to be "read;" but it is not such an expression as that which takes the form of human language, and comes near, in that language, with the treasures of the divine heart, to the human soul, as man comes near in speech, and opens his heart to his fellow-creature. If, for example, we observe attentively what a man does, we may generally so far learn what that man thinks and feels. If we note what he does to us, we may generally so far learn his state of heart towards us. Man's works are, in this sense, an expression of his thoughts which may be read. So far, we may speak of his doings as the Book of his deeds; and we may also thus far speak of the "Book" of God in nature. But this is very different from

* Page's *Advanced Textbook of Geology*, edition 1856, page 31.

that which takes place when any one either speaks to us himself, or sends another, for the purpose of telling us the very thoughts and feelings of his own mind. In the former case, we indirectly learn something regarding the mind of the person whose deeds we observe,—we may, so to speak, *guess* correctly his feelings and designs; but, in the latter case, we are not left to guess at all. We are directly told the thoughts and feelings, as well as the true intentions of his heart. He who, in any proper sense, believes in the divine authorship of the Bible, sees in it an expression of God's own thoughts, and that by Himself, as really addressing Himself to mankind.

This view is greatly strengthened, when we remember that portions of the Sacred Scriptures consist of God's own statements of such doings of His as could not, in the nature of the case, be otherwise known to man. The account of the creation is plainly of this character. It could not be gathered from any other source than God's own testimony. Man seeks in vain for it in the so-called "Book of Nature." He finds it in the plain testimony of the inspired teacher, who is made to communicate God's own thoughts of it to mankind. We see in it the teaching of the Creator himself as to His work—not the teaching of the work, but of Him by whom the work was performed.

But there are other distinctions of great moment to be noticed. We must not confound the noblest productions of men as authors, with this Word of God. To take, therefore, another illustrative example. If we open a book which has been written by one of ourselves in the ordinary way, we gather merely the thoughts of the man who has originally written the book. If we open the book of Genesis, we gather not merely thoughts which passed through the mind of Moses, but the thoughts of God, which He passed through the mind of the Hebrew, that they might be communicated to us. No modification of the idea of inspiration, which allows any fragment of that idea to remain in the mind, can dispense with this view of the divine origin of those thoughts that are embodied and expressed in the Sacred Scriptures. These Scriptures must be accepted as God's expression of His thoughts, as truly as man's scripture is his expression of his own thoughts, or we are not regarded as possessing any true Word of God in the Bible. What is called "the inspiration of the poet," is no more "inspiration," such as that of Sacred Scripture, than is ordinary thought of the dullest kind. Both are only the thoughts of human beings. But the inspiration of the Bible is really God's personally passing His thoughts through human

minds, so as to cause them to be expressed in human language to men.

I am careful to make this part of our subject clear, because the entire importance of all true defence of the Bible hinges on the idea of a real inspiration of the thoughts communicated in that record by the Infinite One. The relation of science to Milton's "Paradise Lost," for example, is a matter of little or no moment; and if the Books of Moses had no other inspiration than those of Milton, and others of like genius, the relation of science to them would be equally unimportant. It is the belief that God spake by Moses, and meant that the words which Moses wrote should express His own divine thoughts, and this belief alone, which gives the relation of Science to Scripture its intense interest. "*Thus saith the Lord,*" are words that express the grand peculiarity of Sacred Scripture, and they can have no meaning short of that to which we are now directing attention.

There is, however, another aspect of this matter which requires to be carefully considered here. If thought is to pass from the Divine to the human mind, that thought will be affected both in form and degree, because of the nature of the mind which it enters. It must be evident, at a glance, to any one, that the infinite conceptions of God cannot be comprehended in the extremely limited intelligence of man. So must it be evident that the absolute harmony which appears to the Omniscient, because of His omniscience, cannot be made to appear to those who can, in the nature of the case, see only a few fragments of the vast whole. This is true even in the communication of truth from a largely informed to a little informed mind among men. If any one who has mastered a great subject is desirous to communicate some portion of his thoughts to another who is as yet very ignorant not only of that subject but of things in general, he must present only a portion of those thoughts, and that such a portion as cannot represent the loftiness and harmony of that which delights his own mind. While, then, the believer in the divine inspiration of the Sacred Scriptures, regards them as the expression of God's thoughts, he does not imagine that these Scriptures were ever intended to express all God's thoughts on any subject, or to represent the harmony of truth as it is seen in the Infinite Mind. He means only that the thoughts, so far as expressed, are God's own thoughts, and hence infallibly true.

But if these thoughts are affected by the nature of the mind which they enter, they are still more affected as they pass from one human mind to another. We all know how seldom anything is told twice over in exactly the same shade of meaning, and

how necessary it is, if we would secure the truth, to have it as far as possible at first hand. This makes it necessary ever to distinguish between the teachings of the inspired writers and all *interpretations* of those teachings. Not that we would undervalue interpretation. When a mind full of vast and varied knowledge, reads a portion of the Sacred Scriptures, the divine thought which rises in that mind will be far more full than that which rises in the mind that has but little information. Consequently, the well-informed will often be able to help the ill-informed to more lofty and expanded views of divine things, or of things divinely spoken of, than could otherwise be reached by the less favoured among men. So the mind which is free from error, to a great extent, will be capable of far more truthful thought in reading the divine record, than that mind which has imbibed a great deal of false idea. There will be less mixture in the views suggested by revelation in the one mind, than in those which rise in the reading of it by the other. The man, therefore, who is comparatively free from misleading preconceptions, must often be of great use to the man who is not so. Hence the value of his interpretations. But if these same interpretations are allowed to take the place which can only be properly occupied by the sacred Word itself, it is not difficult to see that there must be great risk of evil. In so far as the interpreter enables the reader to see the meaning of the divine text more fully for himself, he proves of use and value; but the moment the person to whom the interpretation is given is turned from thinking of the word of God, as addressed to his own mind, away to the thoughts of an uninspired interpreter, even if he is not led into error, he is led into a false position, in which he loses the peculiar influence which truth has on the mind when it is seen to come from God Himself.

Here, then, it seems well to glance at Scripture interpretation, as that has been affected by geological theories. The desire to accommodate men of science, and to accept their conjectures as established discoveries of truth, rather than to face the unpleasant consequences of sifting their statements so as to show the visionary character of their most cherished theories, has had a powerful and, we think, a disastrous effect, on the exposition of the Bible. It is not an easy matter for those who have the duties and responsibilities of active ministerial life resting fairly on their hearts, to find time to cultivate much acquaintance with geology. If they are earnest, they are likely to be swallowed up with what they deem more urgent work, so as to excuse themselves from that labour which alone can enable them to judge for themselves on so complicated a

subject. If they are not earnest, then they avoid the toil on other grounds. If they see in some degree the momentous character of the agreement of popular science with religious belief, and so turn their hearts to do something in the way of promoting that agreement, they are tempted to study rather the things that make for peace than those by which a really solid edification may be secured in the public mind. They too readily accept the decisions of the great leaders of science, and set to work to make the ideas given forth in Scripture harmonize with these decisions. Hence the almost incalculable amount of utterly groundless thought that has been made to overlie the clear ideas of God put before us in the Sacred Scriptures. It is not possible to see the relations of geological science to the Sacred Word, without some knowledge of the effect which has been thus produced on its interpretation.

We have illustrations of this in the productions of some of the most noble minds. One of the first of these, a truly representative man of an important class, may be quoted as an example. Dr. John Pye Smith, of Homerton College, was not only a man of the most earnest religion, but also of the most intensely scientific spirit. In his masterly book, "On the Relations between the Holy Scriptures and some parts of Geological Science," he shows that he felt himself forced to give a new and startling interpretation to the teaching of the Bible, by what he thought were the irresistible conclusions of geology. It is most instructive to observe where the centre of this fancied compulsion lay. He imagines one opposing his views, and says, "If, for example, the objector could say to us, 'You have arrived at no term. You cannot show us the indications of a cessation of the materials which you say have been deposited, and which form the portion through which you have passed. The series may be repeated, possibly again and again; or there may be another series of entirely different composition, such as precipitates from suspension in water, or products of chemical action, or results of igneous fusion, and so on indefinitely. Unless you had penetrated through all these, you can draw no conclusion on which dependence can be placed.'" How does the good man reply to this supposed objector? He says,—“But the objector cannot say this. He would be guilty of a false assumption. The true state of the facts is the very contrary to what he supposes. We are acquainted certainly, I might almost say perfectly, with the character and succession of the deposited substances, which, laid upon each other, compose the crust of our globe; and we know the totally different constitution of the materials which lie underneath. We see demonstrated

with satisfactory clearness the distinct character and the opposite mode of production of these two classes of mineral formations. We have all the evidence that can reasonably be desired, of the previous condition of those underlying rocks, their ancient, and, at a depth not great, their present liquidity by heat; their boiling up; their extrusion, both in the melted state and in different degrees of advancement towards being cooled and hardened; their being driven upward through the overlying formations of deposited layers; their sometimes insinuating themselves between the previously contiguous surfaces of those deposits; their filling long furrows of outbursts, and their being laid bare in many cases to open daylight. It is therefore no presumption to affirm that we do know, with the clearness of sensible evidence, the constituent formations of the crust of the earth, their modes of production, their relations to each other, and the fact of their enveloping a mass of materials similar in composition to the lowest rocks, and which we have much reason to think are, at certain depths, still in a state of constant fusion.”* What does the editor of the *Geological Magazine* for 1865 say to this “certain” and almost “perfect” knowledge? His words are: “Many a range of so-called primeval granite, gneiss, and slate, lapping the one over the other successively for hundreds of thousands of feet, or of upright ‘primary schistus’ miles across, will exhibit to the geologist of to-day only many-times-repeated folds of an altered set of strata; nor will their furthest change, or granitic form, be taken either for primeval or intrusive granite: and whilst the latter may still be found, the former, or the hypothetical granite of a cooling globe, becomes a myth.”† Sir Charles Lyell expresses the same truth still more decidedly. In the first volume of his “Principles,” which has just been issued, he says, “The progress of geological investigation gradually dissipated the idea, at first universally entertained, that the granite or crystalline foundations of the earth’s crust were of older date than all the fossiliferous strata. It has now been demonstrated that this opinion is so far from the truth that it is difficult to point to a mass of volcanic or plutonic rock which is more ancient than the oldest known organic remains.”‡ So the all but perfect knowledge of the excellent man who felt, in view of it, that our Scriptural cosmogony must be all recast, was only a perfect delusion! Are we not taught by this that great minds are not only gigantic in their grasp of

* Dr. J. Pye Smith’s *Scripture and Geology*, edition 1843, pp. 44 to 46.

† *Geological Magazine* for January, 1865, page 2.

‡ Lyell’s *Principles of Geology*, edition 1867, *in loco*.

truth, but equally gigantic in their grasp of error? Are we not warned against that grand popular mistake which leads thousands to accept as true that which has no other evidence in their thoughts than the fact that great men believe it? And do we not see how important it ever must be to keep the Sacred testimony itself most carefully in view?

We do not think it necessary on our part in this paper to give any interpretation of what the Sacred Scriptures teach on geological subjects. Our present duty is not to interpret, but to state and illustrate relations which are not essentially dependent on any peculiar interpretation of Bible teaching. If we do not greatly err (and are not led on in our error by all we can learn as we go on with the study of our great subject), the Bible will turn out in the end to be its own best interpreter. The account of the creation and the flood, as given by Moses will, we think, prove to be only the plain truth, as the scientific world will be compelled to admit it at last.

From what we have said thus far, it will appear that there are various fields of thought in which we might attempt to trace the relations of geological science to the Sacred Scriptures. These relations exist in the absolute truth as that stands in the Divine Mind. The thought of this leads us to raise our eye to that ocean on the shores of which we can only gather fragments of the wealth that lies hid in its waters. It is beyond measure cheering to the Christian to remember that endless time remains for the exploration of this expanse of thought. It is because he finds that he gathers most precious treasures cast up by this vast sea on Bible ground, that he so loves the Bible. But relations between geological science and the Sacred Scriptures exist also in that field of thought in which we meet with the true facts and sound inferences of geology, on the one hand, and the actual teachings of the Bible on the other. This is our true field of safe investigation. If we could only keep within its enclosures, all would go well. But neither have theologians nor geologists been as yet confined to such ground. As we have seen, the influence of great names—the power of great talents—the vanity which makes us proud of that which is knowledge in appearance only—the worship, we may say, of magnificent delusions, even after their delusive nature is exposed—in a word, the deceivableness of our common humanity, seems to have swept us into a turbid stream of thought in which it is extremely difficult to say whether the teachings of the geologist or the interpretations of the expositor are most to be distrusted.

In the way of reviewing the actual facts and such conclusions of true reasoning in geology as have been derived from the

comparison of those facts, we are disposed to regard the history of this science as naturally divided into certain great epochs, or stages of development. It will suit our purpose of making the past and present relations of the science somewhat clear, if we glance at the progress made during each of these great epochs. With this plan in mind, we go back to the earliest thoughts recorded on the subject, and run rapidly down the stream till we reach the present state of affairs.

Ever since man was on the earth, the more prominent facts of geology must have been patent to his observation, and they must, we think, have so far arrested his attention, and exercised his reason. When, therefore, we trace back the literature of the science, and light upon the first written thoughts that indicate observation and reasoning on the subject, it would not be wise to conclude that men never thought geologically till the authors of that literature lived among them. Those who did write so much as six or seven hundred years before the commencement of the Christian era, constantly refer to others who had written before them, and to ideas on the subject that had generally prevailed. We are disposed to select two of the prominent names of antiquity, as representative of all the rest. These are Herodotus among the Greeks, and Pliny among the Romans. In the works of both of these authors, we think we see that which may be very respectfully regarded as worthy geological observation and not unworthy reasoning on the important facts that had been observed.

We turn for our earliest historical notes to the pages of Herodotus. This masterly Greek had evidently thought geologically, and so far correctly. Speaking of the account which the Egyptians gave of their peculiar country, he tells us that, in the time of Menes, "no part of the land that now exists below Lake Myris was then above water."* Herodotus says that "they seemed to me to give a good account of this region. For it is evident to a man of common understanding, who has not heard it before, but sees it, that the part of Egypt which the Greeks frequent with their shipping, is land acquired by the Egyptians, and a gift from the river; and the parts above the lake, during a three days' passage, of which, however, they said nothing, are of the same description." Then he speaks of the sea-bottom, a day's sail from land, as mud in eleven fathoms, and evidently "an alluvial deposit." He says again, "The space between the above-mentioned mountains [the Arabian and Libyan], that are situated beyond Memphis, seems to me to have been formerly a bay of the

* Herod., *Est.* ii. 5 and 12.

sea." He goes on to establish this idea by a reference to other rivers, and especially by a description of the Arabian Gulf, into which, he says, if the Nile were turned, it would fill it up within twenty thousand, or even within ten thousand years. Herodotus gives a number of other reasons for his belief that the sea once flowed over the space now occupied by Egypt; among which is the fact that "shells are found on the mountains." He says, "that a saline humour forms on the surface, so as even to corrode the pyramids, and that this mountain, which is above Memphis, is the only one in Egypt which abounds in sand; add to which that Egypt in its soil is neither like Arabia or its confines, nor Libya, nor Syria (Syrians occupy the sea-coast of Arabia), but is black and crumbling, as if it were mud and alluvial deposit, brought down by the river from Ethiopia, whereas we know that the earth of Libya is reddish and somewhat more sandy; and that of Arabia and Syria is more clayey and flinty." It is very clear, we think, from these true ideas of this author regarding the basin of the Nile, that he was accustomed to a certain extent to follow out his observations of the surface of the earth, in true geological reasoning.

But we pass from the Greeks to the Romans, to give the ideas of another truly representative man. So far as the collection of facts and correct reasoning on these are concerned, Pliny is our best ancient writer on geology. This does not arise from his own observation of the structure of the earth, so much as from the wonderful acquaintance which he displays with the works of other authors. Herodotus was a traveller, and observed with his own eyes the facts which he narrated. Pliny gathered sheaves of information from the labours of all reapers in the field of knowledge.

It is in connection with earthquakes that this author gives us his best geology. Speaking of these, he says that "the earth is shaken in various ways, and wonderful effects are produced; in one place the walls of cities are thrown down, and in others swallowed up by a deep cleft; sometimes great masses of earth are heaped up, and rivers forced out, sometimes even flame and hot springs, and at others the course of rivers is turned." "There is no doubt," he says, "that earthquakes are felt by persons on shipboard, as they are struck by a sudden motion of the waves, without these being raised by any gust of wind." Then he notes the important truth that "inundations of the sea take place at the same time with earthquakes; the water being impregnated with the same spirit, and received into the bosom of the earth which subsides." "The same cause produces an increase of the land;

the vapour when it cannot burst out forcibly lifting up the surface. For the land is not produced merely by what is brought down by rivers, as the islands called Echinades are formed by the river Achelous, and the greater part of Egypt by the Nile, where, according to Homer, it was a day and a night's journey from the island of Pharos; but in some cases by the receding of the sea, as, according to the same author, was the case with the Circean Isles." Then again he says, "Land is sometimes formed in a different manner, rising suddenly out of the sea, as if nature was compensating earth for its losses, restoring at one place what she has swallowed up at another."* He gives abundant instances of islands so formed. Then he shows that lands are separated by the sea, and islands formed, by this means; while islands are added to the mainland by the elevation of their channels. All this is unexceptionable geology. It reads like some modern treatise on the principles of the science. Like everything of that early time, it was mixed up with fabulous statements, just as nearly all modern geology is mixed up with conjectural notions equally fabulous; but, so far as it goes, it indicates a very large and successful observation of the changes that affect the earth's surface.

The great amount of attention now drawn to recent formations, lends peculiar interest to the observations and reasonings of these ancient writers. There seems to be no good ground for believing that they had thought of penetrating to the secret depths of earlier strata, so as to classify the rocks; but we ourselves have been brought up from the depths to the surface by the most important controversies of our time. Hence the peculiar relish with which one now reads the records of thought so ancient, and traces the formation and character of that thought, so very much like the ideas which occupy the minds of the men of our own day.

If we endeavour to sum up the knowledge of the ancient philosophers, so far as their geology is concerned, I think we should regard them as having observed, to a great extent successfully, the characteristic changes of the surface of the globe—the degradation of higher strata—the consequent formation of alluvial land—the upheaval of the bed of the sea, and of mountain-ranges—the vast alterations connected with the phenomena of earthquakes—as well as the aqueous and igneous agencies and forces by which these effects are so far accounted for. If we compare their collections of minute facts with the collections and classifications of these accu-

* Pliny, ii. 82, 86, and 87.

mulated at the present day, the advance of science since their time has been immense, but if we fairly compare their philosophy of the earth with that reasoning as to the causes of terrestrial changes which prevails in even the highest quarters now, I am not sure that progress can be reported as of so great a measure. Fire and water unitedly filled up their thoughts of causation, so far as the surface of the earth was concerned, and these two well-known agencies seem to occupy the same space in the thoughts of modern philosophers. The forces that produce fire, and give water its power to dissolve, and which must be considered before many of the greatest facts in the earth's history can be explained, are nearly, if not quite, as much unknown to the moderns as they were to the ancients. Perhaps here the comparatively superficial thinker will remember Newton and "gravitation." The more careful thinker will remember Faraday, who says that force is "matter." "Gravitation," he says, "is a property of matter depending on a certain force, and it is this force which constitutes matter."* He will ask whether either Newton or Faraday really knew what gravitation is. He will find it very difficult to think that they did so. He will deeply ponder the manner in which the most favoured of the moderns reason on the effects of forces; exaggerating the least, and forgetting the greatest. And he will be constrained to give the ancients credit for a very great amount of geological science—that is, when that which they knew is weighed against that which is known at the present hour. There is a dangerous vanity which feeds on imaginary progress in knowledge, and needs often to be made aware of the fanciful character of that on which it thrives. I am persuaded that few things are more salutary in the way of restraining this vanity than an honest and patient comparison of what even the heathen thinker knew with the actual science mastered by the most civilized and enlightened among ourselves.

When we leave the period of observation and reasoning represented by such men as Herodotus and Pliny, and endeavour to find some tufts of truth on which to place our feet as we pass through the morass of stagnant and phosphorescent thought which followed that time, we feel greatly at a loss. For nearly fifteen hundred years rational inquiry stood as still as if progress had ceased to be a feature in humanity. It is,

* Faraday's *Researches*, vol. ii. p. 293. In this remarkable utterance gravitation is not a force but a property of a force. It is a property of matter, but then that is constituted by, or, in plainer words, is a certain force. So gravitation is a property of a force depending on a certain force, which force is just force!

however, remarkable that with the revival of intellectual activity generally, we have a very decided revival of geological inquiry. When Leonardo da Vinci pictured the fossil shells of Italian rocks so beautifully, and contended that they had once been real shells, there must have been a somewhat deep and wide interest awakened in connection with fossil remains. This was at the close of the fifteenth century. When Fracastoro wrote, about the year 1517, on the petrifications that were brought to light at Verona, some degree of fundamental geology had found its way into the more intelligent minds. But it is not till more than a century after that we have much of a really scientific character in the form of geological literature. Then, it is clear, that true thought on the earth's structure had begun to spread widely. There is a rather interesting evidence of this in a production from which we have already quoted. It is a translation of Steno's work on "Solids contained in Solids," which was published in London in 1671. In the address of the "Interpreter" to the reader, he says that the treatise "giveth very fair hopes, that by a due weighing of the particulars therein laid down, the sagacious inquirers into nature may be much assisted to penetrate into the true knowledge of one of the great masses of the world, the earth, and therein to find out not only the constitution of the whole, but also the several changes and the various productions made in the parts thereof." Steno, as we have already indicated, was a learned Dane, living, at the time when he wrote this treatise, under the Grand Duke of Tuscany, but about to leave for his native land. The treatise itself is constructed as a mere sketch of a much larger work which had been contemplated. It was published as a sort of apology for so full and noble a discussion of the deeply interesting theme as might have been worthy of the acceptance of the prince. Thought on such subjects had ripened to a very great extent before the date of this publication.

We consequently find a very considerable amount of sound and excellent geology in the treatise of Steno. He writes on what he calls "the much controverted question about marine bodies found at a great distance from the sea," and says that the question itself "is ancient, delightful, and of use." He complains that modern writers had rendered the subject more difficult and doubtful by departing from the solutions of the ancients. He says, "The ancients were exercised by one only difficulty, which was, how *marine* bodies came to be left in places remote from the sea." The discussion in Steno's time was as to the origin of these marine bodies—some ascribing them to the sea, others to the earth—while many held that

some had been produced by the earth and others by the sea. He says, "Only some make mention of inundations, and I know not what immemorial course of ages; though they do that overly, and as 'twere by the by." Steno himself gives as good an account of the matter as could be desired. Speaking of "cockles," he says, "Where the penetrating force of juices hath dissolved the substance of the shell, the same juices being either drunk up by the earth, have left the spaces of shells void (which I call aerial shells), or being altered by new adventitious matter, have, according to the variety of that matter, filled up the spaces of the shells, either with crystal, or marble, or stone. Whence comes that very pretty marble, called *Nepheri*, which is nothing else but a sediment of the sea full of all sorts of shells, where the substance of the shells being wasted, a stony substance is come in the place thereof."

But Steno wrote not only of objects found in the rocky beds of the earth, but of the beds, or strata, themselves. In a notable passage on this part of the subject, he says: "At the time that any bed was formed, there was another body under the same bed, which did hinder the further descent of that dusty [muddy?] matter." Again, "At what time there was formed one of the upper beds, the lower bed had attained a solid consistency." So he reasons as to the succession and superposition of strata. Then he says, "'Tis certain that when any bed was formed, its inferior surface and that of its sides did answer to the inferior body and of the bodies lateral, but the superior surface was, as far as possible, parallel to the horizon. So that all the beds, except the lowest, were contained in two planes, parallel to the horizon. Hence it follows that beds, either *perpendicular* to the horizon, or inclined to it, have been at another time parallel to the same." He then speaks of the "beds" changing their places, "first, by a violent excussion of the beds upwards." "The other is by the falling down of the upper beds, when the lower matter or foundation being thrown down, the upper bodies begin to crack; whence, according to the variety of cavities and crevices, there follows a various situation of the broken beds." So he says, "This changed situation of beds affords an easy explanation of many things else difficult enough to give an account of."* The formation of strata, the inclosure of fossils, the change of the position of strata, the forces at work in producing these effects, the conditions necessary to the operation of these forces, and the consequent result in the external form of the earth, as

* Steno, pp. 42, 43, and 99.

affected by the lofty mountains and deep seas, were known in a very remarkable measure by this intelligent thinker.

An author like Steno, who could write such geology above two hundred years ago, is worthy of respect ; and we may quote him at some length on the relation of geology to Sacred Scripture. He had come to the conclusion that " Etruria," which he had surveyed with some attention, had had *six* different " faces " or states of the surface, and he conjectured that this had been the case with the earth as a whole. So he says :— " But lest there should be apprehended any danger in the novelty, I shall, in short, lay down the agreement of *Nature* with *Scripture*, reciting withal the chief difficulties that may be raised about each face of the earth. As to the first face, Scripture and science agree in this, that all was covered with water ; but how it began to be thus, and when, and how long this continued so, Nature is silent, Scripture is not." Then he says : " Of the second face of the earth, which was plain and dry, Nature is likewise silent when and how it began, but the Scripture is not so ; meantime, that there was once such a face of the earth, Nature affirms and Scripture confirms, forasmuch that it teacheth that waters arising from one spring did water the whole earth." So he writes as to the whole appearance of this world spoken of by Scripture and seen in Nature. He says : " How great the height of the sea hath been, where Scripture determines it, Nature contradicts it not ; forasmuch, I. There are certain marks of sea extant in places which are many hundred feet high above the surface of the sea ; II. It cannot be denied that all the solids of the earth were in the beginning of things covered with an aqueous fluid, as they may have been covered with it again, in regard that the change of natural things is indeed continual, but there is no annihilation." This passage gives us a very fair view of geology in its relation to Scripture as it stood at this time, though we have given but a small portion of what Steno says on this relation, and its perfect harmony. He was, as we learn from his treatise, evidently a man of great ability and of a truly scientific spirit—worthy of being taken as the representative of the most advanced opinions of his time on the great subject we have in hand.

Thus far it will be seen, that we have little in what may be called geological science that could seriously come into conflict with anything that occurs in the Sacred Scriptures. Those ideas of a vast duration through which changes have been following one another in the earth's structure, ideas which have played so important a part in some recent controversies ;

these had been mooted only, as Steno says, "overly and by the by." They had not taken the form of conclusions of science to which the cultivated intellect was expected to bow. Geology, though "descriptive," and so far philosophical, had not become sufficiently "systematic" to give even apparent solidity to speculations in reference to the time required for the world's upbuilding, or in reference to the manner of that great work. A most spirited controversy had arisen as to "pre-Adamite" men, but the discussion was not geological in any degree. It was founded on an exposition of the fifth chapter to the Romans, and not on deposits in the earth.* The foundation, however, was broadly laid, on which in later days a geological argument was to be raised in favour of these "pre-Adamites," and also in favour of vast ages through which such beings had lived on the earth.

It was about 1759 that the element of time fairly took its place in geological science. Whewell says that at that date Arduino deduced from original observations, the distinction of rocks into *primary*, *secondary*, and *tertiary*, and that the relations of positions and fossils were from this period inseparably associated with opinions concerning succession in time.†

It is at this point, therefore, in the history of geology, that we meet with these formidable elements of which so much advantage has been taken, against the more ordinary views of Sacred Scripture. It was now that geological science in almost every one of its branches began to give system and great additional force to the reasonings of those who studied the structure of the earth. In giving a brief sketch of what may be regarded as a grand advance in geological inquiry about this time, we shall follow other and more competent judges in giving the names of Werner, Smith, and Cuvier, as the representative men.

Werner's great distinction lay in his mineralogy. The ordinary inquirer, who thinks with any degree of care, will see the importance of this in all that concerns the true knowledge of the earth's structure. If any one takes his stand opposite a cutting which has been made—say for railway purposes—through a large and varied mass of rock, he sees layer above layer of the stony substance, each layer, perhaps, differing in its composition from every other. No inference is more certainly true than that all these layers have not been

* The chief promoter of the Pre-Adamite idea at this time was Peyrere, in whose Latin work on the subject the curious may see the best that could be said in its favour.

† Whewell's *History of the Inductive Sciences*, edition 1857, vol. iii. p. 413.

originally formed and transformed in the same way. The sandstone has not been formed as the coal has been, nor has the ironstone been formed in the same manner as either of the other two, nor has the limestone been composed of the same materials, or in exactly the same way, as any of the other three. The conditions of mineral formation must have been different, and even greatly different, in order to the composition of the strata exposed to view. If the observer has the opportunity of watching the sinking of the shaft of a deep mine, he will find a variety in the character of the layers passed through, corresponding somewhat with the thickness of the penetrated mass. Every layer will indicate by its mineral character that a peculiar state of things prevailed at the time and place of its original formation, or at that of its transformation afterwards. It was, as we have said, the great distinction of Werner to apply this truth to the study of geology. His classification of rocks depended on their outward characters. It was not their chemical distinctions, but such as could be detected by the eye or hand, that formed the bases of his ideas of them. Jamieson, his great Scottish follower, says that chemical science was not then in such a state as to warrant dependence on its decisions. He says, when speaking of his tour through the Scottish Isles: "The chemical characters which form even the foundation of many mineralogical systems, I have seldom employed; from a conviction that the chemical part of mineralogy, notwithstanding the late improvements in the art of analysis, is still to be considered as imperfect."—(See Preface, page viii, Jamieson's *Mineralogy of the Scottish Isles*.)—It was Werner's immensely superior acuteness in distinguishing one mineral from another by the eye, or hand, or smell, that made him great as a pioneer of advanced science, and enabled him to bring a grand truth to bear upon the earth's structure. Although his theory of the origin of rocks cannot be said to have been at all established, his views of their character will be found to be far nearer the truth than those of the men who have all but despised them. He was the great champion of the aqueous theory as to the formation of almost all strata.

Hutton opposed this view, with a popularity which shows painfully how error may triumph. When this great geologist was searching the rocks of the Grampian range, and lighted on what he took for veins of injected granite, his joy was unbounded. The scientific world may be said to have gone after him in the belief of an internal molten state of the globe, only to find that it had been misled by a false idea. Yet the varied composition of the rocks to which Werner had effec-

tually drawn attention, remained as a momentous truth in established science.

But the name of William Smith represents an advance in the knowledge of the earth, of greater importance than that of Werner. This was characterized chiefly, though far from exclusively, by true doctrine as to the superposition of the strata.* It was not so much the varied character of the rocks, nor the varied character of the fossils which they contained (though both of these were known to this thinker), as the order in which they had been laid on one another, which first influenced his thinking on the structure of the globe. It was clear and certain enough that sandstone and coal had not been laid down in the same circumstances in their original beds; but this could not tell whether the actual sandstone or the coal in a particular series of rocks, had been first formed. When, however, it was noted that the coal had from the first lain beneath the sandstone, it was sure enough that the coal had been first laid down; and so on through all the varied strata of the earth. A field of vast dimensions was thus opened for inquiring minds, and the work of many generations was cut out for them. Men imagined ere long that they had lighted on the nethermost rocks—the true foundations of the everlasting hills—and that they could trace the whole of the wonderful building of the globe all the way from the centre up to the grassy turf that crowned it! But a great deal more has yet to be learned ere that can be done.

Then came that most important of all advances, which is represented by the name of Cuvier. It was his great task to mark off the physiological distinctions that separated the kinds of creatures that lived on dry land and in the ocean, when the various strata of the earth were laid down.† The difference between stone and stone was something, the position of rock above rock was something more; but the genera and species imbedded in one set of strata, shown to be so thoroughly different from those imbedded in another set, proved a far more important affair than either of the other two. The trees on land and the shell-fish in the ocean, compared with the fossil wood and rocky forms and casts of ancient mollusca, brought wonderful results to the minds of men. Yet, if we consider calmly the true extent of those results, so far as they constitute real science, they seem to us to amount to little, if anything, more than the placing of an

* Whewell's *Hist.*, vol. iii. p. 424. "In 1792 he [Smith] 'had considered how he could best represent the order of superposition—continuity of course—and general eastern declinations of the strata.'"

† Whewell, vol. iii. p. 418.

instrument in scientific hands, by which important work may be done in the course, perhaps, of centuries.

There were now, however, three great general ideas established in scientific minds. Certain rocks, deep in the earth's crust, or high on the sides of lofty mountains, were seen to have been formed in the same manner as similar rocks are now in the course of formation in the bed of the sea. The masses of sandstone that lie buried so many fathoms down, or have been raised so many thousands of feet high, were once sand-beds washed by the waves that now wash the sandbanks over which they flow. It was not yet within reach to tell how the rocks were formed on which the sand was first laid down; and it is not yet, we think, within reach of science to tell this secret. The limestone could be traced to its formation by the living creatures, and otherwise from the ocean, and it could be seen in course of deposition on that ocean's bed. How the first bed was formed in which the shell-fish lived, or on which the ooze was first thrown down itself, was and is the grand mystery. But the discovery of the truth, that deeply hid masses had been formed at one time on the surface, and that masses now high up the mountains, had been formed in the depths of the ocean, was the opening of a vast field of thought for men. Then there was the order of superposition, teaching that difference in age is irresistibly evident from difference of place in that order. That which is now forming on the surface, must, as to its formation, be new; that over which it is forming, must, as to its formation, be older. Strata laid conformably on each other, show that they were formed during one series of changes, while those on whose edges they have been laid down, have been formed during a very different series; and so on, as far as men can make out the actual facts of the order of deposition. But the grandest of all the teachings of these discoveries, was found in the order which seemed to be disclosed by the fossil contents of the strata. Man was on the surface, but no trace of his existence could be found, except on that surface. Creatures approaching man in his material structure, were found in the relics of their existence some way down, but only a short way; and just as the search descended, the class of being discovered was "low" in the scale of life. Not that it was less perfect in its kind. As Sir Roderick Murchison says: "When first created, the *Onchus* of the uppermost Silurian rocks was a fish of the highest and most composite order; and it exhibits no symptoms whatever of transition from a lower to a higher grade of the family." Only it was a fish and not a reptile. This truly eminent geologist, speaking of one of the great objects he had in view in

his vast labours, says: "I am, indeed, led to hope that my readers will adhere to the views which, with many contemporaries, I entertain of the succession of life. For he who looks to a beginning, and traces therefrom a rise in the scale of being, until the period is reached when man appeared upon the earth, must acknowledge in such works repeated manifestations of design, and unanswerable proofs of the superintendence of a *Creator*."* This was and is felt to be a point of great moment, though we must confess that it is one of those points which, to say the least, are very far from being fully established. Some modification of Sir Roderick's idea may prove true, but not that idea, we think, as it appeared to him when he wrote the words we have quoted. Yet enough had become certain to convince men that there has been only a limited line of life on earth. So far as mineral character and the superposition of rocks were concerned, it appears as if there may have been an indefinite series of changes going on; but what is regarded as the irresistibly evident progress of life, from things of the most humble to beings of the most exalted character, seems to shut up the inquirer to a belief in the limited character of the creation.

We have now before us the three great parallel lines along which all geological science, properly so called, has been travelling: the varied mineral character of strata, the varied order of their deposition, and the changing character of the fossils which they contain. If we trace the progress of the science up to the present hour, we find only a development in detail of these three great branches of truth, and that development rendering it continually more evident that the present state of the earth's surface is the result of a series of material changes, as to the nature of which men are yet only beginning to see as through a glass *very* darkly. But from this point, I think we pass naturally over into the dreamland of conjectural geology.†

When we come to consider the speculative divisions of geological science, we find ourselves at once in a region where men are in conflict equally with all true reason, as with the Sacred Scriptures,—a region in which, however, they stand on ground of the most unstable character. It was because of their unwise love for pure fancy in the garb of Philosophy, that the

* *Siluria*, pp. 239, 483.

† Probably the careful reader will think that we have already passed into that region. The succession of life on the earth, which has been thought so fully established as a truth in science, is not unlikely to share the fate of some other great but too hasty generalizations.

ancients were so completely led away from the true paths of knowledge. Whewell strikingly describes their failure, and its cause, in his admirable *History of the Inductive Sciences*. "Yet," says he, "we are not to think slightingly of those early speculators. They were men of extraordinary acuteness, invention and range of thought; and, above all, they had the merit of first completely unfolding the speculative faculty; of starting in that keen and vigorous chase of knowledge by which all the subsequent culture and improvement of man's intellectual stores have been occasioned. The sages of early Greece form the heroic age of science. Like the first navigators, in their own mythology, they boldly ventured their untried bark in a distant and arduous voyage, urged on by the hopes of a supernatural success; and though they missed the imaginary golden prize which they sought, they unlocked the gates of distant regions and opened the seas to the keels of the thousands of adventurers who, in succeeding times, sailed to and fro, to the indefinite increase of the treasures of mankind."* We can enter with all our hearts into this well-merited eulogium; but it is more difficult to praise the speculative ambition of an age which has the failure of the Greeks so fully before its eyes, and yet follows in that very track in which they reached only failure, and misled the inquirers of succeeding centuries.

When Herodotus proceeds to account for the overflow of the Nile, he furnishes us with a very good example of early speculation. He says: "During the winter months, the sun, being driven by storms from his former course, retires to the upper parts of Libya; this in few words comprehends the whole matter, for it is natural that the country which this god is nearest to, and over which he is, should be most in want of water, and that the native river-streams should be dried up. But, to explain my meaning more at length, the case is this: the sun passing over the upper parts of Libya, produces the following effect: as the air in these regions is always serene, and the soil is always hot, since there are no cold winds passing over, he produces the same effect as he usually does in the summer when he passes through the middle of the firmament; for he attracts the water to himself, and having attracted it, throws it back upon the higher regions."† It is not necessary to quote the whole passage. That to which I direct attention is the purely conjectural character of the explanation of the historian, coupled with the show of science, which caused his words to pass for the language of truth.

* Whewell's *Hist.*, vol. i. p. 48.

† Herod., *Eut.* ii. 24, 25.

We have equally striking illustrations of the conjecture into which scientific minds are ready to fall in the literature of later times. Steno, who has given us so much excellent geology, gives us also a good specimen of speculation in his explanation of the general deluge. "If it shall be said that in the earth the centre of gravity is not always the same with the centre of the *figure*, but that now and then it recedes from the one or the other side, according as the subterranean cavities are grown in divers places, it is easy to render a reason why the fluid which in the beginning of things covered all, left certain places dry and returned to them again. With the same ease may be explained the *general deluge*, if we place about the fire in the middle of the earth, a sphere of waters, or at least certain receptacles of them, whence without the motion of the centre, the pouring forth of the included water may be deduced." So he goes on at great length to account for the Deluge by means of conjectural reasoning, which is assuredly every whit as scientific as the best of the speculations of the present day.

When we come to the geological speculations of modern science, we find them arranging themselves along the three lines of thought to which we have already referred. Where reason and true science stand waiting for light, imagination kindles the torch of fancy, and passes on. Werner worthily represents those who pass down to the beginnings of the earth's strata, and see old Chaos amid his watery desolations, commencing the work of uprearing the present order of things. It is not a little interesting to find, as we have already said, recent discoveries lending so much countenance to Werner's ideas. Sir W. E. Logan's descriptions of the Laurentian rocks of Canada go very far in this direction. He has not only described the limestone formations interstratified with gneiss and granite, but he says, "Interstratified with the Laurentian limestones there are beds of conglomerate, the pebbles of which are themselves rolled fragments of still older laminated sand-rock, and the formation of these beds [that is of the beds of sand-rock from which these pebbles came] leads us still further into the past." Speaking of these limestones still, he says, "Of these calcareous masses, it has been ascertained that three, at least, belong to the lower Laurentian. But as we do not yet know with certainty either the base or the summit of the series, these three may be conformably followed by many more."* All, therefore,

* *Quarterly Journal of the Geological Society*, February 1st, 1865, pp. 46, 47

that we can say from these discoveries is, that the lowest rocks yet known to popular geology are sedimentary. If by the leadings of the highest note in the world, we go down to those sand-rocks seen in the pebbles of Laurentian conglomerate, and ask for the character of the rocks on which their sand was first laid down, we have no reply. We are not told that the foundation is granitic, nor are we told that it is not so. Our conscious ignorance here is, perhaps, our surest knowledge. We know that we do not know—that is all.

Hutton represents that host of speculators who still go down to the centre of the earth, and see all on fire. Because veins of superincumbent rock were full of granite that looked as if it had been melted and injected from below, he imagined, as we have seen, that the conclusion was irresistibly established that the basis of all the strata of the earth's crust was cooled lava, or molten rock cooled down and crystallized under great superincumbent pressure. It is most instructive to see how the very best authorities were led astray by this unfounded notion. As an illustration of this, though the author is one who discourages conjecture (at least in words), we find in Page's *Advanced Text-Book* (1856) the statement that the variable temperature of the crust of the earth descends to from sixty to ninety feet, "but at this limit it is stationary." Then he says, "that downwards from this invariable stratum, the temperature increases at the ratio of one degree for every fifty or fifty-five feet, and at this rate a temperature would soon be reached sufficient to keep in fusion the most refractory rock substances" !* At the depth of twenty-five miles, his estimate is 2,400° Fahrenheit ! This is surely hot enough for the most fiery philosopher. To give another instance. Whewell says, in the second edition of his admirable history, regarding Hutton's theory, (which, however, he admits was "premature,") "that many of its boldest hypotheses and generalizations have become a part of the general creed of geologists; and its publication is, perhaps, the greatest event which has yet occurred in the progress of Physical Geology." † These words were published in 1857; and in 1865 the very foundations of Hutton's theory were seen by all informed men to be false. Playfair, Dr. Hutton's great illustrator, says, "The power of the same subterranean heat which consolidated and mineralized the strata at the bottom of the sea, has since raised them up to the height at which they are now placed, and has given them the various inclinations to the horizon which they are found actually to possess." ‡ This is just what the very best

* Page's *Advanced Text-Book*, p. 15. † Whewell's *Hist.*, vol. iii. p. 505.

‡ Playfair's *Illustrations*, edition 1802, p. 55.

authorities now tell us is utterly untrue in both its halves. We shall see this fully as we proceed. What then was the advantage derived from Dr. Hutton's speculations? Physical Geology has had the benefit of being effectually misled for half a century. No matter for congratulation, certainly. This remarkable delusion did not spread, because no one opposed it. Far abler geologists than Dr. Hutton gave facts and arguments to the world more than sufficient to show the fallacy of his notions, but they were all despised as mere Neptunian prejudices. One cannot but regret that it should have been so. It is true that we are profited by being even painfully convinced of our folly, and so far good may come out of these grand mistakes when their spell has been broken; but surely it would be better if we were sufficiently careful of the grounds of our belief to secure that we should not be misguided, generation after generation, by these magnificent fancies. As matters stand, we see only the groundless nature of those grand ideas by means of which so many have been led to think that the teachings of Scripture are overthrown.

As we proceed with the review of theories, we see how one series of errors issues in another. When it was thought to be a truth, established by the mineral character of the rocky strata, that the earth was a globe of molten matter cooled down till a solid crust surrounded the still molten centre, it was natural that men should seek for a "beginning" to the history of such a globe, in something from which a fiery mass might come. Astronomy teaches that our world is one of multitudes that whirl in space; and so in searching among those other orbs it might be hoped, that men would find some analogies to guide them in conjecturing the real origin of the earth. A great astronomer had already given the fancied cue to the wished-for mystery. In looking among the myriad stars, we descry certain bright clouds that could not at first sight, or even by the aid of very powerful telescopes, be regarded as crowds of distant globes. So far as even Sir Wm. Herschel could judge with the aid of his vastly improved speculum, these *nebulae* were composed of "star-dust," or luminous matter in a gaseous state, and in process of concentration. The nebula seen in the constellation of Orion was one of the most persistent of these clouds. It can be seen by the naked eye, and yet the most powerful telescope that could be constructed then, failed to show that it consisted of separate stars. The irresolvability of this nebula seemed to teach that it was not so much distance which gave it a nebulous appearance, as its gaseous constitution. In the winter between

1844 and 1845, the Earl of Rosse brought his "three-foot mirror" to bear upon it, but could not see the vestige of a star. "The Nebular Hypothesis" was strong then. The immense weight of Hutton's influence, combined with that of Herschel and Laplace, bore on the scientific mind, and made the conviction apparently as irresistible as the nebula was irresolvable. Men felt as if they must believe that here was the primary state of a world—a cloud of luminous matter circling round a centre, and in process of cooling down into a solid globe like our own.* But Lord Rosse at length constructed his telescope with a six-foot speculum. Professor Nichol tells us the result, in language of intense eloquence. He was present the first time the "mighty tube" was directed to the mysterious nebula in Orion. The instrument was still imperfect, and no stars were seen. At length, however, Lord Rosse wrote, under date March 19th, 1846, telling him that with only half the magnifying power the speculum bore, he "could plainly see that all about the trapezium is a mass of stars; the rest of the nebula also abounding with stars, and exhibiting the characteristics of resolvability strongly marked." "And thus," says Dr. Nichol, "doubt and speculation on this great subject vanished for ever!" Then he says, "Yes! the Infinite we had built up after the fashion of what had become familiar, was yet, with all its greatness, only IDOLA, and could fill neither Space nor Time."† It required, as we have seen, a few years longer to demonstrate the mythical character of the "fundamental granite of a cooling globe;" but now these "brilliant" notions are safely registered in the record of dreams. It should never be forgotten that the most confident unbelief in the Sacred Scriptures perhaps ever entertained, had its foundations in these purely imaginary notions of great minds. So had the most laboriously framed but misleading interpretations of the Mosaic narrative, the force of their imagined necessity in those now abandoned theories.

It is not, however, in what may be regarded as isolated hypotheses that we notice the most signal failures in speculative geology. In its grandest generalizations there are astonishing defects. For example, when we are told that the crust of the earth is known to the depth of "perhaps ten miles,"‡ and inquire into the grounds of the statement, we are introduced into a field of astonishing reasoning. The deepest

* It is a puzzling question why philosophers did not regard these nebulae as worlds going to smoke, rather than consolidating into globes like our own.

† Nichol's *System of the World*, ed. 1846, pp. 53 to 56.

‡ Lyell's *Elements of Geology*, page 2.

mine of which I have seen any record, is only about a twenty-second part of ten miles. Twenty-two such shafts end to end with each other, would be required to pierce the earth's surface to that depth. Then if we take the estimated thicknesses of the strata that have been classified, that proves far too much. Those formations which are now placed below the Silurian, are described as fifteen miles in thickness in themselves alone! Were we to go by the estimated thicknesses of the rocks, and to imagine that at one time they all lay one over the other at any one point on the globe, we must conclude that we know something like a hundred miles down, instead of ten! Then suppose that we take a mountain and let it even be 20,000 feet high, that is, nearly four miles, who shall tell us what is in the interior of that mountain on a level with the plains at its feet? We are told that "it may appear inconceivable to a beginner, how mountains several thousand feet high, can have become filled with fossils from top to bottom;" but our difficulty is not with the conception, but with the entire absence of proof that there are any such mountains on earth. We may be perfectly satisfied that the surface of the mountain, even to its summit, is formed of sedimentary strata and contains fossils; but this is only a surface matter of comparatively a few feet, while we are seeking for some scientific grounds on which to found the belief that geologists know the crust of the planet to a vertical depth of ten miles! But we have the "dip" and bend of strata going down from the surface and coming back to it again. Say we take a Laurentian rock that rises to the surface, at a certain point, and consequently, if we trace it back from that point, it "dips" away towards the earth's centre at a certain angle. We pass along in the direction of this "dip" till we at last believe that we meet with this same rock rising to the surface again, we shall say at a similar angle to that at which it went down. Working on this angle, and on the distance between the two points at which the rock rises to the surface, we draw a "section" of the crust of the earth which accords with these data. We have a magnificent bend in the bosom of which to "fill in" any amount of newer formations, and at the point at which the bend is the deepest, we have a great deal more, we suspect, than ten miles! Our difficulty here again is, not that we have not proved enough, but that we have proved a great deal too much! We begin to be deeply thoughtful on the problem, as to whether, if geologists had known the crust of our globe to half the distance we have reached, they could ever have fallen into those mistakes as to its character which have

turned out to be so enormous. Their real knowledge amounts simply to this. At the time when certain creatures lived under the sea in a certain place, certain rocks were formed at the sea-bottom; certain rocks were formed after these, inasmuch as they were laid above them; and during the period of this newer formation, certain other creatures lived above where those older rocks *now* lie. We do not know that the older rocks continued to lie exactly where they were formed, when the newer rocks were being formed above them. We know that certain rocks dip at a certain angle and rise to the surface at a certain angle too,—sometimes the same as that at which they dip;—but we do not know that they form always such a curve as may be drawn in following this angle of dip and rise. The variations of position and contortion are innumerable, and our ignorance of the unseen depths is perfect.

But the ignorance which, so far as we can see, prevails as to the depths, is clearly traceable among geological ideas of the surface. We may give, in passing, a notable instance of the evidence that it is so. One of the most influential theories in that class which has been used against ordinary scriptural ideas, is that usually called the *glacial*. It is given as the true account of the formations embraced in the “boulder clay,” which means so much in geology. It is thus briefly but clearly stated by Page.—He says: “After the deposition of the lower tertiaries, it would seem that the latitudes of Britain and the North of Europe underwent a vast revolution as to climate, and that some new arrangement of sea and land took place at the same period. At all events, the large mammalia of the earlier tertiaries disappeared, and the land was submerged to the depth of several thousand feet, for we now find water-worn boulders on the tops of our highest hills, or at all events, at an altitude of from 1,800 to 2,000 feet. A cold period ensued, and icebergs laden with boulders and gravel from other regions, passed over these latitudes, and dropped their boulders on the then submerged lands.”* This immense ocean then gave place; and upheaved land with masses of ice pressing down the mountain-sides, and laying similar loads of boulders and clay at the sea-bottom, to be raised by fresh elevations, gave existence and character to the boulder-formations of the present surface. He says, “It is thus that we find granite and gneiss boulders from the Scottish Highlands now spread on the plains of Fife and Midlothian, and blocks from the hills of Cumberland spread over the moors of

* Page's *Advanced Text-Book*, pp. 233, 235.

Yorkshire." But this dream of a vast ocean with its burdens of ice and stone has been most successfully supplanted by one (if it also be a dream) which shows the north of Europe, and especially the regions spoken of above, all covered by a mass of snow like that now covering Iceland, which travels over even the tops of high mountains, and across valleys, carrying with it similar boulders to those advanced in proof of the submergence of the land, even to the thousands of feet spoken of. Especially by Mr. T. F. Jamieson, of Aberdeen, we are shown the folly of the fashionable faith in an ocean flowing over mountains now 2,000 feet above the sea-level, and the reasonableness of the mass of superincumbent snow, such as is still creeping over the inequalities of the northern surface, carrying with it all that is required to account for the boulder formations.*

Other ice-theories are contending with this of Mr. Jamieson for the mastery over the upheavals and subsidences of the ocean-bed. Among these, the most important is that which is founded on the fancied displacement of the centre of gravity in the globe by means of an immense accumulation of snow at the Pole. A grand difficulty in the way of this is the fact of open sea at the Pole now, though such masses as those which cover Iceland lie on Polar lands. But even if this displacement theory could be accepted fully, it would not at all change the relation of the boulder formations to the ice-covering. It might account for a submergence of northern regions to the extent of 300 or 400 feet, but could say nothing as to those facts which call for one of more than 3,500 feet, if an ice-bearing sea were to be maintained instead of snow. This dissolving view of an immense frozen ocean, with all its accessory ideas, is disappearing, like those of the central fires and the nebulae of space.

If we pass from these glacial affairs, and examine into what is known as to the formation and transformation of the rocks, we find that the same absence of true thought characterizes the present condition of this science which is seen in the matters we have thus reviewed. The mineral constitution of the strata, as enabling men to say how they were formed or transformed, is a cardinal affair in geology. Let us take up the popular notions of "trap" rocks, as a striking example of the light which prevails in this direction.

Looking into the *Geological Magazine* of July 2nd, 1866, we find, in a brief notice of an excursion of the Bath Naturalists'

* *Quarterly Journal of the Geological Society*, vol. xviii, p. 164.

Field Club, that on the 15th of May, "whilst passing along the Ridgeway, several indications of trap were noticed." One of these rocks was pointed out, coming to the surface "in the form of a boss; thus giving evidence of a mighty volcanic movement, which took place at a remote period, the limestone, before horizontal, being then upheaved by this great protruding mass, and thrown off on either side with considerable force; the lava at the same time bursting forth wherever a vent could be found." Such are popular ideas of trap rocks. In the same number of the *Magazine* (and, indeed, in the page facing that from which I have quoted) we find that the Warwickshire Field Club, on the 16th of May, had been examining "interesting sections of the lower coal-measures, with intrusive trap," and that they had some interesting discussion, on finding this once molten rock "in connection with coal shales," which in some cases remained little changed, though "in close proximity" with the igneous rock. Let us fairly fancy a melted mass of stone at its white heat flowing over a bed of combustible shale, and this same shale remaining "little changed"! In the same number of the *Magazine* still, we find that a paper was read to the Glasgow Geological Society on trap rocks near Bowling, on the Clyde. The writer, speaking of Auchentorlie Glen, says, "A little way up, on the left-hand side, there is a cave-like recess under the trap, partly filled with water, which has been formed by the scooping out of a bed of coal and shale which crops out near the level of the stream. The trap is here seen resting on the coal, which dips to the south-west at an angle of twenty-six degrees, and is almost two and a half feet in thickness. It is considerably burnt in its upper part, but some of it gives off a little flame. Between the coal and the trap there is a thin bed of clay-shale, and another bed of shale underlies the coal." Here then is a problem. Let us imagine a furnace large and hot enough to send out a stream of slag sufficient to form a mass like that which lies on this bed of coal. This stream, at its white heat, flows over this thin clay and combustible coal, yet the clay is not altered, and the coal is only "considerably burnt," and not even changed enough to prevent its "giving off a little flame"! Can anybody that ever saw molten slag coming in contact with shale and coal, conceive of such a miracle in nature as this? It would be just as easy to believe that geologists are trap rocks themselves, as to believe that coal could lie under a stream of molten lava of size enough to form the Bowling hills, and yet be only "considerably burnt." Yet Professor Ramsay himself, in his inaugural address to the Geological Section of the British Association, refers to the car-

boniferous system of Scotland as one in which "igneous rocks are rife;" the igneous rocks being this very trap which could lay itself so harmlessly at a white heat on clay-shale and ordinary coal, without even taking the colour or the smoke out of them!

The facts to which we call attention are just such as Kirwan, for example, published as early as 1799. He tells us that at Borrowstounness, in Scotland, a stratum of trap or whin is the immediate roof of a seam of coal, and at Hillhouse, near Linlithgow, a thin seam of coal is found beneath a stratum of columnar basalt. At Bathgate hills, strata of coal and basalt alternate with each other. His authority is John Williams, of whom Sir Charles Lyell says that he gave "the best account of the coal strata." Kirwan gives an instance from Hussia, in which a bed of coal six to ninety feet thick lies under a "mass of trap or basalt 600 feet high." He says that "when the coal is some fathoms thick, it forms a stratum that, next to the basalt, is the best and most bituminous."* Jamieson, in 1800, published the results of his personal observation of the geology of the Islands of Scotland. Speaking of the island of Canna, he says that there the people who had worked the coal told him that it was from six to eight inches thick, and inclosed in whin rock. At Portree, in Skye, he "observed a stratum of coal one to two feet wide, resting on basalt, and covered by a similar mass sixteen to twenty feet high." At another part he saw coal only a few inches thick, "covered by a stratum of basalt thirty feet high." In keeping with these observations, Kirwan quotes Bruckenman, who "found musselshells, ammonites, and corallites in the basalt of pretended extinct volcanoes of France," and says "Doctor Richardson lately discovered, and showed me shells in the basalt of Ballycastle."† Such testimonies might be multiplied to a very great extent; and the wonder is how the facts testified escape the notice and fail to be quoted, at least for refutation or explana-

* See Kirwan's *Geological Essays*, edition 1799, pp. 247 to 252, and 310 to 311. The passage in Williams is worthy of quotation; he says, "Strata of basaltine rocks are very common in many coal-fields in Scotland. There are several thick beds of this stone betwixt the different seams of coal at Borrowstounness, and one of them is the immediate roof of a seam of coal in that ground; and there is a thin seam of coal below a beautiful bed of columnar basaltes at Hillhouse lime-quarry, a mile south of Linlithgow. In the Bathgate Hills, south of Linlithgow, there are several strata of coal and several strata of basaltes blended together, *stratum super stratum*. These instances may suffice as a proof that strata of basaltes are sometimes the immediate roof and pavement of strata of coal." (*The Natural History of the Mineral Kingdom*. By John Williams, F. R. S. A. Posthumous edition, 1810.)

† *Mineralogy of the Scottish Isles, &c.* By Robert Jamieson, F. R. A. S., &c. Vol. ii. pp. 38, 57, 87, 88 (edition 1800).

tion, by those who uphold so strenuously that the trap formations of the carboniferous period of Scotland are the lavas of submarine volcanoes.

If it were necessary to give the authority of a living geologist for the truthfulness of our ideas regarding these so-called igneous rocks, Mr. Geikie might be referred to. He read a paper before the Geological Society on the 6th of last June, and wrote also an article which appears in the December number of the *Geological Magazine* (1866); in both of which he shows that sandstones and clay, as well as limestones, can be seen passing into trap and granite in Ayrshire; and that without either rising from their beds or being overheated in them.* Speaking of sandstones, he says that they "have become changed in places into a rock of variable composition, which is sometimes quartzless syenite, sometimes minette or mica-trap," and goes on to show how crystalline structure is fully reached. "At last," he says, "I am therefore forced to conclude that the crystalline rocks, described above, have resulted from the alteration, *in situ*, of certain bedded deposits." It is interesting to see the effect of this conclusion, as to sandstone passing into trap and granite, in connection with these rocks passing into each other. Sir Charles Lyell says, "It would be easy to multiply examples to prove that the granite and trap rocks pass into each other, and are merely different forms which the same elements have assumed according to the different circumstances in which they have consolidated from a state of fusion."—(*Principles*, vol. iii. p. 362, ed. 1833.) Now, sandstone and even clay, passing into trap and granite, must be classed among the fused rocks too, or the whole "fused" theory of trap and granite must be given up. If the positive statements as to the origin of trap rocks, which so abound in our popular geology, taken along with what we have thus stated, do not prove ignorance of fundamental truth in the science, nothing can be proved.

When we would account for geological belief as to the origin of certain strata—belief that is so palpably false—we have only to mark the oblivion which prevails as to some of the grandest discoveries of kindred sciences. Our great leading geologists

* Mr. Geikie says, near the commencement of his paper in the magazine, "The rocks referred to below are *Diorite*, *Minette*, and *Granite*, all of which, with one exception, are admitted by most geologists to have *generally* had an igneous origin—that is to say, they have not only been in a state of fusion, but have also at various periods forced themselves among pre-existing strata." The exception is *Granite* evidently. Mr. Geikie lets the fused theory down *gently*, but he lets it down effectually.

seem to us to have failed truly to study the subject of *force*. This cannot but prove a defect of great influence, and such as might be expected to produce results of the most disastrous character to the science. In these rocks, observed by Mr. Geikie in the very process of change from sedimentary sand and mud into what were imagined to be fused masses slowly cooled down and crystallized under pressure, but which are now seen to be simply changed masses becoming trap and granite before the observer's eyes, the very chief of geologists seem not to have even the ghost of an idea as to the power which is effecting the change. Take, for example, a piece of the undoubtedly aqueous rock before it has become changed, and a piece of the trap into which it has been changed;—here are two "facts," and what is the relation of the one to the other? The one kind of rock has passed into the other;—but how has the change been effected? Geology cannot tell. Why so? Because a force is at work which has been ignored. It has been thought of only by "heretics"!

In explaining the present mineral constitution of the varied strata, there are still, as we have said, only two great agencies recognized in any adequate degree. These are fire and water. *Igneous* and *aqueous* influences are the only ones that are allowed prominently to occupy the mind, while the best writers describe what is believed to be the origin of rocks as they now appear in the earth. The wearing down of strata, with the consequent formation of sedimentary beds by means of water, and the alteration of these sedimentary strata, by heat, under great pressure, seem to have filled the scientific mind, as if almost no other forces existed in nature. Playfair speaks decisively on this point. He says, "In Dr. Hutton's system water is first employed to deposit and arrange, and then fire to consolidate, mineralize, and lastly to elevate the strata; but with respect to the unstratified or crystallized substances, the action of fire only is recognized."* Hutton has been followed with wonderful docility by most of our popular geologists. Hence fire and water are still the only great acknowledged forces. Chemical changes, so far as they are aqueous, that is, so far as they occur through water, are recognized. The electrical force, which is surely more than equal to heat, on the one hand, and to all aqueous forces on the other—more than equal indeed to both combined—seems lost sight of. I should think that it will readily be admitted that the altering power of the electric current is greater than that of either heat or

* Playfair's *Illustrations*, p. 131.

chemical affinity, so far as that is found in igneous or aqueous agencies. It is more powerful than pressure, or heat under pressure, or hydraulic force, or anything else yet known in material changes. Yet this most inscrutable of all forces seems scarcely thought of in relation to the transformation of rocks. Must not speculations on the effects of force, which leave out of calculation the most powerful force of all that is known in physics, be radically defective and misleading? Is it not this neglect which leads geologists so often into the gross error of imagining that even stagnation itself will issue in the most magnificent changes, if it is only allowed sufficient *time*?

But the same defect is visible in the utterly inadequate accounts given of the positions of strata. The only upheaving force thought of is *heat*, and the only degrading force is *water*. In upheaval, water in the form of steam is thought of so far, but that only as it is, like the rocks themselves, affected by heat. Hydraulic force seems scarcely thought of, nor is that force fully considered, whatever it is, which makes water the parent of fire. Take a ship-load of burnt limestone, and let into the hold only a small portion of water, the result is fire, and a resistless rending and destruction of the vessel. So far as volcanic fires are concerned, there seems enough in this "chemical affinity," as it is called, to account for them, were it not for the associated earthquake. The shock of that seems to us to travel much too far to be accounted for by anything but electricity. The force which shakes the solid crust of the globe throughout an area of two hundred miles in breadth, and as much as fifteen hundred miles in length, cannot, I humbly think, be referred on any reasonable principle, either to the agency of fire or to that of chemical change. No development of force has any likeness to that required for such an effect, but such as we see in electricity. That strata should be rent and changed in mineral constitution, by a force that can affect the globe in this way, seems at least like reason, and it does not call for the *time* so anxiously prayed for by the fashion of the present geological day.

But there is a more important defect to notice in relation to the positions of strata. We naturally inquire where the subsiding masses that are said to sink down into or through the earth's "crust" are "stowed away." And how are the spaces out of which Alps and Andes, and even continents rise, so filled up as to support such burdens? The conglomerate which lies below the Laurentian limestone contains, as we

have seen, pebbles of sand-rock which must have come from older strata than that conglomerate itself. But we have no sign as to the nature of that rock on which the older strata were laid down. In popular geology, with its vertical upheavals, we have no provision for anything below, that could sustain the now raised sea-bed on which these pebbles were strewed. Heat is only a state of matter analogous to motion, and to have the heat we must have something to be heated; but as at present taught, we lack this actual substrate which is so indispensable. The truth is, we are worse off than Archimedes when he would have moved the world: we have neither fulcrum nor lever! Then we are taught to believe in masses equally great, that sink down without our getting any idea of unoccupied space below. Even molten matter requires space, but the molten character of the inner centre is now seen to be a "myth;" and how to account for the subsidence of vast continents is as difficult, if not more difficult, than to account for their upheaval. There is one among some other curious exceptions to this vertical rule which we have noticed in Sir Charles Lyell's explanation of the position of a mass of gneiss 1,000 feet thick and 15,000 feet long, which he found in the Alps "not only resting upon, but also again covered by strata containing oolitic fossils."* He supposes "great solid wedges of intrusive gneiss to have been forced in laterally between strata," to which he found them to be in many sections unconformable. This is a great step out of the usual road of movement. It is amusing to see how happy many great minds are in their enjoyment of vertical motion alone. Their sea-beds sink to nowhere, and their mountains and continents rise from nowhere; but they themselves are not troubled with the incongruity in the dream! Is it not possible that there may be a horizontal motion of the earth's surface? May not the travelling of Icelandic snows bear some analogy to the changing position of the masses of the earth's surface? It is surely more philosophical to speculate with the greatest of all natural forces and the only possible direction of motion in view, than to leave them out of sight, imagining vast effects without adequate causes, risings without lever or fulcrum, sinkings without empty space below, and when difficulty is hinted, merely to pray for *time*! But like all else that is really fundamental in popular geology, this vertical upheaval

* Lyell's *Elements of Geology*, edition 1866, p. 752. This whole passage in one of Sir Charles's latest editions is strikingly indicative of confusion of idea as to the nature and position of the strata on which he is remarking; however unpardonable it may be in us to think so.

and subsidence is passing from the scientific mind. It too is doomed.

The latest ideas of upheaval and subsidence entertained in what may be called "head-quarters" in this science, are stated by Professor Ramsay, in his address already quoted. He says, "There, in the Alps, we find areas half as large as an English county, in which a whole series of formations has been turned upside down. But by what means were masses of strata many thousands of feet thick bent and contorted, and raised into the air, so as to produce such results, and thus affording matter for the elements to work upon? Not by igneous or other pressure and upheaval from below; for that would *stretch* instead of *crumpling* the strata in the manner in which we find them, in great mountain chains like the Alps, or in less disturbed groups like those of the Highlands, Wales, and Cumberland, which are only fragments of older mountain-ranges; but perhaps, as some have supposed, from the radiation from the earth of heat into space, producing gradually a marked shrinkage of the earth's hardened crust."* Again, he speaks of the formation of mountain-chains by "direct igneous action operating from below," as an old-fashioned idea which he wonders to see produced in memoirs of even well-informed writers now, and thus he leads on to the new theory of a "shrinkage of the earth's hardened crust." He does not say how this *shrinkage* and *crumpling* were produced. He only speaks of the radiation of heat as that which "some have supposed;" and in regard to the formation of gneiss and granite, he says frankly, as to how they were produced, he "cannot tell;" only he imagines that somehow the means must have been heat! This launches the hypothesis of a shrinking crust on the sea of willing speculation; but by "the law of continuity," which has so ruled the race of theories from the beginning till now, ought we not to expect that "*shrinkage*" will, perhaps, by the time the British Association meets again, have given place to a successor? Surely when we recollect that the lowest stratum yet discovered in the formation of the globe is one from water, which gives no sign whatever of *shrinkage*, it requires a very bold stroke of fancy to imagine that such a thing is to account for the mighty disturbance evident even in the Alps themselves. Who, then, can contemplate the real state of speculative geology, as we are thus finding it in its very foundations, without seeing that its great leaders are completely adrift, and that without either chart or compass by which to steer? We have been kindly told, not to be afraid of the effect which this science may have

* *Geological Magazine* for November 1st, 1866, p. 510.

on religion. We hope it is understood that our fear has never arisen from its truthfulness. But false speculations are to be feared.

It may be the highest presumption in us to allow the thought to enter our minds, yet we cannot help thinking that the bewilderment of our geological guides may be in a great measure traced to one fallacy. They seem to think that it is impossible that a stratum of rock could have been formed anywhere else on the earth's surface than where it now lies. Although we have seen that a whole formation, half as large as an English county, has been turned literally upside down, it seems, according to current ideas, that this remarkable revolution *must have* taken place on the spot above which the strata of this formation were originally deposited. Upheaval and subsidence being the only recognized movements of the earth's surface, the transportation of such masses from one latitude or longitude to another, is not to be thought of! It is, however, extremely difficult for one who looks at the subject from a common-sense point of view, to imagine the mass of rock forming half an English county turned over, so that it would lie upside down over the same portion of terrestrial surface on which it lay before; but if such a mass might change its place, so that its latitude or longitude, or both, should no longer be the same as they were, it is hard to see how the British Isles themselves might not also change their place. But such change of place at once introduces the idea of a change of climate, and that again a change of the plants and animals inhabiting the transported region. Alterations of climate have been generally accounted for by referring to changes in the atmosphere arising from new directions of the oceanic currents, or changes of sea into land, or of land into sea. But such changes could never account adequately for the plants and animals of a tropical climate that are found embedded in the rocks even of England itself. Winds passing over burning deserts, and the Gulf Stream passing more directly northward, might modify the climate greatly; but with the relation of the sun and surface, as it stands, they could never account for the fossils that are found in the North now. The case is very different with the view to which I am now calling attention. For example, when we have satisfactory evidence that a climate like that of Egypt once affected the life of England, and that a change from Egyptian heat to our present climate has extinguished certain species that now live only in the Nile, or in rivers of distant lands, we are free to ask whether this change is the result of an alteration in the atmosphere of England, considered in its rela-

tion to the terrestrial surface only, or of an altered position of England in relation to the sun. I am aware that I am suggesting a "heresy" for which Mr. Evan Hopkins is responsible now for some twenty years; but surely the fact that an idea has been condemned as "heretical" can be no drawback to it among truly scientific men.* The idea is forced upon us, not by the weight of any name, unless it be that of Professor Ramsay. His facts and his bewilderment, when meditating among those old Alps, seem to urge us to accept the idea. His observed *crumpling* cannot be explained by his suggested *shrinkage*—of that we are sure. It can be explained by a lateral motion of the earth's unequal surface—of that we are as sure. How could *shrinkage* lay half an English county flat on its back? A force sufficiently powerful, pushing the mass along among other masses, might accomplish such an overturn. That force whose shiverings shake the solid globe at once over even 1,500 miles, when at its steady, earnest work, is more than enough to lay England itself, if not upside down, at least on a new and distant bed in the course of years. We do not say that this view is infallibly right, nor can we say that it is wrong; but we certainly think that the progress of Descriptive Geology shuts us up to some doctrine of lateral movement in the surface of the globe, if we would allow our physical principles to keep pace with discovery. Its rejection by geologists, combined with the necessity for some such explanatory force, is another powerful proof that the science we have in hand is loose in an extreme degree in its fundamental principles. As it now stands, no one can say what its doctrine as to the real character of strata, or as to their superposition, may be tomorrow. It is, in these essential principles, in a state of perfect indecision, and ready, like a vane in the wind, to turn itself to any current that may blow.

But it is equally clear that a thoroughly unsettled state of mind prevails among speculative geologists as to organic remains. We have already seen how important are the discoveries that men have thought they had made in this direction. Sir Roderick Murchison especially lays great stress on the idea of successive creations in the peopling of the globe, and those who take very different views from his are almost equally interested in progression. It is clear, however, that discovery of great importance is threatening the science in the direction of its doctrine as to these organic remains. The writer of the

* See *Geology and Terrestrial Magnetism*, by Evan Hopkins, C.E., F.G.S. third edition, 1865; a book worthy of earnest study.

first article in the *Geological Magazine* for 1865, from which I have already quoted, in asking the question, "Have we got back to the first of earth's created beings?" and replying "That is not for us to say," concludes his remarks with these words: "Judging from analogy, then, the Eozoön rock of Canada was the foraminiferous formation in one part of an ocean which elsewhere may have borne manifold and higher species, and buried them in sands and muds, that have since lost all form and feature by the metamorphism of age and pressure, or which were altogether shorn away by wave and weather when the old ocean-bed was lifted up."* Nothing can be more evident than that language such as this expresses bewilderment in fundamental thought, such as prepares men for any change. The theory of progression, as it has been called, is sick and ready to die. That is, not merely Darwin's notion of the transmutation of species, but the theory of a gradual evolution of higher forms, either by creations or transmutations. The grand, general idea, that the production of man formed the last step in an inconceivably long chain of development, which rose from a low first link fastened on somewhere to a piece of "fundamental granite," is expiring! If "manifold and higher species" might live in the ocean at the time of the Eozoön, why might not manifold and higher species live also on land? And if higher species, why not the highest? Here we ask our guide, if he knows the road beyond? and he replies, "No, gentlemen, we are off the track. I see no path either behind or ahead!" Such is Geological Science in one of its grandest features at the present hour. Pressed to speak as to even the way to light, it can tell us simply nothing. So we must think for ourselves.

If, then, we give up the merely vertical movement of upheaval and subsidence, with latitude maintained, and believe that since half an English county could be turned over like a turf on its grassy side, any number of such formations could be pushed along from tropical to temperate and thence to arctic positions on the great globe, we have, at least, *one line of thought* marked off, by which changes of climate, and all consequent changes of species, may ultimately be accounted for. We have also that in view, of which the sickly theory of progression, as it has been held by geologists, may be allowed to die, and the doctrine of creation, as taught us through Moses, may be seen in its proper scientific light.

As a fuller illustration of what we mean, we must direct

* *Geological Magazine*, January, 1865, p. 3.

the most earnest attention to some of the very thoroughly ascertained facts of geology. We observe that Sir Charles Lyell says: "Mr. [now Dr.] Bowerbank, in a valuable publication on the fossil fruits and seeds of the island of Sheppey, near London, has described no less than thirteen fruits of palms of the recent type *Nipa*, now only found in the Molucca and Philippine Islands, and in Bengal." He says also, that "the teeth and bones of crocodiles and turtles" are found here, with other relics of an unquestionably tropical character. Here then fairly occurs the question as to whether all these undoubtedly tropical productions and living creatures grew in the present latitude of London; or have the relics of a truly tropical situation been transported northward by the removal of the strata in which they were entombed? Certain minor causes might, perhaps, account adequately for a milder climate prevailing in England, or in its latitude, than even that which is produced by the Gulf-stream now. But it is impossible, apart from the vertical rays of a tropical sun, to account for the richest results of a tropical climate; and the very richest are entombed in the London clay. Is it not evident that this clay was formed within the tropics, and that somehow it has been removed, until it lies in our northern latitude? And is it not this removal alone that can account for the difference between its climatal character and that of the beds of sediment now forming in the Thames? But if such is the account to be given of changes in climate, we must recast our ideas of the extinction of species, and alter our views of what is called geological time. The shutting off of the warm waters of the great Atlantic current from our shores might bring a glacial period over Britain; but as we know, the letting on of those waters would not give us the heat of Bengal. No raising or sinking of the surface, which could be conceived, could give us the effects of the direct radiance of a tropical sun without those rays themselves. But the removal of the abodes of tropical creatures from under tropical skies is abundantly sufficient to account for their extinction or emigration from the portion of the earth's surface so removed; and it requires only, that we should be able to form some true idea of the time consumed in this removal, in order to our coming somewhat near the date of the extinctions and emigrations which the records of the rocks disclose.

It is at this point that we are, as it were, compelled to look into current astronomy, where that science has been called in to account for changes on the surface of the earth. And here, too, we must distinguish between practical and physical science. Because astronomers predict, to the fraction of a

second, when an eclipse will occur, if it should be thousands of years hence, it is taken for granted that all they teach must be true! But while a child may look to the dial of a time-piece, and tell us to a second when the pointer will cover a certain mark, not one among ten thousand of grown men can go behind the dial, and explain how the causes operate by which the hands or pointers are moved. So may a very poor thinker calculate the time of a transit, or an eclipse, while the loftiest intellect becomes bewildered, and is lost in trying to prove even the existence of those forces on the reality of which the fundamental doctrines of physical astronomy depend. The noblest minds are overtaxed when honestly attempting to tell us whether there is such a thing as centrifugal force, and what it really is, which is called "gravitation." No one has gone behind the scenes, and seen how the highest authorities in astronomy are situated, without seeing that the physics of this science are as unsettled and uncertain as those of geology itself. But we gladly look into its teachings notwithstanding.

Mr. Croll, of the Glasgow Andersonian University, has presented the world of science with the best phase of one of the most interesting of all theories from this quarter.* Sir Charles Lyell has given Mr. Croll great credit for his labours in this matter, as one who has pointed out a *real cause* hitherto neglected in the calculations of geologists; and although we cannot accept the conclusions at which he arrives, we must acknowledge our admiration of this writer. His idea, in essence, may be briefly stated. Our globe in being carried round the sun, as modern astronomy teaches, has a path which is not a circle, but an ellipse. This, of itself, causes the earth to be nearer the sun in certain parts of its orbit, and farther away in others. But this elliptical path of the earth does not always maintain the same relation to the sun as a centre; it changes continually, and in the course of time, the aggregate of change is very considerable. At one time, the earth, at its nearest approach to the sun, is vastly nearer, and, at its farthest departure, vastly farther from that source of heat than it is at other times. The difference, as it is calculated by astronomers, is expressed in millions of miles. This element alone, however, would not give us any reason which could account for a change of temperature on the surface of the globe, because the motion of the earth being quickened in proportion to the nearness of its path to the sun, the amount of heat which it receives is the same when it is nearest as when

* See the *Reader* for October 14th and December 2nd and 9th, 1864; also *Philosophical Magazine*, 1866, pp. 26, 27, 28, and 30.

it is farthest from the solar centre. But there is another element which combines with what is called the eccentricity of the orbit. Winter and summer are not caused by our being farther from the sun in the one than in the other ; but by that motion of the earth which shortens, or, as we may say of polar regions, blots out the winter's day, and lengthens the day of summer. In polar latitudes, the sun shines on the surface of the globe during the whole twenty-four hours of the summer's day, and is not seen at all in winter. It is on the effect of this, which arises from the turning away of the polar surface from the sun, that Mr. Croll chiefly depends for the proof of his theory. The radiations of heat must be excessive from the polar surface, when it is dark and at its greatest distance from the sun—when, too, because of its slow motion, its winter is at the longest. This loss of heat (as Mr. Croll argues) will not be compensated by the sun's nearness in summer ; for the shortness of that season, from the swiftness of the earth's motion, in proportion to the length of the winter, will prevent all that would otherwise make the summer warm. Put, then, these two things together—let the northern winter occur when the earth is farthest from the sun, and, consequently, the summer when it is nearest—the winter will then be excessively severe, and the short summer, not even usually warm. This, Mr. Croll thinks, will cause a glacial period over great part of the northern hemisphere. Now, let the case be reversed—the short winter occurs when the earth is nearest the sun in space, and the long summer when it is farthest away. The consequence of this will be greatly lessened radiation in winter, and the equalizing, to a great extent, of that season and the summer in northern regions. These opposite combinations of the earth's position, in relation to the source of heat, account, according to this view, for regularly recurring periods of extreme winter cold, combined with proportionally small summer heat, such as will fail to melt the winter snow, and periods when the summer and winter are lost in constant spring. Could we confine our reasoning to astronomical theory, and leave out other considerations of a geographical nature, Mr. Croll would, we think, make out a pretty strong case by his argument for a "*glacial period*," during the time when the winter occurs at our greatest distance from the sun. But this is not the problem which is of greatest importance, as we are constrained to view the case,—that has respect to a hot climate sufficient for palms and turtles in our northern latitude. Mr. Croll does not attempt to make out this. He has difficulty in making out a period fit even for the *ferns* of the coal-measures, when winter occurs

at our nearest to the sun in the earth's eccentric orbit. He argues only for a "perpetual spring." His mean temperature, calculated for Great Britain, is only 60° F. This, he argues, must have been the summer and winter heat, with scarcely any variation, in the Carboniferous period. But, as we have seen, geology calls for the climate of the hottest parts of India, an equatorial climate whose mean heat is 81° . What we want is, at least, a *tropical* climate in the latitude of London—a climate very different indeed from that which, even according to revised ideas, could suit the vegetation of the Coal period. In thinking of the possibilities of such a climate in the North, it is necessary to keep in mind the truth to which we have already referred, that the length of the polar summer's day, though giving great advantage in the reception of heat by the constantly enlightened parts, presents only a *slanting* face to the sun, and so can never account for the heat and other effects which flow from the vertical radiance of Bengal. Sir Charles Lyell, in criticising Mr. Croll's theory, quotes from the *Encyclopædia Britannica*, the results of the reasoning there given in the article on *climate*. It is to the effect that the sun's rays passing through the atmosphere, so as to fall on the earth's surface at the equator, give 115° of heat, for 51° given in latitude 45° south or north, and for 14° given at either pole.* The latitude of the London clay is $51^{\circ} 30'$ N. The radiance of the sun, which gives 115° F. at the equator, and gives only 51° as far as 45° north latitude, is required to give an equatorial heat more than six degrees further north than where it can give only 51° . How will Mr. Croll, or any one else, make this out, and so explain on this theory the tropical remains in the isle of Sheppey? Yet this is that for which an account is required as the facts of geology stand.

The remains which, as we have seen, are imbedded in the London clay and kindred formations, are such that nothing short of the sun's vertical radiance will account for them. Dr. Hook saw this as early as 1688, and although his idea has been scouted, it is not on that account the less true. But, in addition to all this, any one who has had to do with the growth of palms and other tropical plants in this country, knows that it is not so much want of heat which renders it impossible to grow them satisfactorily, nor is it the want of moisture. These can be supplied; but what we lack is the sun's tropical radiance. Sunshine means much more than mere heat. How to show that this ever fell on the

* Lyell's *Principles of Geology*, vol. i., edition 1867, p. 284.

earth, in such a latitude as that of Britain, as it falls now in India, and raised even the ocean to a temperature such as that of the Indian Ocean now, is the problem which we think astronomy, as generally understood, cannot solve. Even if we grant the truth of the fundamental principles on which the calculations of the first philosophical astronomers of our time are based (and many competent thinkers will not grant so much), we are totally without anything in the popular teachings of the science that accounts in any degree for the facts of geology to which we refer.

In coming to a conclusion,* we are very forcibly reminded of a saying of one great man of science, which has been quoted and applied to a special idea by another of nearly equal standing. We direct attention to it, because it falls so signally short of the whole truth, and yet so faithfully represents a part of that truth. It fails to express that very thought which is of greatest moment as science stands at the present day. Agassiz has said, "that whenever a new and startling fact is brought to light in science, people first say, 'It is not true;' then, 'It is contrary to religion;' and, lastly, that 'Everybody knew it before.'" Sir Charles Lyell quotes this in reference to the idea of the former existence of man with many extinct mammalia, holding that this, which he seems to regard as a "fact," has gone through all the three stages spoken of by Agassiz, at least so far as practical geologists are concerned. This idea of the coexistence of men with mammoths, it is important to observe is *not* a FACT, even if perfectly true. It is only an inference, at best, perhaps a theory by which certain facts are partially explained. So far as this matter of coexistence of man with extinct species of animals is concerned, we are not anxious as to what may prove to be its ultimate development. We refer to it at present only in connection with the idea of the *three* stages through which Agassiz said a new and startling fact passes. Such "facts" are often only theories, and we think we have given abundant evidence that the law of such things in geology calls for a *fourth* stage, which follows the three thus mentioned. In this fourth stage, "people" believe and teach the startling doctrine for a generation or two, and then find out that they have been all the while thoroughly deceived! Let any one pass carefully over the ground at which we have but glanced in this paper, and then let him say if the vast

* In preparing this paper I have left out of sight not a few of the speculations by which geology has come into conflict with the Bible, partly because moderate limits had to be studied, and also because I was desirous not to repeat here what I have published already.

majority of ideas that have prevailed in the geological mind have not passed already through all these *four* stages.

What, then, are the relations of geological science, as popularly understood, to the Sacred Scriptures? They are the relations of that which in its fundamental principles has been changing, we might almost say, every hour of its history, to that which has passed down through thousands of years, running the gauntlet between the ranks of ten thousand times ten thousand assailants, remaining unchanged and even untouched to the present moment. So far as the facts and certain inferences of geology are concerned, they do not in any degree affect the Sacred Scriptures. The vast ages that have been made to occupy the minds of men when thinking of the world's history, and are now multiplied into endless millions of years, belong all to that conjectural thought which, as we have seen, is so perpetually changing. Few things are so fitted to humble us as an honest admission of our weakness under the influence of this. Men have thought that they were forced to remodel their ideas of the word of God, and even to abandon the belief of its Divine inspiration, by the force of that which turns out to be only a shifting dream! So we see the wisdom of those who have said to us, as they held back themselves, "Allow your Bibles to remain as they are; wait awhile, till it is seen what these speculations are worth. We have been too often misled by such conjecturings to be in any hurry to acknowledge their weight." And we see now our own well-meant folly, mingling with that of many others, in labouring to construct Scriptural theories that might harmonize with the passing visions of the scientific mind. As the men of science and the men of Scripture—the geologists and the theologians—awake together from their reveries, it seems as if it were to find, as we have already hinted, that the teachings of Moses regarding the world's up-rearing are, after all, the grandly comprehensive truth—in very deed the Word of the Living God.

The CHAIRMAN.—It would be a mere idle form for me to ask you for a vote of thanks to Professor Kirk for the interesting and valuable paper he has just read. I am sure no one who has heard it found it too long; our only regret must be, that we had not the time to listen to, and Professor Kirk the physical power to have delivered, one double the length. There are few outsiders of Geology (as Professor Kirk has characterized himself) who have paid any attention to the subject, who will not feel that the Professor's greatest difficulty in writing his paper, must have been in selecting the few baseless theories he has spoken of this evening from among the many whose

fallacies he might have exposed. We have heard much about the difficulties of Revelation in regard to the progress of physical science, and particularly that of Geology. Professor Kirk has given us a very fair exposition of the difficulties of Geology itself, in its claim to be even an approximation to an exact science. When I have been pressed to reconcile Geology with Revelation, I have always said, Let us wait till Geology becomes established as a sound science; then, and not till then, need the theologian care to seek to reconcile the Bible with Geology. While the Professor was reading his paper, I felt what a vast field of facts he had also left untouched, simply because he had so recently brought them before the world in his admirable little book, *The Age of Man, geologically considered in its bearing on the Truths of the Bible*.* The theory of man's great antiquity as an inhabitant of the earth, so well received in high geological quarters, and already crumbling so rapidly before the accumulation of new facts, has been so completely refuted in that work, that the Professor seems altogether to have passed the subject by in his paper. In saying all this, I cast no reflection on the pursuit of the real science of Geology. What we do protest most earnestly against is the present habit of neglecting the sound method of Baconian induction,—not only in the science of Geology, but in so many other sciences,—and attempting, by vague hypotheses, hastily built on a few facts, to get a short cut to truth, instead of pursuing the toilsome wearying work of collating and arranging facts irrespective of theory. When men had few facts to reason upon, such a process was excusable—now it is utterly inexcusable. Great as may be the mass of facts known to modern geologists, it sinks into insignificance, compared with what must be accumulated before we can pretend to say we have gathered together the materials necessary to construct a true science of Geology. Not only, as Professor Kirk has pointed out, do we only know a mere superficial scraping as it were of the structure of the globe, but how little do we know even of that! How small a portion of the earth's surface has been geologically mapped,—and even of that how little has been accurately done,—is admitted by our best geologists, who consider the geological map of our own country as falling far behind the present requirements of the science. When we reflect upon the grand and bold theories founded on knowledge so very superficial in respect to that which is necessary to found the science, we cannot be surprised that they should so rapidly fall into oblivion. Not only are the data wanting to construct Geology as a science, but we have to contend also with the difficulties of the problems it presents for solution. Its requirements are almost superhuman. To measure the chronology of given strata demands the skill of a profound mineralogist, and how many of these can we find among the ranks of the geologists? But to be a good mineralogist, implies also a considerable knowledge of chemistry and crystallography. You must have all this knowledge before you can interpret the nature of the material whose age you wish to determine. And even this will not carry you far. You must add to it a knowledge of the whole range of

* Jackson, Walford, and Hodder, 27, Paternoster Row, London.

natural history, of comparative anatomy, and comparative physiology, before you can interpret the palæontological facts of your strata. Then some other condition may call for all the powers of mathematics to solve some dynamical portion of your problem. And as if all this were not enough, Professor Kirk has shown us that we must ask the aid of the science of Electricity. There has been much boasting lately about the connection of the Old World with the New by the electric chain ; and it is a feat of which science may well be proud. But the earth-currents and magnetic storms which affect that cable, give us a glimpse of the important part which electricity may play in the changing structure of the globe. When we consider the vast requirements, the vast amount of knowledge a man must bring to bear, in order rightly to interpret geological facts when he has discovered them, we need not wonder that blunders should be committed. We do not complain of the blunders, but we do complain of the tone of infallibility some men assume, and the absence of that modest humility so requisite in the pursuit of truth. Compare Geology with Astronomy, and you will find that the solution of the problems which has raised the latter almost to the rank of an exact science, is a far easier task than those with which the geologist is called upon to grapple. Professor Kirk has asked us, "What do you know about gravitation?" You cannot tell what it is. Newton did not profess to know. It was to him the name of an unknown force ; though in his modest queries he seems to consider it not an inherent property of matter, but something external to it. What is the problem of the astronomer? It deals with the motion of bodies under the influence of this unknown force. Even here the imperfection of our mathematical analysis shows itself. We can only deal with three bodies at a time. And even then, were the problem not simplified by assuming the absence of an appreciable resisting medium, and many other favourable conditions I cannot now enter into, we could neither establish the lunar nor planetary theory. If such difficulties beset the establishment of the comparatively easy science of Physical Astronomy, surely modesty must be most becoming in dealing with the far more abstruse problems of Geology,—a science in my estimation requiring not only a more gigantic intellect than that of Newton, but an age equal to the patriarchs of old, for the sound solution of some of its easiest problems. I need now only express our deepest obligations to Professor Kirk for the valuable instruction he has given us.

The Meeting then adjourned.

ORDINARY MEETING, JANUARY 21, 1867.

THE REV. WALTER MITCHELL, VICE-PRESIDENT, IN THE CHAIR.

The minutes of the previous Meeting were read and confirmed.

The following paper was then read by Mr. Walter Brodie, in the absence of his father :—

ON THE LESSONS TAUGHT US BY GEOLOGY IN REGARD TO THE NATURE OF GOD AND THE POSITION OF MAN. *By the REV. JAMES BRODIE, M.A., Mem. Vict. Inst.*

MANY seem to entertain the opinion that there is a natural antagonism between the study of science and a simple and earnest belief in the Record of Revelation. Not a few of those who take an active part in our philosophical societies, and who speak on the subjects brought before them as men who are entitled to assume the voice of authority, treat the Mosaic narrative as they would treat an idle tale, and speak as if they deemed it inconsistent with the character and position of *savants* to pay any regard to the statements of Scripture. Some timid theologians, on the other hand, draw back from the study of science, as if the necessary result of engaging in it would be the awakening in their minds of doubt and perplexity, and shrink from an investigation into the laws which regulate the material creation, as if that would prove a first step to open infidelity.

As it is one of the special objects of the VICTORIA INSTITUTE to show that these views are altogether erroneous, and that the Work and the Word of God are in perfect harmony with each other, it is hoped that a few remarks on the lessons which geology teaches, in regard to the nature of God and the position of man, may be regarded as suitable to the times in which we live, and appropriate to the objects of the Society before which they are brought.

Without stopping to inquire whether the facts on which geologists rest their hypotheses have been ascertained with

sufficient accuracy, or whether the arguments which they employ have been weighed with the requisite care, we shall assume that their conclusions are correct; and, after briefly stating them, we shall consider some of the inferences to which they lead.

CONCLUSIONS OF GEOLOGISTS.

During a lengthened course of ages the earth remained destitute alike of animal and of vegetable life; at least, no trace of organized existence has hitherto been discovered. At an after-period, a period, however, very remote from the present, life began to manifest itself in some of its lowest forms. Since that time it has been exhibited in a great variety of species and genera. Abundant evidence is afforded that there have not only been innumerable generations of plants and animals that have lived for their appointed season and then passed away; but that species after species, and genera after genera, have lived and died, and been entombed, since life first dawned on the globe.

The history of the earth's varied conditions has been divided into more than thirty epochs, or formations, as they are usually termed, which are distinguished from one another by the peculiarity of their organic remains. The vegetation that covered the earth in the earlier eras, and the living creatures that then inhabited it, were very different from those that afterwards appeared; and these again were altogether unlike those that now exist. There seems also to have been a gradual change in the material or physical condition of our planet. Its outer crust, in the earlier ages, appears to have been subjected to subterranean action of a far more formidable kind than any that is experienced in the present day. A larger proportion of the carboniferous element was diffused through the atmosphere, and there is reason to conclude that the average temperature of the globe was much higher than that which now prevails.

Two things more especially press themselves on the notice of the inquirer, who takes a general view of the conclusions to which geologists have come, without allowing his thoughts to be distracted by a minute attention to details. These are, the vast duration of the epochs that are past, and the uniformity of system that has been exhibited in the course of creation and providence.

THE VAST DURATION OF FORMER EPOCHS.

The more carefully we consider the subject, the more are we

impressed with the sense of the earth's immense antiquity. Upwards of thirty formations, or eras of creation, containing thick beds of fossil remains, have already been discovered, and without doubt many more remain to be explored. These must have taken very protracted periods for their accumulation; beds of sand and gravel may be deposited in a single season, but thick masses of organic remains must have required a lengthened time for the production, the growth, and the life of the vegetable or animal forms of which they were once a part. The duration of the different geological formations is not to be reckoned by centuries, but by millenniums. When we are told, for instance, that in Nova Scotia there are found "fifty or even a hundred ancient forests, buried one above the other, with the roots of trees remaining in their original position," we conclude that as each of these forests must have required at least five hundred years for the formation of the soil in which it grew, for the growth and decay of the trees, in so far as we can judge, the epoch to which they belong must have extended from forty to fifty thousand years. Masses of shells and corals, "hundreds of feet in thickness," demand an equally lengthened period for their deposition. Another formation, of less extent than these, conveys, perhaps, even more vividly than they do, the idea of great duration. Sir C. Lyell, in describing some lacustrine strata that are found in Auvergne, gives the following statement:—"The entire thickness of these marls is unknown; but it certainly exceeds, in some places, seven hundred feet. They are thinly foliated, a character which frequently arises from the innumerable thin plates, or scales, of that small animal called *cypris*, a genus which comprises several species, of which some are recent, and may be seen swimming swiftly through the waters of our stagnant pools and ditches. The animal resides within two small valves, not unlike those of a bivalve shell, and moults its integuments annually, which the conchiferous molluscs do not. This circumstance may partly explain the countless myriads of the shells of the *cypris* which were shed in the ancient lakes of Auvergne, so as to give rise to divisions in the marl as thin as paper, and that, too, in masses several hundred feet thick." The little shells or scales, here referred to, are smaller in diameter than the head of the smallest pin; they are annually shed, and float lightly in the stream. Here, we are told, that layers of them divide the marl into beds as thin as paper. These facts naturally lead to the conclusion that, year by year, as the moulting season came round, and these diminutive denizens of the stream and pool dropped their scales, their cast-off habiliments were car-

ried into the lake, and scattered over its silent depths. Autumn and winter followed, and sent down their floods, swollen with the rain, and carrying along the *debris* of the mountains around. While the gravel and sand brought down by the streams were deposited at the sides of the lakes, the lighter particles of floating mud were spread over its entire extent, and settled down in the stillness of its deeps. The cypris scales were the deposits of the summer floods; the alternating marl was the product of the winter's rain. Every layer, therefore, may be regarded as the record of a year; and if these layers are as "thin as paper," in masses "several hundred feet thick," a very extended time must have elapsed before the lake had its peaceful repose disturbed. If we reckon ten of these divisions to an inch—and the description would lead us to suppose that there are many more—stratified masses thus formed, and of the thickness Sir Charles mentions, must indicate a period of at least some fifty thousand years. These marls, moreover, are spoken of as representing only the latter part of the period, during which the Upper Eocene was formed; and the whole of that epoch seems to have been brief when compared to the duration of others.

Who then can calculate the age of the earth, or reckon up the years of its many generations!

UNIFORMITY OF SYSTEM IN THE COURSE OF CREATION.

We now proceed to remark that the history, written in the records of the rocks, very plainly shows that in all the periods of the earth's existence, the laws that regulate the material world have been the same as those that are now in operation. The ripple-mark left by the tiny billow on the muddy shore, and the impression made by the raindrop on the yielding sand, can still be traced in formations many epochs old. The annual rings that we find in the trunks of fossil trees testify to the regular return of "summer and winter, seed-time and harvest," in ages long since gone by.

Leaving it to others to speculate on the law of progression, according to which animals of higher development and more delicate organization have, from time to time, been introduced into the terrestrial sphere, we content ourselves with remarking that in all the various stages through which the world has passed, we find creatures formed with an organization that was admirably fitted for the circumstances in which they were placed. When the globe was subject to volcanic convulsions, far more terrible than any we now experience, and the ocean was tossed with tempests of proportionate violence, the ani-

mals that peopled the dry land belonged to the reptile tribes and other genera which are distinguished for their tenacity of life, while the fishes that swam in the primeval seas had bones of gristle, the better to endure the stunning effects of a blow, and were covered with scales of bone, that, clad in coats of mail like the knights of olden time, they might pass unscathed through the elemental war. Other epochs came, and saw other races rise, conformed to the altered conditions of the time. "Fishes and reptiles," says Mr. Miller, "were the proper inhabitants of our planet during the age of the earth's tempests; and when, under the operation of the chemical laws, these had become less frequent and terrible, the higher mammals were introduced. That prolonged ages of these tempests did exist, and that they gradually settled down until the state of things became at length comparatively fixed and stable, few geologists will be disposed to deny. The evidence which supports this special theory of development of our planet, in its capabilities as a scene of organized and sentient being, seems palpable at every step. When the coniferæ could flourish on the land, and fishes subsist in the seas, fishes and cone-bearing plants were created; when the earth became a fit habitat for reptiles and birds, reptiles and birds were produced; and with the dawn of a more stable and mature state of things, the sagacious quadruped was ushered in."

THE LESSON TAUGHT BY GEOLOGY IN REGARD TO THE NATURE OF GOD.

We now direct attention to the lesson that Geology teaches in regard to the Author of All. In all these lengthened eras, amid all the changes which the globe has undergone, we can trace the same unwearying power, the same unerring wisdom, and the same beneficent design, that we discover in the scenes that now surround us. We review the list of epochs past, we stretch our ideas of time along the far receding array, till we are oppressed with a sense of the vastness of a duration which the mind of man attempts in vain to conceive; and still the world testifies of Him that made it, that in all the varied manifestations of His providence, which the terrestrial scene has beheld, the character of the Creator has remained the same. Geology and Scripture alike declare that the Lord hath reigned through all the ages of the past, as He reigns in the time that now is—infinite in wisdom, in power, and in goodness—the unchanged and unchangeable God.

THE LESSON TAUGHT BY GEOLOGY IN REGARD TO THE POSITION OF MAN.

Another important lesson which Geology teaches, is the peculiarity of Man's nature and position. When the records of the different strata are laid open before our eye, and we examine one by one their pages of stone, they tell of a vast variety of species and genera that lived, and multiplied, and passed away; but from the earliest appearance of life on the globe, up to the day of Adam's creation, during ages so long that we cannot conceive them, and among species and genera so numerous that the thought of their multitude overwhelms us, there is no trace of any creature possessing the faculties and feelings of a rational mind, the hopes and aspirations of an immortal soul. In all the epochs of the past, we find no evidence of any being exhibiting intelligence like that of the human race. There are no remains of the builder's toil, or of the potter's art; there is nothing to indicate the presence of mechanical skill capable of directing the agencies of Nature; there is no sign of a master-mind capable of subduing the inferior orders to his will. Had such a being existed, he must have left some impress of his operations, some relics of his power.

When Man appeared on the terrestrial scene an altogether new element was introduced into the constitution of earthly things. Mineral, vegetable, and animal existences had been there before; but it was not till that time that an accountable and intelligent creature became a dweller here below. Geology teaches us that man stands alone, and that he is not to be classed with any other being that has hitherto inhabited the globe. His nature and his position are altogether peculiar. He is as highly, and as essentially, exalted above the most intelligent of the irrational animals as they are exalted above the vegetable, or as the vegetable is above the stone. He has before him a nobler destiny than theirs, and he has been created for a higher end.

It is needless to remark that the lesson taught us by Geology is in perfect harmony with the doctrines of the Bible. We may go farther, and affirm that even the conjectures that are suggested by the study of the past, find a striking confirmation in the statements of Scripture. Science leads us to conclude that, if the primeval introduction of animal life into the globe was followed by brighter manifestations of the Creator's perfections than had been exhibited before, the creation of a rational and intelligent being must be followed by still more striking exhibitions of His sovereign power. It bids us look

for scenes as far surpassing those that we have hitherto seen, as the beauty of the present world excels the dreary and desolate aspect of the Azoic ages. Science and Scripture concur in saying that *Man does not belong to the past, but to the future*. To that future they bid him look, and for that future they tell him to prepare.

The CHAIRMAN.—In asking you to return your thanks to the author of this Paper and also to Mr. Walter Brodie for reading it, I may observe that Dr. Gladstone's Paper, which is to follow, is of such a cognate character, that, unless any one wishes now to make some observations upon the Paper just read, I think it will be more convenient to take the discussions on both papers together. (Hear, hear.)

The following Paper was then read :—

ON THE MUTUAL HELPFULNESS OF THEOLOGY
AND NATURAL SCIENCE. By JOHN HALL GLADSTONE,
ESQ., PH. D., F.R.S., *Mem. Vict. Inst.*

MAN, God's child, is put to school in this world, and among the books which he has to study is the varied volume of Nature. There he finds endless pictures to arouse his infant wonder; and there, if he read thoughtfully, he may learn much, not only of the mysteries of the universe, but also about the wisdom, power, and goodness of its Architect, and his Father. But this child is a rebellious one, and in order to restore him to the position which he has forfeited, and to reveal more fully the Father's will, message after message has been sent him from on high. In the book of Nature he finds a multitude of facts which he combines as he best can, and the result is Natural Science: in the volume of grace he finds a number of facts and statements, from which he builds up Theology. The lessons in either department, as God gives them, can scarcely be conceived as otherwise than absolutely true; but as apprehended by man, they are necessarily subject to human error; and thus his systems of Theology and Natural Science must always admit of correction and enlargement.

In this essay I propose to confine my attention to these two parts of man's curriculum—the knowledge of Nature and the knowledge of God; and I shall endeavour to show in what way they are mutually helpful.

The great difference between the two books is in the subject treated of; the resemblance is in their indications of the character and mind of their Author.

They tell of different things. The book of Nature appeals to the bodily senses, and the whole of its teaching relates to the physical universe, and to this life. It knows nothing of the spirit, and its destinies. The Bible, on the other hand, never professes to teach Natural Science. Its words, of course, are coined from natural objects and actions, and it makes large use of Nature in the way of illustration; but its subject matter is the moral law of God, the way of salvation, and eternal life. It is not in this direction, therefore, that we need look for much mutual confirmation, nor need we fear much disagreement.

The two books, however, as was just stated, resemble each other in their indications of the character and mind of their Author. Nature leads us up to the conviction of a Supreme Intelligence; the Bible assumes His existence from the beginning. The unity of design that runs through the universe bespeaks the oneness of its Maker; in the Bible we read, "Hear, O Israel, the Lord our God is one Lord." Nature shows us the superabundant evidence of power; the Holy Scriptures call God "Almighty." Our proudest achievements in natural knowledge are but the disclosing of a higher wisdom; the sacred writers stand amazed at "the depth of the riches both of the wisdom and knowledge of God." The philosopher and the inspired apostle agree that "in Him we live and move and have our being," and alike recognize His constant sustaining energy. In our study of the universe we come to a profound conviction of the uniformity of law; Jehovah declares, "I change not;" and even miracles appear in the Bible as part of the working out of a foredetermined plan. The terribleness of the Most High is seen alike in the world and on the page of inspiration. His justice and His goodness may be gathered, though somewhat uncertainly, from the book of Nature; but they are clearly revealed in His word. It is only when our accusing conscience forces the question of His mercy, and makes us doubt the possibility of His favour, that Nature is silent, and we turn to those better oracles which unfold to us the scheme of redemption, and assure us that "God is love."

There is also another kind of resemblance between the two books of Nature and Revelation, which springs from their having the same Author, and which I may, perhaps, be allowed to term the analogy of style. In both we find facts given abundantly, but no scientific systems; in both there is a wonderful unity of plan in diversity of operation; in both there is a frequent recurrence of types—that is, of the same Divine idea repeated, perhaps many times, but modified to suit the

altered circumstances. In both, too, we find a gradual development in time, the later additions being not mere additions, but also evolutions of that which preceded, and ever tending to what is more comprehensive and better. It would take me too long to work out and illustrate these points of analogy; indeed each might be the subject of an essay. I mention them because they have a direct bearing upon part of my future argument.

If there be truth in the statements hitherto made, we shall be fully prepared to find that the study of Nature and of the Sacred Scriptures are mutually helpful. I propose considering the subject under the three heads of Natural Theology, Evidences of Christianity, and Methods of Interpretation.

I. NATURAL THEOLOGY.—It is needless to say much on this head, for this is a department of Divinity which depends wholly, as its name imports, on the study of Nature. The pious in all ages have loved to trace the hand of God in the visible creation, and in doing so they have only followed the example of the inspired Psalmist, or have learned of Him who “answered Job out of the whirlwind”—of Him who on the Galilean mount drew lessons from “the birds of the air,” and “the lilies of the field.”

This habit of noticing the indications of the Supreme Intelligence may be of service also to the philosopher in his scientific pursuits. Thus, to take an illustration, a physiologist examining an eye will see its exquisite adaptation to the properties of light and the purposes of vision; but he may come across some muscle the use of which is not evident, or such an organ as the *tapetum lucidum* of the cat, and the conviction that this also has some “final cause” will probably lead him to discover the part it plays in perfecting the mechanism of sight.

Under this head of Natural Theology, may be mentioned another important service which the fuller study of Nature renders to true religion,—it clears away much rubbish; for science is the foe to superstition. The unknown or ill-understood forces of Nature beget a vague fear in the minds of the ignorant; the movements in the world around them appear the actions of spiritual beings; a roaring waterfall, a black damp cavern, a tree waving its branches in the moonlight, the sun beaming forth heat and splendour—each is inhabited by some mysterious agent, and the character of this spirit takes its hue from the character of the mind that imagines it. If the untaught man be gentle and comparatively innocent, the spirit will be a nymph or a fairy; if he be mischievous, a satyr or an elf; and if he be wicked, the mysterious being will be a demon as

licentious or as malignant as himself. I need not remind you of the multitude and variety of false religions which have these fancies for their basis. All such ghosts vanish at the sunrise of scientific truth. No man taught in modern science can any longer believe the statement of the Hindoo scriptures, that "heavenly cows hurl the destructive thunderbolt"; nor, as the lightning flashes around him, will his fear embody itself in the picture of Thor wielding his mighty hammer, or Jupiter Tonans grasping a handful of lightnings. In the mighty electric discharge he sees only one manifestation of a force which pervades all Nature, and is convertible into other forces, the varied exponents of that one Supreme Will whose wisdom ordained and whose power sustains the whole.

II. EVIDENCES OF CHRISTIANITY.—Natural Theology is not Christianity: its deductions may be perfectly true, and yet the Jewish and Christian Scriptures may be false. It seems to me, however, that the study of Nature has something also to say to this question, and that in more ways than one.

The accordance of the character of God, as we find it described in the Bible, with that deduced from Nature, is itself an argument in favour of the truth of Revelation.

The fact that the same difficulties which meet us in Revelation have their analogues in the world of sense, as shown by Bishop Butler and others, not merely serves to stop the mouths of objectors, but is of some value in establishing a common origin.

But there is a more important issue. Science sweeps away the rubbish of superstition;—is what we deem sacred truth likewise doomed to disappear? Facts seem against such a supposition. The present century, which has seen so wondrous an extension of physical science, is marked by an increase of religious earnestness; and it seems to me that, notwithstanding some great and peculiar perils, our age has the healthy sign of a more intelligent and painstaking desire to arrive at the true meaning of the Word of God than characterized any earlier period of the Church's history. If, moreover, we turn from the effect of Natural Philosophy on an age to its effect on individuals, do we really find that the pursuit of science overthrows the belief in the Divine origin of what is recorded in the sacred writings of the Jews and Christians? By no means. A singularly large proportion of the highest men of science of this and preceding times have been devout believers, or, at least, have acknowledged the truth of the Scriptures; while, if we descend to men of the second or third ranks, we find—at least in my experience—about the same proportion of Christians as in most other professions. It is true there are scientific men

who are infidels, and at the close of last century we saw on the Continent of Europe the sad spectacle of French Encyclopædists, and other learned men, labouring to extinguish the little faith that was then to be found in the world; but it remains to be inquired whether these men were not infidels before they were philosophers; and subsequent events have shown that they raised their pæan before they had won their victory; for the Bible is read now far more than it was then, and Christ has His disciples in the halls of Continental as well as British science.

And it has not been for want of will on the part of infidels that our Sacred Writings have remained the firm foundation of the faith of Christendom. As science after science has risen into notice, they have ransacked its storehouse in search of something which they could forge into a new weapon against the old book; and even the guardians of the faith have sometimes been the first to brand some new scientific doctrine as unscriptural, or to decry the whole investigation as irreligious. As time has gone on, it has occasionally happened that the scientific doctrine proved to be a crude and erroneous conclusion; or the suspicious theory being established, it has been found that what it opposed was merely the view of some Jewish commentator or Christian poet.

The history of astronomy is instructive in this respect. When it was contended that the earth, instead of being a flat plain was a round ball, with people walking on the other side of it, the idea was denounced as unscriptural and preposterous. After this was generally received, the Copernican theory of the solar system was promulgated, and then monks preached against the new heresy, and the authorities of the Church passed these two resolutions:—"1st. The proposition that the sun is the centre of the world, and immovable from its place, is absurd, philosophically false, and formally heretical; because it is expressly contrary to Holy Scripture. 2nd. The proposition that the earth is not the centre of the world, nor immovable, but that it moves, and also with a diurnal motion, is absurd, philosophically false, and theologically considered at least erroneous in faith." When, however, these propositions were universally taught, even at the Roman observatory, the immense magnitudes and distances of the stars were looked upon with suspicion as reducing our globe to a mere speck in the universe, although it is the theatre of man's probation, and of the Son of God's great sacrifice. But no educated man doubts these conclusions now, and in many a sermon, as in Dr. Chalmers's

Astronomical Discourses, they serve as an additional proof that "the heavens declare the glory of God, and the firmament showeth His handywork." Yet astronomy may still have its theological battles to fight: the nebular theory of the formation of worlds seems to be offensive to some religious minds, and if it be ever established, it will be in the teeth of opposition.

I think that without presumption I may suggest an idea as to the purpose for which Providence has permitted this difficulty to stand in the way of the reception of many scientific truths. It thus becomes clear there is no collusion between the teachers of physical and theological science; it is not a sacred priesthood, as in ancient Egypt, that holds the key of the mysteries of nature; and thus the ultimate concord can scarcely be suspected of being at the expense of truth. No doubt foolish attempts have sometimes been made to twist the facts of science and the statements of the Bible into harmony, as for instance, by some of the advocates in the great case of Genesis *versus* Geology; but usually the physical philosopher has calmly or boldly pursued his own line of investigation, and the theologian has inquired whether the apparent discrepancy has not arisen from a human gloss, or from a misunderstanding of the true province of revelation. And what is the result? There has been the din of battle, and the shrieks of the timid have been heard amid the shouts of the warriors: earthworks which the defenders of the faith have pushed forward have been repeatedly carried by the assailants, but the citadel of the word of God remains untaken, and its venerable walls are the more redoubtable on account of the sieges which it has withstood.

III. METHODS OF INTERPRETATION.—If two books were products of the same mind, and, especially, if they are written somewhat in the same style, we should expect that the study of the one would make us better fitted for understanding the other.

In treating of the analogies between the two branches of study here referred to, I may allude to the necessity of the mind being adapted to the reception of the particular kind of truth. This is mentioned first to obviate an objection that has probably presented itself already to the minds of some hearers, and which has, perhaps, clothed itself in the emphatic words of Paul: "The natural man receiveth not the things of the Spirit of God; neither can he know them, for they are spiritually discerned: but he that is spiritual discerneth all things." Indeed, ordinary reason is sufficient to teach us that if a man would apprehend the word of God, his mind must be

previously brought into unison with that of God; while experience proves abundantly that an intellectual worldling is often blind where an unlearned believer sees intuitively. And just so is it with physical science; the man who has not a loving interest in it, can never understand its doctrines, or weigh its conclusions.

Yet neither Scripture, nor logic, nor experience teaches that the spiritual mind is all that is needed on the one side, or the scientific mind all that is needed on the other side, in order to arrive at the fulness of the truth in either department of study.

Assuming then that each student is possessed of the proper receptive faculty, and a true interest in the subject, I proceed to notice several points of analogy in the temper of mind, or the intellectual processes required. The sketch will be a very rough one, and nothing more than a sketch; for the full illustration of the subject must be left till either I, or some one with greater leisure, may take up the subject in a separate treatise.

The first requisite for a successful prosecution of any inquiry into the ways of God either in Nature or Revelation, is a *reverent spirit*,—a desire to arrive at the truth—a remembrance that what we are studying is incomparably greater and nobler than our first impressions of it. This is surely self-evident. Flippancy is fatal to success. And here the student of each department may often learn a lesson from his brother; for, unhappily, there are theologians who think they can overthrow the careful deductions of scientific men by a few dashing remarks; while there are philosophers who anxiously inquire into the mysteries and apparent contradictions of nature, yet fling aside the Bible at the first seeming discrepancy either in its statements or (more foolish still) in the statements of its interpreters.

A proper reverence will evince itself, by the care taken to arrive at whatever is the truth, by the adoption of the best methods, and by a readiness to reconsider our views, whenever any new facts or fresh arguments appear to throw any reasonable doubt on their correctness.

Passing from this moral requirement to intellectual ones, we may remark that the first step in any process of investigation, is to *ascertain the facts* on which our conclusion is to be based. Now this is a most difficult thing, though, unfortunately, people often think it so easy. Thus, turning first to Nature, let any ordinary observer try to describe such a common phenomenon as the rainbow. What a string of errors his account will probably be as to its apparent height and size, its distance,

the order of the colours, their brightness, &c. Aristotle, who investigated the subject, says that the circle is of smaller diameter at sunrise and sunset than at any other period, whereas it is in reality always 82°. The history of science is full of such mistakes of eminent men, including Herodotus's lioness, which never has more than one cub; the consequence of which of course would be that the leonine race must rapidly become extinct, by its numbers being at least halved in each generation. And the popular beliefs, how strange they often are! There is, for instance, that of the influence of a change of the moon on the weather. How many of our weatherwise friends have noticed it a hundred times! And yet the highest meteorological authorities, after a series of observations continued through many years, have come to the conclusion that no influence of any sort can be traced.

Turning from natural to divine science, we find that the facts which we must collect are the statements of Revelation; but how difficult is it to quote the Bible correctly! Passing by the errors introduced by bad translations, there is the scarcely honest practice of cutting down a text, so as to produce such unqualified statements as "Hear the church," or "All things work together for good." There is the thoughtless practice of laying hold of anything within the covers of the Bible, and using it as authoritative truth, though it should be the words of the Father of lies,* the statements of wicked and designing men,† the mistaken opinions of good men,‡ ironical remarks,§ or sayings introduced by inspired writers only to be refuted.|| There is the ignorant practice of associating modern ideas with the ancient story; as the noteworthy reference of the Mormon apostle to Paul's sailing by the mariner's compass.¶ And there is the foolish practice of wrenching a text from its connection, and making it carry any meaning which the words seem susceptible of. Some of these, indeed, have become the popular meaning of the texts; as "one star differeth from another star in glory," which generally does duty to prove the different degrees of blessedness in the heavenly state, instead of the difference between celestial and terrestrial bodies, as the context at once would show.

Passing from the facts of Nature or Revelation to the language in which we clothe our impressions of them, it may be remarked that *the terms employed should be definite and appropriate.* Some words have necessarily a more complex signification

* As Job ii. 4.
 † As Isa. xxxviii. 18.
 ‡ As Col. ii. 21.

† As Luke xi. 15.
 § As Eccles. vii. 16.
 ¶ Acts xxviii. 13.

than others; and generic terms—such as metal, or minister—have a certain vagueness which does not attach to specific terms, such as iron or Levite. In the history of science, this ambiguity of terms has been a constant source of error. The Greek philosophy was rendered almost fruitless by it; and from that time to the present, some words, such as fermentation, have been used to express two or more different modes of action. Sometimes even now a word has a different signification among the votaries of one science to that which it bears among those attached to another: thus, if a geologist hammer out of a rock a bone or shell, which, in process of ages, has been reduced simply to phosphate and carbonate of lime, he places the relic among his “organic remains,” while a chemist examining the specimen, will pronounce it to be wholly “inorganic.” Other words, as Catalysis or Epipolism, seem to have been woven as a cover for our ignorance. And as to the appropriateness of terms—in inventing a name, a discoverer is tempted to make it express his own theory of the matter; the name thus becomes bright with significance, a spark capable of kindling a similar thought in those minds on which it falls. But, while there is a present gain in this, there may be a future loss; and it may be fairly questioned, whether a simple unmeaning name is not often preferable. The disadvantage is this: as knowledge increases the theory alters, and the word becomes inappropriate; and since it is very difficult to disturb a name which has acquired general acceptance, the facts continue to be presented to the mind under the old heraldic device, on which is conspicuous the bar sinister of an original mistake. Thus, when Priestley isolated a certain gas eminently capable of supporting combustion, he called it “Dephlogisticated air,” thus giving it a name that involved a theory then under discussion, and which shortly ceased to exist; and when Lavoisier renamed this gas, believing it to be the acidifying principle, he termed it “Oxygen,” the Acid-producer, and “oxygen” it has ever since been called, though chemists know that some of the strongest acids contain none of this substance. I would just remind those acquainted with the subject, how “chemical affinity” has come to mean almost the opposite of what the words naturally imply; and how what is called the “north pole” of a magnet is really its “south pole,” with reference to the north magnetic pole of the earth.

Turning from natural to theological science, we find the same dangers attending a bad choice or employment of words. While, however, theological terms are very often ambiguous, I believe they are more appropriate than those of most other sciences:

for the sacred writers themselves furnish the words—sometimes words of their own invention—and the duty of the interpreter is not so much to put the facts of revelation into appropriate language, as to discover the meaning of the words of Scripture, and thus penetrate into the revealed mysteries. This demands scholarship, no doubt; but what is far more essential, is a certain logical power of seeing through the significance of words in relation to their context. Sometimes a popular misapprehension of a term will greatly mislead; and it should be borne in mind that words are always shifting in meaning, and have to be brought back again to their true bearings by the public teacher, or they will go hopelessly adrift. For instance, how many hearing the verse “Now abideth faith, hope, charity, these three; but the greatest of these is charity,” have a confused idea that this pre-eminent virtue is little else than either almsgiving, or a disposition to condone the faults and errors of others!

If care had been generally taken to arrive at the true understanding of what is symbolized by the terms of Scripture, how many differences among Christian speakers and writers would be saved! Thus, faith is considered by some as totally independent of, if not opposed to reason, while others view it as the highest development of reason; again, some speak of faith as the same mental act, though exercised on different objects; while others draw distinctions between historic, saving, practical, miraculous, and other kinds of faith; and there is a popular use of the word which actually confounds it with superstition.

Would that theologians were content to employ scriptural terms, and that in their scriptural significations! We should then be saved from many an unseemly controversy.

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In any investigation, beside the definiteness of the words employed, *the ideas themselves must be definite*. As instances of the contrary, may I not take almost at random, “A visitation of Providence;” “Nature abhors a vacuum” (at least up to 33 feet); and “Miracles are impossible.”

To think clearly in one department of knowledge is good training for thinking clearly in another.

Leaving many tempting points of analogy, I pass on to consider the most important of all—the formation of our larger generalizations,—what Bacon calls “*the raising of doctrines.*” For natural science is not a mere collection of facts, or even a classified arrangement of them; and theology

is more than a string of texts, even though they be selected to bear on one point.

In treating this subject, I must be permitted to glance back at past history, and in a few sentences to recall to your minds some of the broader features of the progress of thought.

We know little of the science of the Chaldeans, Egyptians, or Chinese, before the Christian era; but the works of many Greek philosophers have been handed down to us, so that we can form a good opinion of the way of thinking of the master-minds of that nation. While we stand awestruck before these mighty intellects, we are still amazed (perhaps amused) to see what a prodigious edifice of theory they could build on a small and often shaky foundation of fact, and how it was mental conceptions and not natural phenomena that formed the materials of their arguments. In the mean time the Jewish prophets, though generally exhibiting a loving admiration of nature, scarcely attempted to trace secondary causes. Afterwards there arose in that nation a series of commentators, who spun out a wondrous web of divinity and ethics, by as faulty a system of deduction from narrow premises as ever spoilt the philosophy of a Grecian sage. The fathers of the Christian Church were not much affected by these Rabbinical fancies, but Greek speculation had a more potent influence; and it is little to be wondered at that such mighty spirits as Plato and Aristotle cast a spell over the minds alike of the theologian and natural philosopher; and presently we find all parties bowing implicitly before the authority of the Stagirite.

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But from the gloom of the middle ages a better philosophy began to dawn, and reformers arose both in the schools and the Church: they began to recognize a higher authority, and to allow "the ideas of the Divine Mind," whether in Nature or Revelation, to overthrow "the idols of the human mind." At length Bacon, with his "new engine," demolished the structures of the Aristotelians; and on a more careful inductive basis the temple of modern science has been erected.

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Thus, while the mediæval natural philosophy is only known by its fossil remains, the huge saurians, the pterodactyls, or the mammoths of former theological epochs still walk the earth; or, to return to the old figure, I am sure that each of my hearers, whatever his own religious views may be, will readily **acknowledge** that while the rubbish of astrologers and alche-

mists has been cleared away, he is surrounded by faulty theological systems, some in ruins, some tottering, but others still erect, though doomed to fall.

The true method of interpreting either Nature or Revelation so as to build up a scientific system, is, *first to collect all the known facts of the case, and then to form a theory, which, without going beyond them, shall include them all in its explanation.*

Though this principle is well known, and has been often recognized both theoretically and practically in each of these departments of knowledge, and in others which we are not now considering, it may not be superfluous to illustrate it step by step.

First, as to collecting all the known facts bearing on a particular subject,—in the world of sense this is generally a very arduous undertaking, or rather, the wider we push our inquiry the greater becomes our knowledge of the facts,—in matters of revelation it is not so very arduous, for the Bible is a limited book, and the additional facts of Christian experience are gathered without great difficulty. The natural tendency of the human mind to select involuntarily one particular class of facts, and to found its conclusion on them, is a fruitful source of error and controversy. The history of geology and mineralogy furnishes us with a remarkable instance in the fierce and acrimonious discussions of the Vulcanists and Neptunists at the close of the last century. The one party, fixing their attention on the basalts, traps, and granites, held that the configuration of the surface of the earth was due to the agency of fire; while the other party, finding everywhere hardened sand and mud filled with organic remains, contended that the whole of the land was a deposit from water; and each one insisted that the opinion of his party was the only orthodox one, till a better school arose, and pointed out that in the production of the multifarious rocks and strata of our globe both agencies must be recognized. Just so in theology, there are those who think of “the man Christ Jesus,” as He wandered about Galilee or Judæa, often hungry and weary, thwarted in His wishes, imperfect in His knowledge, and saying such words as “My Father is greater than I,” till they adopt Arian or Socinian views; while there have been others, who seeing in Christ the authoritative worker of miracles, the divine Logos, the Creator of the worlds, and hearing Him utter such language as “I and my Father are one,” have sublimed away His humanity, and formed for themselves views like those of the ancient Docetæ. But each of these doctrines is erroneous, in

as far as it ignores or denies the opposite truth, and they must both be combined in a true theory of the God-man.

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The theory must not go beyond the facts. But how hard it is for imagination to bear the harness and the bridle! We see a piece of rubbed amber giving rise to certain phenomena of attraction and repulsion, and we spring to the supposition of an "electric fluid." We count seven colours in the solar spectrum, and we at once associate it with the gamut of music; or we read, "Render unto Cæsar the things that are Cæsar's," and we conclude the divine right of kings. Of course it is when we have a strong preconceived notion, that we are sure to see proofs of it everywhere. A man is easily supported on a one-legged stool if his own two feet are firmly fixed on the ground.

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Oh for that intellectual temperance which would prevent our seeing in Nature the products of our own brain, or drawing out of a Scripture statement what we have ourselves put into it beforehand!

A good theory must include all the facts in its explanation. That advance towards a true conception of Nature which should mark the progress of every physical science, is only to be obtained by the gradual replacement of the first hypotheses by such as are founded on a larger generalization. Thus the idea that heat was some imponderable form of matter, which could be transferred from one substance to another, and could remain latent among its particles, was once deemed competent to explain the various phenomena; but now its incompetence is fully recognized, and we are led to regard heat as one of the ever-shifting forms of force, so that our measure of it now is expressed in terms of foot-pounds, that is, of the amount of force required to lift a pound weight through a space of twelve inches. Similarly, we should expect that in the progress of Divine science our doctrines should become fuller and truer, as we sound more thoroughly the depths of the Divine word and the dealings of Providence. I must, as before, select an instance. Suppose we are investigating the benefits which flow to mankind from Christ's death, we must enter into the meaning of those typical sacrifices under the old dispensations by which atonement was made; we must listen to the utterances of the prophets; we must catch the allusions of Christ to that future scene of suffering which appears to have been constantly present in His mind; we must study the simple narratives of the

crucifixion; and we must try to discover what is involved in the Apostles' preaching of the cross, and in such words as propitiation and ransom, reconciliation and eternal redemption. Then we shall scarcely be satisfied with the opinions of Anselm, or Abélard, or Bernard of Clairvaux, but we shall endeavour to include the whole of the Scriptural statements in our great conception of the Saviour's sacrifice.

I have thus endeavoured to illustrate some of the points of analogy between the methods of interpreting Nature and Revelation; and it is on this account that the present lecture has been written, for I want to plead for the larger introduction of the study of Natural Science into our schools of Theology. The power and usefulness of the Christian ministry in the future will depend little on their ability to make verses in dead languages, or on their knowledge of the differential calculus, but it will depend greatly on their being abreast of their fellow-thinkers in their appreciation of those processes by which truth is arrived at. Every parish priest, and every teacher of religion, must be more or less an expounder of the word of God, and it is surely desirable that he should enjoy, as far as possible, the advantage which may be derived from a knowledge of those methods of investigation which have proved so fruitful in a kindred region of thought,—a region where calmness is more easy, for human passions and human interests are less involved in the issue,—a region, too, where the conclusions are more readily brought to the test of direct experiment than they generally can be in the domain of Theology. I do not forget the greater importance of those studies which bear directly on the duties of the sacred office, but I plead for the study of Natural Philosophy because I believe in its peculiar adaptation as a trainer of the mind in the pursuit of truth.

There will be also minor advantages. A better acquaintance with physical science will remove distrust, and enable the sacred teacher to feel as well as to repeat, "The word of the Lord is right, and all His works are done in truth." And then again it will furnish the preacher with an abundant store of illustrations, such as adorn Moses's Song of the Rock,* or Paul's argument about the resurrection of the body.†

I feel that my train of reasoning has led me to speak of the services rendered by natural science to theology rather than those rendered by theology to natural science. The advantage of their mutual intercourse would seem to be on the side of theology. Perhaps it is so, and perhaps it is right that it should be so. Theology is the queen of sciences: it is befitting that

* Deut. xxxii. 1—43.

† 1 Cor. xv. 35—44.

those of lower rank should wait upon her. Yet, if I had spoken not of theology, but of the Christian religion, I know not but that the obligation would have been on the other side. Human philosophy has done little to make men better Christians; but had Christ never become man and suffered, or had the Holy Spirit never been poured out, it may be a question whether the race of man would not have sunk lower and lower in their degradation, and whether there could have been that state of civilization which allows of the calm pursuit of intellectual studies, or that mutual confidence which is necessary for such great undertakings as the establishment of museums, the perfection of large and costly machinery, or the laying of submarine telegraphic cables. But I care not to compute too nicely the gain on either side, but rather to remember that every honest student may be the servant of Him, who has given to us the command, "By love serve one another."

The CHAIRMAN.—I am sure you all feel very much indebted to Dr. Gladstone for his paper; and I may say that both Dr. Gladstone's paper and the preceding one exemplify one of the canons which Dr. Gladstone has laid down,—namely, that the first requisite for a successful prosecution of any inquiry into the ways of God, either in nature or revelation, is a reverent spirit. I am sure you will feel that that marks both the papers we have heard this evening; and I now call upon any gentleman who wishes to make remarks on these papers, to do so.

Capt. FISHBOURNE.—There was another canon that Dr. Gladstone gave us, which is a very excellent one, and which, I observe in the paper, is marked in Italics,—*That we should first ascertain all the facts upon which our conclusions are based.* Now I observed that in the first paper all the facts are assumed, and I must protest against this—against taking for granted that all the conclusions advocated by geologists are true. It appears to me they are all rather in question; and the whole argument falls to the ground, if that be so. Mr. Brodie argues as if the current system of deposition and of the stratification of the earth were quite true; but in the paper read at our last meeting, we were told that Professor Ramsay had alluded to strata in extent equal to an English county, that had all been turned upside down. In Mr. Brodie's paper the question is begged, while we want proof; and until we have that we cannot admit the order of stratification. Again, in the paper it is assumed that the earth was once a great many degrees hotter than now—that the world was at one time a globe of fire, and gradually cooled down;—and that this accounted for the tropical plants, and evidence of tropical signs in this country and in Spitzbergen. On the contrary, however, it appears that will not answer the case at all. You may have a hotter climate the result of internal heat, but that will not give the tropical rays of the sun or the plants of the tropics. In this view is wanting

that characteristic adaptation which is found all over the world at the present moment:—it does not account for the tropical plants requiring the sun's rays and the showers of a tropical climate ; for mere heat below would not give these. I need say no more about Mr. Brodie's remarks, because I think they fail, from not being founded upon established facts.—Dr. Gladstone's paper was on the subject of the mutual helpfulness of Science and Scripture ; but, as he tells us, he went rather on the one side ; and I strongly feel this, that it is in this way that science is doing one of the greatest injuries to Scripture that is possible at the present moment. There is a passage in his paper which shows what I allude to ; and I am sure, that if he had thought of it, he is really of the same mind as myself. I allude to the passage where he quotes from St. Paul, that “the natural man receiveth not the things of the Spirit of God.” The meaning of this is, that as respects Scripture, it is indispensable we should have a power—the teaching of the Holy Spirit—to enable us to understand it ; but Dr. Gladstone draws a parallel between Philosophy and Scripture in that respect ; whereas there is this characteristic difference between the two. I say that elevating the requirements of philosophy, into the position of a strict parallel with the requirements for the interpretation of Scripture, has just this effect, that men fancy that by mere force of intellect they can understand all Scripture. Now, I say, that this is most fatal ; and that as long as any idea of that kind arises in the mind,—while it ignores, either directly or indirectly, that indispensable power for the understanding of Scripture,—it is not helpful, but exceedingly injurious, and I think that view is a main defect in Dr. Gladstone's paper. I am sure we are one in sentiment ; but in the paper he has overlooked the point, perhaps from writing it hastily.

Mr. WARINGTON.—I confess on looking through Mr. Brodie's paper as Captain Fishbourne was speaking, I failed to see there any assertion on the part of the writer that the earth was at one time hotter in consequence of internal heat. I find it there stated that “a larger proportion of the carboniferous element was diffused through the atmosphere, and that there is reason to conclude that the average temperature of the globe was much higher than that which now prevails ;” but I did not see any assertion as to how it came to be higher, nor did I see any assertion of our globe being originally a molten mass—

Capt. FISHBOURNE.—I said it was assumed ; I did not say it was asserted.

Mr. WARINGTON.—I am not disputing that it is possible the writer of this paper may have had that theory in his mind ; but I do not think he has so expressed himself as to be open to the charge of having bound up the lessons which geology teaches, with particular theories which may be erroneous. No theory of geology will ignore this, that the earth has existed a long time and gone through many changes, and that man is about the last being that has been created on the earth ; and as these are the whole foundations of the lessons which Mr. Brodie draws, I think it is hardly fair to say, because there may be a particular detail questionable here and there, that his whole paper is at fault. Surely we are too much disposed, in looking at these questions, to

forget that all our knowledge rests on probability. That was the great thing Bishop Butler insisted on in his *Analogy*, that probability is a fair foundation for practical conclusions. I think, then, that in these matters of science, we are not to say, because a certain thing is not mathematically demonstrated, therefore we are not to take it as a basis of argument. If so, we should have no arguments at all. Our chairman has told us that in the purest of all sciences, mathematics, there are propositions taken as bases of argument which cannot be demonstrated in mathematical fashion—they are assumed ; so that even in that science we have to take probability into account. Hence I take it, that all we can fairly demand in taking any conclusion of science as a basis for argument, is that it should be a probable conclusion. To pass to the second paper ; it struck me that the objection which Captain Fishbourne raised against it, arose from a misunderstanding of what the author of the paper intended to convey. As I heard it and read it, it did not seem to me that Dr. Gladstone meant that it was the same quality, the same faculty of mind, which rendered man able to interpret the facts of nature scientifically, that would enable him to interpret Scripture scientifically ; but rather that there was in each a true and proper faculty, and that so far the two cases were analogous ; because just in the same way as the scientific faculty of the mind was required for the investigation of the facts of nature, so the spiritual faculty of the mind was required for the investigation of the facts of Scripture. It struck me that the position Dr. Gladstone took up was one of great importance with a view to tracing out the analogies which exist between nature and Scripture in this way. It gives a useful answer to objections which are raised at the present day, something in the same fashion as the great work of Bishop Butler on *Analogy* did, to objections in his day. For there are certain prominent fallacies put forward by some thinkers now, which can be met most effectively by this analogy between science and Scripture. I will take two, which are hinted at, though not worked out, in Dr. Gladstone's paper. In the first place, we are constantly hearing men say that there is but one standard in theology, and that is conscience ; and of course if we reason on *à priori* principles, we must admit that the standard of ultimate appeal is man's conscience. There may be others, but we must come at last to the practical one, the ultimate one, and that is conscience. The conclusion drawn is, that, consequently, whatever a man's conscience thinks right, is right. Now, to turn to science ;—the ultimate standard of appeal, by which every scientific conclusion has to be judged, is reason. And this not merely reason generally, but by each man's faculty of reason. But would it therefore be fair to jump to the conclusion that what every man's reason decides is science ? Certainly not. We see that although reason is the true faculty to which appeal must be made, yet that faculty has to be educated, and must have before it a proper estimate of the facts of the case on which the conclusion is to be based ; and unless these are kept steadily in mind, it is extremely probable that reason will come to a wrong conclusion ; and thus though the right standard may be

referred to, that standard will give a wrong verdict. So, if conscience is not educated to discern right and wrong, and you have not considered the full estimate of the facts of the case, you are liable to make similar mistakes in religion; and therefore, just as you say to a man in regard to science, your individual reason is not sufficient ground for adopting a conclusion; so also you may say to a man in regard to religion, your individual conscience is not a sufficient ground for adopting any conclusion. To take another parallel case, we hear it constantly said by persons who uphold conscience as opposed to authority: We are to search out everything for ourselves, and believe nothing on trust. Now, if we look at this matter on *à priori* principles, it is right that we should search out everything for ourselves, just as in matters of science, the scientific student is supposed *à priori* to search out everything for himself. But what is he obliged to do practically? If he wants to learn astronomy, for instance, he does not immediately begin investigating the minutest principles of his science, and go through every step. No; he takes a manual of astronomy and learns first of all the conclusions to which others have come in the science he proposes to learn. Then when he has mastered these conclusions, if he thinks a point defective, he tests it, and puts the whole into practical use; and if it passes this greatest test of all, the test of practice, he does not quarrel with the conclusions of others, but accepts certain things, contrary to the theory of science, on trust. And so it is precisely in theology; the student does not begin by questioning the fundamental positions of theology, but learns of his teacher or theological manuals; then he puts their conclusions to the test of practice, or tries any particular point which seems defective, and decides whether it is true or not. It struck me that in this kind of way the false positions taken up by theological sceptics at the present day may be advantageously met, by showing that precisely the same thing is done in the matter of science; especially as it is on the scientific method that our sceptics profess to deal with Scripture. We should say to them, then, Deal with your conscience in religion in the same way as with reason in science. Deal with authority as to theological conclusions arrived at in days gone by, in the same way as you do as regards scientific conclusions come to by investigation in days gone by; and you will find your objections touching conscience and authority fall to the ground. In this way, I say, science may very notably be the helper of theology.

REV. DR. IRONS.—What has fallen from the preceding speakers has failed, I confess, to reconcile me altogether to the thesis which Dr. Gladstone has attempted to demonstrate this evening. I am reluctant to admit the expression that science is helpful to Revelation, or Revelation helpful to science. I think that Revelation being most distinctly the impartation of truth from God to us, does not as such need help from science or man at all. Of course there is a sense in which every external instrumentality may be said to be helpful to it. Language may be said to be helpful to the promotion of the cause of religion, and so may all social institutions; and in that sense I, of course, cannot deny that science may do a little in helping the education of the human mind. It certainly has done but little as yet, though it may do more in time to come.

But as to its being helpful in any higher sense, I confess Dr. Gladstone has failed to convince me. If he will excuse my saying so, I think there did prevail throughout his essay a kind of patronage of theology, a kind of treatment which I think, as theologians, we do not desire. I do not, as a theologian myself, wish to be patronized. Believing that Divine Revelation is actually true, I ask no favour to be shown to it whatever. Let it confront the world in its own way, and I am quite sure it will answer for itself. If it be not capable of doing so, it is not of God. Then the tone which was adopted in some parts of this well-meant paper, seemed to me to be otherwise scarcely respectful to our side—the theological side—of the subject brought before us. Indeed, Dr. Gladstone admitted that he had paid rather more attention to the other side, and in some degree in one passage he apparently apologizes for it; yet I thought the apology a somewhat awkward one. It is that sort of apology which we make to a lady when we tell her, in some very complimentary way, that we defer to her judgment, that she is our queen! And “queen” was the title assigned to our science,—not by Dr. Gladstone in the first instance, I grant, but in his paper to-night, in a somewhat new sense,—a sense which seemed to me to be about as respectful as that which I have just indicated. But there were graver things that arose in my mind many times as the paper proceeded. One or two points seem to me to show that Dr. Gladstone has not given that close attention to theology that he undoubtedly has given to science. He may probably retort that on me; and I cannot help it. But I think in his case, it would have been well if he had not classed Anselm on the doctrine of atonement with Abélard and Bernard of Clairvaux, as though there were anything in accordance between them—

DR. GLADSTONE.—I referred to them as holding totally different views!

DR. IRONS.—I only mention that as an instance of a kind of treatment of theological science which, I think, would scarcely have been thought respectful, if it had proceeded from our side towards natural science. It would have been thought to have been a mingling together of incongruous and impracticable theories, as if all were science alike. But with respect to one part of Dr. Gladstone’s paper, I have to take a much stronger line of objection. He says that the Bible is so much easier to understand than natural science. You will recollect the passage, as the paper has been so recently read. He seems to consider even the language of the ancient prophets to be so extremely intelligible that any one might make out their meaning for himself. Now I do not hesitate to say, that if he would take the prophet Isaiah, and read it through (in the Hebrew) with care, and take his pen and endeavour to put down in plain modern language side by side, in a parallel column (in language such as *The Times* newspaper, for instance) the exact sense of the prophet,—what he means in every phrase,—Dr. Gladstone would certainly not arrive at any of these conclusions concerning any single chapter of Isaiah, which have been universally taken, in the Christian Church, as being the sense of the prophet. I am persuaded there would be found in the literal language much more that is acceptable to a Jew than to a Christian. And yet, notwithstanding this, we should accept

the Christian interpretation of Isaiah, for instance (and I only give that as one example) and not be prepared to accept Dr. Gladstone's dictum, that we can ascertain its meaning for ourselves, in that off-hand way which he seems to suppose in this essay. I am perfectly sure that, apart from the hereditary faith of the Church, we should not be able to interpret truly the Old Testament prophecies. Take, for example, the prophecy concerning the Child that was to be born, whose birth we celebrate on Christmas Day. We read, that "before that Child should be able to know good or evil, the land would be abhorred of *both her kings*." All such details connected with the prophecy, literally and simply understood, would lead to a distinctly Jewish interpretation of the whole. I mention this as one warning as to the way in which the whole of Christian truth may be cut from under our feet, if we were to adopt the rule implied in this paper, of reading by our own wit the Old Testament, instead of being led by the Spirit of God to those interpretations handed down from the days of Christ. It was not my intention this evening to address you at all. I have been, though interested in the subject, so engrossed by other matters, up to the moment of my coming here, that I have been unable to do justice to the subject, in any observations I might have wished to make; and you must forgive me for speaking in this desultory way. I do feel that this is an important Institution, and that every subject here discussed ought to be watched with care. I should be sorry indeed if any paper read in the Victoria Institute should give currency to the idea that we are going to "help Revelation" in any way. Let us remember that we must be helped by Revelation, rather than that we can assist it. The passage which I referred to before, my eye now falls upon—"Theology is the queen of sciences, it is befitting that those of lower rank should wait upon her." Wait upon her! With reverence, surely; in a lowly and distant spirit of homage, if you will; but not wait upon her in the spirit thus intimated; for here she is set before us, as not only having an equal, but perhaps an equal of a somewhat domineering character, in this natural science! No, I must entirely dispute, either that science receives help from us, or that we receive help from science. I have not yet glanced, indeed, at the other side of the alternative. But I quite admit that it is not our business, as theologians, to import into science any of our dogmas. The two subjects should be pursued with independence of thought, and with fearlessness as to all conclusions. Reverence, indeed, in both should be predominant, for if there be not a reverent mind, I cannot conceive that any one would be either a truly scientific man or a good theological student; but the two things must stand on their own merits. Science must be pursued for its own sake, humbly, fearlessly, truthfully; and so also Revelation; but that must further be aided externally by the gift of God directly, and internally by the Spirit of God applying His truth to the soul of man. I have no further observations to address to you on this paper, and I thank Dr. Gladstone for his patience in listening to these few remarks.

Mr. REDDIE.—I should wish to notice first the remarks of Captain Fish-

bourne with reference to Mr. Brodie's paper. While I quite agree with Captain Fishbourne, that some of the assumed facts in the paper may not be regarded as facts by many of us here now,—and especially after Professor Kirk's able Discourse upon the history of geology ever since geology became part of the science of the world,—yet I think Mr. Brodie puts it very modestly in his paper, that he is only assuming certain conclusions in the meantime, without stating that they are ascertained facts:—his words are, “without stopping to inquire whether the facts on which geologists raise their hypotheses, have been ascertained with accuracy;”—and I think the paper is valuable in this respect, that assuming all those long epochs, and assuming even the now extinct “Azoic ages,” we find that a reverent spirit can still extract grounds to support his belief in a Supreme Being of Almighty power and wisdom, and yet perceive that man occupies that position in the world, even upon these suppositions, which he also is shown to occupy from the teaching of Scripture. Of course, it is always to be preferred that arguments should be based upon what are perfectly ascertained facts; but I think it must be in all our recollections, that most of these assumed facts in Mr. Brodie's paper, have been taught as the certain facts of geology during the last twenty or thirty years. Some men also, we know, have made use of these same “facts” to teach impious doctrines, or to oppose Revelation. And it is, therefore, of great consequence to find that a gentleman like Mr. Brodie,—himself an able geologist, who has written one of the best replies to Sir Charles Lyell's book on the Antiquity of Man,—can extract proper notions of the Deity, and of man's position in the world, from those same facts from which others have drawn very different deductions.—I come now to the more important paper of the evening. I do not quite go with Dr. Gladstone's mode of treating the subject of his paper, especially when we view it with regard to its title,—“The Mutual Helpfulness of Theology and Natural Science.”—I however consider this a fair subject for philosophical consideration, and I cannot agree with Dr. Irons in saying that the one cannot derive any benefit from the other. Still, it strikes me that Dr. Gladstone (as he in fact himself states in his paper) has not treated the subject of their mutual helpfulness, but rather the respective modes of interpreting the two sciences, Theology and Natural Science, and drawn analogies between them. Now, of course, there are analogies, or ought to be, between all kinds of right reasoning; and if you have not a fact to deal with, you cannot very well reason soundly, or at least, to any good purpose. You may assume a hypothesis, and say that such and such follows; but this too often results in idle speculation.—I must now notice some incidental remarks in the paper, although I consider that there is this mistake throughout, that it does not quite fulfil its promise; for I do not know in what respect it has shown us that science helps theology or theology helps science. In the opening of Dr. Gladstone's paper, the first thing I find to which I should venture to demur, is the almost hopeless view he seems to take of the whole subject. He says that our “systems of theology and natural science must *always* admit of correction and enlargement.” Now to me that sounds too like Pilate's

question, "What is truth?" I have greater hopes of both than that; and trust that science, as well as theology, is on a sounder basis, and that we are not destined to be ever learning, and yet "never able to come to a knowledge of truth." Then he says, "The book of nature appeals to the bodily senses, and the whole of its teaching relates to the physical universe, and to this life." I must also demur to that. I do not know what Dr. Gladstone means to include in natural science; but I consider that some of the heathen in their "natural science" taught more as regards another life than almost our own Christian theologians. For instance, the immortality of the soul has been almost demonstrated by Plato and the Greek philosophers, while it is a question scarcely argued in the Christian church. It has been assumed no doubt, and many other arguments have been added, in connection with the resurrection of the body; but I fancy no Christian theologian would like to throw aside the teachings of pure natural science, or human philosophy, on that subject. Then I find St. Paul himself making use of natural science to aid theology (I say this in all deference to Dr. Irons's opinion); and he does so, no doubt, because theology has for its basis, belief in God; and St. Paul appeals to things visible as proving the existence of the invisible Deity; thus also showing us that even natural science does properly deal with something besides this life and mere material things.—(Dr. Gladstone here made an observation to the Chairman.)

THE CHAIRMAN.—I think Mr. Reddie means this, that he considers natural science in a wider sense than Dr. Gladstone has done, and would include in natural science, mental philosophy, and I suppose what the Scotch term "the humanities."

MR. REDDIE.—I include all human philosophy, and that is why I think this Society has such a wholesome range in its scope. We are not a mere "scientific Society" in the narrow modern sense, but truly a philosophical Society—

THE CHAIRMAN.—I think Dr. Gladstone's paper was directed to the one branch of science, which I should term "Natural Philosophy," rather than as including the whole range of philosophy.

MR. REDDIE.—I would scarcely like thus to dissociate the various branches of human philosophy or natural science—for instance, natural philosophy from natural theology. But I shall endeavour to bring out my views, and also to show what is found in Scripture, in their justification. I would agree with Dr. Irons that "science," in our modern sense, is not made use of in Scripture; but if by science you mean a true knowledge of certain things in nature, without any pretence of going into the depths of nature and beyond what we do know of the laws affecting these things, then I consider that Scripture makes very great use of science in this sense. It does not profess to propound the particular laws that regulate the movements of the heavenly bodies, but it recognizes most distinctly that they are regulated by law, as in the phrase, "He hath given them a law which shall not be broken." Again, we have the verse, "The Heavens declare the glory of God;" teaching us, therefore, that the contemplation of the material heavens ought to lead the

mind of man beyond the visible to the invisible. Now, that is the essence of what we properly call "Natural Theology;" it is, I might say, the constant burden of the teaching of the prophets in the Old Testament as against idolaters; and it is just what St. Paul argues to the Romans. The allusions to the facts of natural science in Scripture are often incidental, and yet I venture to say they are always characterized by extreme accuracy, although necessarily appeals to the actual knowledge, or science, of those addressed. When Dr. Gladstone tells us that the notion of the earth not being a level plain was opposed as being unscriptural, I can only say that whoever made that objection must have known very little of the Scriptures. What is the fact? In the Book of *Job*—and I believe that is the oldest book in the world in which the idea occurs—the earth is distinctly spoken of as hung upon nothing, or as we should say, suspended in free space, in the beautiful passage, "He stretcheth out the north over the empty place, and hangeth the earth upon nothing." There is there no notion of a flat plain with a solid arch over it; but, on the contrary, as correct an allusion to the earth as we now understand it, as a globe suspended in space, as we ourselves could indite. Then in *Job*, besides, look at the allusions to the sweet influences of the Pleiades, and to some other of the constellations. I believe it is also the first book in which the extraordinary far-sight of the eagle is noticed. This fact in natural history you will find in modern books, like Bishop Stanley's *History of Birds*; but many such facts are now spoken of always as if only we moderns had discovered them; and we take credit for this, though you may find them in the Scriptures. The theory of the circuits of the wind and what we now call "the law of storms," was suggested by the language of Scripture, as has been frankly acknowledged by Captain Maury. There are many other allusions to the facts of nature in Scripture which are very important; and I must say I think Dr. Irons has overlooked them, and will acknowledge this, because some of them have an important bearing upon those teachings of Christianity which relate to the mysteries of grace. For instance, there is St. Paul's argument from the engrafting of the wild olive.* Now, it is a very curious fact, that we have nothing in science, so far as I am aware, to explain to us what constitutes the difference thus produced between the wild and cultivated fruits. We are all acquainted with the fact, and with the mode of engrafting upon the wild tree; but we cannot convert the latter into a cultivated tree without this mysterious engrafting. We must all recollect how St. Paul makes use of this, as an analogy between nature and the operation of grace in man. I recollect, at the meeting of the British Association at Cambridge, in 1862, hearing Dr. Gray, of the British Museum, speak, if I may so say, an admirable "paper" to a number of gentlemen around him out of doors, in the course of which he declared there was no cultivated plant and no tame animal that had not always been cultivated or tame from time immemorial. And he then challenged Colonel Sykes and

* This method of reasoning is, moreover, strictly "theological;" for instance, in the Athanasian Creed we have the argument, "For, as the reasonable soul and flesh is one man; so God and man is one Christ."

other travellers and naturalists who were present, to adduce a single instance of a tame animal that had originally been wild, or of a cultivated plant that had originally been a wild one. Among many others, which he showed to be groundless, (such as the potato and domestic fowl and turkey,) the case of the horse in the Pampas was brought forward ; but Dr. Gray was prepared to prove that the Pampas horse was descended from the tame animal, which had been imported into South America from Europe and allowed to become temporarily wild. Besides, the Pampas horse is not, properly speaking, "wild," for the moment you put a bridle upon him he submits, and his tame nature shows itself. But you cannot do that with really wild animals, like the zebra, or the wild ass, the untameable character of which, also, is recognized in *Job*. Now, if we consider the use which St. Paul made of his knowledge of the process and effect of engrafting, to teach the mysterious power of grace ; and also of the sowing of seed or grain, from which we raise the crop of grass or wheat that grows afterwards, to illustrate the doctrine of the resurrection ; I think we must admit that there are apt analogies in nature, which may most fitly be made use of, to help us to understand theology and certain parts of religion. So, our Lord, in His teaching in the Sermon on the Mount, tells us to "consider the lilies of the field, how they grow ;" and He alludes to the feeding of the ravens by God ; thus showing us that we ought to derive sentiments of natural religion (which will so far concur and agree with revealed religion) from the study of the objects in nature. That being the case, I should be sorry to think there should ever be such a total dissociation between theology and natural science as some in the present day contend for. There is this further thing I would venture to say,—though we ought to be most cautious and not presume to found arguments for religion upon mere imagined knowledge of the laws of nature,—and it is this :—that there can be no harm in taking any of those scientific discoveries, about the truth of which there can be no question, and arguing from them to something higher. I will now, therefore, instance a case in which we may thus make use of our more advanced scientific knowledge as an aid to faith. I do not believe it was possible for the ancients, with the knowledge of physics they had attained, to have such a perfect appreciation of the reasonableness of some of the doctrines laid down in Scripture, (as, for instance, the doctrine of the Holy Trinity, and what is also said of "the seven spirits of God," who is yet "the One Eternal Spirit,") as we can now have, knowing as we do that white or colourless light is actually composed of the three primary colours, with their seven brilliant prismatic shades. I think, therefore, our science of light is a help in that respect to us. I also think that all true natural science may well play its part thus, and "wait upon 'the Queen of Sciences,'" without assuming in the least an improper position. Lord Bacon well said that "natural philosophy is the handmaid of religion ;" but in saying this he never meant that science was to intrude upon things supernatural, which can be only known to us by Revelation. Nor should the perversion of true science by others frighten us from its legitimate and rational use. We must recollect that the foundation of all religion is a true belief in Deity, and in God's

benevolence and wisdom, as well as in His power and eternity. And it is surely by tracing the signs of design in nature, and understanding the various uses of the organs of the body and the marvellous laws of adaptation and compensation throughout nature, that we may best arrive at a higher appreciation of God's wisdom and goodness;—better than we ever could attain if in a state of ignorance of nature. On the other hand, religion, in its turn, has especially benefited our natural science, and above all “the science of man,” by throwing light upon what was felt by the earnest heathen philosophers to be dark as regards the origin of evil, and difficult as regards man's nature and future destiny. It has taught us God's mercy in a way that no mere natural science could have ever reached, and thus has enabled us to understand how the evil in the world, “that mars the fair face of creation,” is to be redressed by the Creator.—But I must pass on to another part of Dr. Gladstone's paper,—that in which he pleads for a “larger introduction of the study of natural science into our schools of theology.” I am afraid we ought to be warned to be cautious as to this, from actual experience of what might be the result. Cambridge, I believe, turned out Dr. Colenso somewhat better taught in the science of the day than in theology. It would depend upon *how* science is to be taught. I am afraid that we might have an enormous amount of bigotry (I can only use that term) introduced into the teaching of our theological colleges, were all that passes for science to take a higher and more positive place than it does at present. Only remember what scientific varieties our students would have been taught in geology, had there been a “Natural Science Tripos” at Oxford during the last twenty or thirty years; because they could only be taught science in one particular way at a time, or they would be “plucked.” With Mr. Mitchell in the chair, I may venture, perhaps, to speak even a little plainer, and ask him, whether there is not a good deal too much of irrational “cramming” at Cambridge already, in the matter of mathematics? Men are expected to get up certain transcendental propositions and repeat them, whether they understand them or not; and I appeal to our chairman, as an eminent Cambridge mathematician, to say whether this is not a fact that may be stated in the face of the world? What could have been the advantage of teaching theological students to accept as scientific truth the doctrines of “latent heat,”* of the Azoic ages, or the Nebular theory? And what might not be taught next as “science”—the theory of “continuity,” perhaps, or Darwinism, or the eternity of matter! In this Society, happily, these things are intended to be questioned and in-

* I was glad to hear from Dr. Gladstone that the “incompetence” of the theory of latent heat is now “fully recognized.” I was taught to believe it as “science,” (with what is in fact co-relative to it, that cold is a mere “negation,”) but ventured to oppose it in *Vis Inertiae Victa, or Fallacies affecting Science* (§ 33), several years ago; but I am really not aware in what textbook on Chemistry or Natural Philosophy it is *not* even yet taught, just as it was in our chemical classes thirty years ago. It will be found, for instance, in the last edition of Bird and Brook's *Elements of Natural Philosophy*, §§ 1223.—1230, etc.

vestigated, and we publish what is said on both sides. Now, though you have good scientific papers read in the Royal and other societies, you have also bad papers ; but the objections taken to them are too often lost sight of, not being reported. But surely the only way in which science can be properly arrived at is when it is discussed as it is here, and as it was among the ancients in their academies ;—not taught dogmatically, in what Bacon calls “ the professorial style.” There is one remark as to this, which Mr. Warington’s observations have suggested. I went with much that he said with reference to appeals to conscience and authority in religion, though even that might require a little qualification. But when he came to argue for such absolute authority in the teaching of science, it struck me that if his principles had been thoroughly at work among people who believed the earth to be a level plain, they would never have been allowed to think or prove the earth to be round ; and if taught to submit in this abject way to authority in science when men believed the earth to be stationary, we should never have had the Copernican theory put forward, and not any modification of it allowed afterwards. We have surely had too much of this authority in the world already. We are just as prejudiced and positive about our current theories as ever the ancients were about theirs, and there is, in fact, a growing *odium scientificum* among us now, apparently intended to supersede the *odium theologicum* of former days, when science was not the fashion. Now, I think neither one theory nor another in science should be taught as absolute truth ; but all regarded as matters of free inquiry ever open to investigation. We, however, boast of the great advancement we have made in science,—and Dr. Gladstone would be the last man to say that we have not truly made great strides in science,—but, how have we done so ? Not by teaching it as now proposed at the Universities ; but by science being comparatively free ; and by means of the press, and societies like this, such as the Royal Society and the Royal Institution of Great Britain, of both which Dr. Gladstone is so distinguished a member.—I shall conclude by citing from the Transactions of the Royal Society a fact little known, relating to what has been certainly taught most authoritatively in our Universities, and is the greatest boast of modern science—“ universal gravitation.” In vol. ii. of the *Philosophical Transactions* from 1672 to 1683, (Lond. 1809, pp. 126, 127 ; vol. ix. of the original edition, anno 1674,) there is an account of a book, entitled *An Attempt to prove the Motion of the Earth from observations made by Robert Hook, F.R.S., in 4to. 1674.* Hook was the well-known Secretary of the Royal Society ; and in this book we have the theory of universal gravitation (which is generally taught as having occurred to Sir Isaac Newton, by a kind of inspiration of genius, from observing the fall of an apple) actually published, and an account of it given in the Transactions of the Royal Society of London, twelve years before Newton produced his *Principia*. The *Principia* is said to have been some two years in MS. ; but that still leaves ten years’ priority to Hook. This is what appears in the *Philosophical Transactions*, and you will see it is precisely Newton’s law which Hook then put forward —

“ He [Hook] affirms to have actually made four observations ; by which, he says, it is manifest that there is a sensible parallax in the earth's orbit to the star in the dragon's head, and consequently a confirmation of the Copernican system against the Ptolemaic and Tychoinic. . . . Lastly, he promises that he will explain to the curious a system of the world, differing in many particulars from any yet known, but answering in all things to the common rules of mechanical motions ; which system he here declares to depend on three suppositions :—1. That all celestial bodies whatsoever have an attraction or gravitating power towards their own centres, whereby they attract, not only their own parts, and keep them from flying from them, as we may observe the earth to do ; but also all other celestial bodies that are within the sphere of their activity. 2. That all bodies whatsoever, that are put into a direct and simple motion, will so continue to move forward in a straight line, till they are by some other more effectual power deflected and bent into a motion that describes some curve line. 3. That these attractive powers are so much the more powerful in operating, by how much the nearer the body acted on is to their own centres.”

There was besides this another book, by Halley, published in 1676, still ten years before the *Principia*, which even gives the precise ratio of attractive force as “ increasing inversely as the square of the distance.”* Now the only book in which we have any approximation to a statement of the real facts as to this theory is in Whewell's *History of the Inductive Sciences*. He laughs at the mythical story of the apple ; but even he does not tell us the whole truth : and although it is actually to be found in print in the *Philosophical Transactions*, it seems to have been lost sight of or intentionally put aside. I think, therefore, these interesting facts are well worth being put on record in our *Journal of Transactions*. We hear many now still talk of this theory as one not to be questioned, although Mr. Grove really gave it up in his address at Nottingham last year ; and indeed every one who has learnt more than this child's story of the apple, or really understands anything about the matter, must know that whatever may be the amount of truth or error in the theory, it has the merit at least of being totally inconsistent with anything like “ the law of continuity ” applied to the heavenly bodies ; for they, according to Newton, must have been hurled into space, or projected in the direction of tangents to their orbits, by a force once given *ab extra*.

Dr. IRONS.—I would mention, in addition to the story of Newton's apple, another old story which some men are never tired of quoting—that of Galileo and his recantation—which should be revised before it is again brought forward. The Pope has really never had justice done to him on that subject ; and I think this stock story of sham scientific ought to be entirely eliminated from scientific history.

The CHAIRMAN.—I think the late Professor Whewell has conclusively shown that the whole story of Galileo's persecution has been greatly exaggerated, and that he never was thrown into the dungeons of the Inquisition. With regard to the first paper read this evening, that of Mr. Brodie, no one

* *Philosophical Transactions*, anno 1676, vol. ii. p. 326. (Lond., 1809.) The *Principia* itself was not published, or noticed in the *Philosophical Transactions*, till the year 1687. (*Ib.*, vol. iii. p. 358.)

who heard it could fail to mark the extremely reverential tone in which it is written. It may well be taken as an example of the manner in which such subjects ought to be treated by believers in revelation. Mr. Brodie's paper will be a valuable addition to our *Transactions*, as affording a fair sample of the manner in which geology was attempted to be reconciled with revelation ten or twelve years ago. Since then geology has so changed its theories that we see how needless such attempts were to reconcile an imperfect science with the Bible. Though Captain Fishbourne has been fairly answered by Mr. Warington, I believe his remarks were substantially true. I shall only quote one passage from Mr. Brodie's paper:—"A larger proportion of the carboniferous element was diffused through the atmosphere, and there is reason to conclude that the average temperature of the globe was much higher than that which now prevails." In this one sentence are two hypotheses now abandoned by the majority of geological professors. They have shared the fate of so many others which, once almost universally received, are now as completely laid aside. Dr. Gladstone has also treated his subject in a very reverential manner. I think, perhaps, that he has not drawn all the lessons he might have done, or shown fully how helpful theology is to science. Perhaps, as Dr. Irons has stated, he has shown a stronger leaning to the scientific than to the spiritual element of his theme. But of this I feel assured, that no one can more highly estimate the spiritual element than Dr. Gladstone does. And in this respect, taking into consideration the difficulty of dealing with subjects so vast and so transcending the powers of the human mind, I feel that there is very little real divergence between Dr. Irons and Dr. Gladstone. We are much indebted to Mr. Warington for a useful line of argument analogous to that pursued by Dr. Gladstone. When, however, he tells us that all our knowledge of science is based on probability, though I agree with him in the main, I might be disposed to take some exception to his illustrations. He has brought forward many useful analogies between a right method of acquiring scientific knowledge, and that of theology. I am sorry that we have not time to extend Mr. Warington's analogies still further than he has done, as they would strengthen Dr. Gladstone's subject of the Mutual Helpfulness of Theology and Natural Science. I shall only endeavour to pursue the subject with respect to one science, that of astronomy. A real knowledge of that science can only be acquired by a long training and a mental discipline very analogous to that required for a reverential study of theology. Before our reason can master the proofs on which astronomy claims to be a natural science, we must cultivate profound humility and great deference to the authority of those who have mastered the subject. Mr. Warington told us he would commence his study of astronomy by reading a manual of the science. But this, though it would give him a fair view of the theories and conclusions of astronomers, would utterly fail to enable him to follow intelligently any of the processes of reasoning by which those theories are proved or are accepted by scientific astronomers. The whole Cambridge course of mathematics in my day was subsidiary to acquiring those methods of reasoning by which Physical Astronomy was

proved to be a true science. I found it a very hard and thorny path to acquire this knowledge. Without this discipline I consider it impossible to judge the pretensions of any theory of astronomy to be a demonstrable science. If you have not gone through such a training as this, and you would ask me what you must do before you can understand the reasonings on which Physical Astronomy is based, I tell you you must acquire knowledge of the whole science of pure mathematics. But this will require an exercise of a vast amount of patience, perseverance, and docility. As Sir John Herschel once so pertinently remarked, you must enter upon this subject through the portal of humility. And in a science of pure reasoning, founded professedly on pure reasoning, you must first defer to your teachers. You must admit the humiliating confession that you cannot at first appreciate the reasoning processes of your teachers. But taking on trust their superior power of reasoning to your own, you cannot test their accuracy till familiarity with their processes has strengthened your own powers. To take Geometry alone, as an instance, what does the study of Euclid require? The admission, at its very commencement, of the most difficult metaphysical problems and paradoxes on which metaphysicians might dispute for ever. That this is no exaggeration on my part, I may mention that only a few days since I was conversing with a most distinguished mathematical professor, and he told me he was engaged in preparing a geometry which should be sound in its logic. He said that it was not till called upon to teach Euclid to others as it had been taught to himself, that he learned how very faulty and illogical that method had been. But the metaphysical difficulties of plane geometry sink into utter insignificance when compared with those of the higher algebra and mathematical analysis. (Hear, hear.) Here long familiarity with new processes and new methods of thought—continued drudgery in the mechanical combinations of symbols, by rules and methods—taken at first as true on the authority of your teachers, or that of men famous in the mathematical world: all this must be gone through before you are capable of comprehending the reasonings, or mathematical logic, by which the problems of physical astronomy are proved. There may be mathematical geniuses who may perceive almost by intuition what costs so much toil and mental labour to others. But men of the average endowment of intellect must pass through this course of mental drudgery with profound docility and humility, before they can feel competent to reason for themselves as to the truth or error of the demonstrations of physical astronomy. The task does not end here. Before his mathematical analysis can be applied to solve the motions of the heavenly bodies, “Laws of motion” must be accepted, which have been inferred, but not proved, from thousands of experiments, which can never be repeated by one man, and must be taken for granted on the faith of others. And after all, the grand problem of celestial mechanism must be solved by methods admitted by no incompetent mathematical authority (M. Comte), to be quite *illogical*, because of the insuperable difficulty of applying those that are considered strictly logical. Then, when you have interpreted the equation of the moon’s place, or that of a perturbed planet, you depend upon the

observations of others to interpret the constants of your equations. And, finally, the real place of the moon or planet occupying the place predicted by your mathematical analysis is your only ultimate proof that you have not been misled by the subtle methods of thought, experiment, and observation, of which you have made use. In such a course as this I think we may see a useful analogy as to the humility, long training, and serious study required by a sound pursuit of theology. I feel assured that men who will apply to theology the same training imperatively required for a sound knowledge of natural science will never be found among the impugners of revelation. Here I am reminded by an observation of Mr. Reddie how much more important is a sound philosophical education to the mere cramming and accumulation of scientific facts—and oftentimes of those doubtful hypotheses so frequently dignified by the name of science. I regret the formation of a natural science tripos at Cambridge. I think the old training was much better, which taught men rather *how* to pursue science than to acquire after all what must be little more than a mere smattering of science, or of scientific theory. Dr. Gladstone has told us that such terms as Catalysis or Epipolism seem only to have been woven as a cover for our ignorance. It may be a humiliating confession after all our boast of the advance of natural science—of our science of physical astronomy, which we have supposed advanced to the rank of an exact science, perhaps the only one fairly dignified by that epithet,—it may be a humiliating confession, but I believe the term *gravitation* to be as much a cover to cloak our ignorance as Catalysis or Epipolism. Gravitation is a name for certain phenomena observed among material bodies. Catalysis is a name for certain phenomena when one kind of matter is in contact with another whose ultimate cause is unknown. Epipolism is a term for certain phenomena of light manifested in its passage through certain fluids. But what do we know about the ultimate cause of the phenomena classed under the term gravitation? Is gravitation a property inherent in matter, or is it the result of certain forces independent of and external to matter? We can give no answer to such queries; even Newton was too modest to hazard any more than a guess inclining to the latter. When I consider how little we really do know of natural science, with all our boasted progress, I feel how little we should boast of our reasoning powers, and I cannot but thank God, who, by the influence of His Holy Spirit on the human heart, affords even the peasant a stronger ground for his faith in the truths of Divine revelation than any the philosopher can adduce for the most advanced of all natural sciences. Dr. Gladstone said, “We see a piece of rubbed amber giving rise to certain phenomena of attraction and repulsion, and we spring to the supposition of an ‘electric fluid’; we count seven colours in the solar spectrum, and we at once associate it with the gamut of music.” Dr. Gladstone, in this passage, as well as in what he said about heat, seems to follow Mr. Grove in the idea that imponderable fluids have been banished from nature. I shall not repeat what I have so recently said to you on this subject, further than to remark that some of the most eminent of modern philosophers have recently started a hypothesis which replaces the imponderable fluids or æthers of

space by an imponderable, vibrating, jelly-like substance, capable of transmitting the vibrations of light, heat, electricity, and other forces, from the sun and stars, while forming a perfectly unresisting medium to the motions of material and ponderable bodies. And with regard to the analogy between the colours of the spectrum and the diatonic scale of music, I have always considered Newton's treatment of that analogy as a prophetic anticipation of one of the most brilliant triumphs of modern analysis. There is one point which I could have wished to have seen introduced into Dr. Gladstone's paper, and that is the powerful aid the belief in the wisdom of the Creator, as displayed in His works, has given to the advance of true science. Newton, Harvey, Cuvier, and Hunter, not to mention other great discoverers of scientific truth, were led to make their discoveries by a profound sense of this wisdom. An assurance of the perfection and wisdom of God's works led them to a right interpretation of facts which to others seemed inexplicable or unmeaning.

Dr. GLADSTONE.—In rising at this late hour of the evening, I must be very brief in what I say; and first I have to thank all those gentlemen, who have spoken upon my paper, for the kind tone in reference to myself in which they have treated it; and I have also to thank Mr. Warrington, Mr. Reddie, and Mr. Mitchell, for the additions that they have made to my argument. I think each of these gentlemen said things that I might have put in my paper if thought of at the time; though I do not of course endorse everything that they may have said in reference to the matter. As to the objections that have been raised to my paper, they seem to class themselves under three heads:—

1. Objections raised upon a mistaken idea of what the paper contains;
2. Objections which I must leave simply to a difference of opinion between myself and those gentlemen; and
3. Objections which I think it worth while to enter upon at length.

First, as to objections which arose from a mistaken idea of what my paper contains, I am sorry to say, it so happens, that all the five objections (I have put down five) of Dr. Irons originate in mistakes—I am quite sure unintentionally, for he tells us he has not read the paper before, and merely received his first impressions of it this evening. He objected, first, to the statement that revelation was helpful to science or science to revelation. I never said either the one or the other. My thesis is, that theology is helpful to natural science and natural science to theology. Then, with reference to the patronage of theology, I am sure I did not mean to speak in a patronising way of theology any more than of natural science. In reference to the particular passage where I spoke of theology being the queen of the sciences, and those of lower rank waiting upon her,—I meant simply what I said. In reference to Anselm, or Abélard, or Bernard of Clairvaux, I mentioned them as representing three extremely divergent doctrines of the atonement. Abélard, I believe, had a definite theory; and not only that, but was one of the earliest promulgators of views relating to the atonement, which have been brought into prominence now; and it is for this reason that I mentioned his name. Then comes the objection that I stated that the Bible is easier to

understand than natural science. Upon asking Dr. Irons for the passage, he referred me to one in which I speak merely of the collection of facts, and I am prepared to stand by what I said in that paragraph. I think it is more easy to collect the mere texts of Scripture bearing upon a particular subject than to collect the facts in nature bearing upon any particular subject there. I speak, of course, in a general way. As to the interpretation of these facts of nature or texts of Scripture, that is another subject, and instead of believing the Bible to be easier to understand than nature, I think the opposite; indeed, one of my reasons for writing the paper was, that I consider nature is a matter which we can understand and comprehend more easily, and that the various methods of interpretation which we arrive at in reference to nature may well be transferred to interpreting the Bible. I am sure that in saying these things you will understand I do not suppose that Dr. Irons in any invidious way brought forward these objections; but, in a brief paper like mine, it is not easy to find the meaning in all cases, and there are complicated lines of thought and argument, and sometimes one may get hold of a meaning which ought to be counterbalanced by what is said elsewhere. As to the second class of objections, Mr. Reddie made various remarks in reference to natural science which showed that he put a very different meaning on the words "natural science" to what I did; but I must leave this as a mere matter of definition. In reference to the question of the introduction of natural science into colleges, I mean to advocate it, and to maintain all I said in my paper; and I hope to express these opinions in other places: I have done so in one theological college, and hope to do so in others. The subject deserves the widest discussion. I am glad it has been brought forward, and that arguments have been used against the position I maintain; and I hope these discussions will extend beyond the Victoria Institute, and that the truth will prevail. Perhaps I may add this,—I repudiate altogether the taking of Colenso as a scientific man, for his objections are non-scientific. Then comes one objection which I ought in justice to myself to deal with at some little length, and it is the objection of Captain Fishbourne, that I have not dwelt sufficiently clearly upon the difference between the natural mind and the spiritual mind. It is possible that the few words I have said on that subject might not convey the whole of my meaning, and you will permit me to explain further my view of the case. In my paper I spoke of there being a receptive faculty in both cases. I think that is what is alluded to in the writings of St. Paul. But there is a different receptive faculty for each: it is the power of appreciating spiritual truth in the one case, and the power of appreciating physical truth in the other. Then the question arises,—How are we to get this faculty? Upon that subject there is not a word in my essay; but there is an important difference between the two. In respect to natural science, there are some men who have the ability born in them of loving science and of taking an interest in it and understanding it, and other men have not this faculty; but when we come to the spiritual mind, we do not find there is by nature this faculty: it has to be imparted to man by the Holy Spirit of God. The origin of these two is therefore different,

and we must bear that in mind always, and I am glad to have an opportunity of expressing my conviction of it here ; but, granted the capability of understanding the Bible, which comes from the Holy Spirit teaching the individual heart ; granted, too, the capability of understanding natural science : then we start on parallel roads, we must have the honest mind and the clear intellect, and I believe the canons of interpretation in the two cases will be found analogous. It has been objected to my essay that it is not complete, and here I fully agree with what has been said. The subject is very large. If, indeed, I have only taken up some particular lines of thought, why, I have left other lines of thought for other persons to pursue. I have dwelt more upon that analogy between the methods of interpretation, because it is one very little written upon or spoken about, and I thought it better to treat of it at greater length. I trust we shall find our efforts will be of service to natural science, and natural science helpful to theology. I believe it is so, and the arguments of others this evening convince me still more that we must enter on the study of theology in the same way in which we enter on studies of natural science, in order to arrive at full comprehension of the truth. There are other points that have been stated by some of the speakers, which, if I had time, I should like to enter upon ; but I must conclude, again thanking you for the friendly spirit in which you have considered my paper.

The Meeting was then adjourned.

NOTE.—The asterisks on pp. 397, 398, and 400, indicate that certain passages in Dr. Gladstone's original Paper were omitted at the request of the Council, as trenching upon purely theological and controversial points.

ORDINARY MEETING, FEBRUARY 4, 1867.

CAPTAIN E. GARDINER FISHBOURNE, R.N., C.B., HON. TREAS.,
IN THE CHAIR.

The minutes of the previous Meeting were read and confirmed.

The following Paper was then read :—

*ON FALLING STARS AND METEORITES. By the
REV. WALTER MITCHELL, M.A., Vice-President, Vict. Inst.*

THE term Meteor, taken in its literal signification as a “thing in the air,” is sometimes used so as to include all atmospheric phenomena, such as clouds, rain, snow, rainbows, mock suns, &c.; but in a more restricted sense it is applied to falling stars and flaming bodies seen passing through the atmosphere. A falling star is a phenomenon with which every one must be familiar. Yet familiar as it may be, it is far more frequent than many would suppose. A star is seen to shoot across a portion of the heavens, vanishing as suddenly as it appeared, sometimes leaving a slight luminous track behind it, to mark for a few moments its course. Generally speaking, few of these falling stars are seen on the same night; but there are occasions when they are so numerous as to fall for hours together in perfect showers,—so numerous as to be compared to a dense snow-storm where every flake is a burning star. Brilliant and startling as was the display last November, when between six and seven thousand falling stars are estimated to have pursued their fiery course in one hour, and at the time of the maximum display at the rate of one hundred per minute, this falls short of the awful majesty of some of the star-storms that have been observed.

A remarkable display of falling stars, seen by Humboldt when travelling in South America, was thus described by him :—“Towards the morning of the 13th November, 1799, we witnessed a most extraordinary scene of shooting meteors. Thousands of bolides and falling stars succeeded each other

during four hours. Their direction was very regular from north to south. From the beginning of the phenomenon there was not a space in the firmament equal in extent to three diameters of the moon which was not filled with bolides or falling stars. All the meteors left luminous traces, or phosphorescent bands, behind them, which lasted seven or eight seconds." Mr. Ellicott, an agent of the United States, thus describes the same phenomenon, as seen by him from the sea between Cape Florida and the West-India Islands:—"I was called up about three o'clock in the morning, to see the shooting stars, as they are called. The phenomenon was grand and awful. The whole heavens appeared as if illuminated by skyrockets, which disappeared only by the light of the sun after daybreak. The meteors, which at any one instant of time appeared as numerous as the stars, flew in all possible directions, except from the earth, towards which they all inclined more or less; and some of them descended perpendicularly over the vessel we were in, so that I was in constant expectation of their falling on us." This particular display of falling stars seems to have been visible from the equator to Greenland in America, and was also observed at Weimar in Germany.

On the 13th of November, 1833, another splendid shower of falling stars was observed over the whole of North and a considerable portion of South America, some of the meteors being of a very large size,—one described as greater than the full moon appears when in the horizon. Another, over the Falls of Niagara, remained for some time almost stationary in the zenith, emitting streams of light. No wonder that many, calling to mind the vision of St. John the Divine, when "the stars fell unto the earth, even as a fig-tree casteth her untimely figs, when she is shaken of a mighty wind," felt awestruck, and imagined that the day of wrath was come. "I was suddenly awakened," says a South Carolina planter, "by the most distressing cries that ever fell on my ears. Shrieks of horror and cries for mercy, I could hear from most of the negroes of three plantations, amounting in all to about six or eight hundred. While earnestly listening for the cause, I heard a faint voice near the door calling my name. I arose, and taking my sword, stood at the door. At this moment, I heard the same voice still beseeching me to rise, and saying, 'O my God, the world is on fire.' I then opened the door, and it is difficult to say which excited me most,—the awfulness of the scene or the distressed cries of the negroes. Upwards of one hundred lay prostrate on the ground, some speechless, and some with the bitterest cries, but with their hands raised, imploring God to save the world and them. The scene was truly awful; for

never did rain fall much thicker than the meteors fell towards the earth; east, west, north, and south, it was the same."

Notwithstanding, says Humboldt, the great quantity of falling stars and fire-balls of the most various dimensions which were seen to fall at Potsdam on the night of the 12th and 13th November, 1822, and on the same night of the year 1832, throughout the whole of Europe from Portsmouth to Orenburg on the Ural river, and even in the Southern hemisphere at the Isle of France, no one seemed to remark the coincidence of so many of these displays happening on the same day of the month. Olmsted and Palmer were the two principal scientific men who described the great meteoric shower of 1833 in America. The latter, calling to mind that the date of the shower described by Humboldt and Ellicott in 1799, was the 13th of November, first suspected the periodicity of these showers,—a fact fully confirmed by a historical investigation into the dates of extraordinary showers of meteors.

On the 9th and 10th of November, 1787, many falling stars were observed at Manheim, in southern Germany. Besides the manifestations already mentioned on the 13th November in the years 1799, 1822, 1832 and 1833, on the same day of the month in 1831, at four o'clock in the morning, a great shower of falling stars was seen by Captain Bérard on the Spanish coast near Carthage. On the same date in 1834 a similar shower, though not so great as that of 1833, was seen. Olmsted was the first to remark that nearly all the falling stars on the 13th of November, 1833, seemed to radiate from one point in the heavens, namely near the star γ in the constellation Leo. The point of radiation did not change, but followed the apparent height and azimuth of the star during the continuance of the shower. This remarkable fact has been confirmed by observation of all the showers witnessed on this date since 1833. According to Enke's computation, this radiant point in space marks the direction in which the earth was moving on the 13th of November in its annual course round the sun.

The periodical appearance of falling stars on the same day of the year, all radiating from a point in the direction of the earth's motion, led Humboldt to conjecture that at that particular period the earth was passing through a ring or belt of minute planetary bodies, which were then drawn within the sphere of the earth's attraction,—a conjecture since pretty generally adopted. He also conjectured that there was, owing to the earth's or other planetary disturbance, a gradual retardation of the November phenomenon, owing to the change of the points where the ring of meteoric bodies intersected the earth's course. He sought for records of falling stars in an-

cient histories. On the night when king Ibrahim Ben Ahmed died, in October, 902, there fell a heavy shower of shooting stars "like a fiery rain," on which account that year was called the year of stars. On the 19th of October, 1202, the stars were in motion all night, and "fell like locusts." On the 21st of October, O.S., 1366, stars fell in such multitudes that they could not be counted. On the night between the 9th and 10th of November, 1787, many falling stars were observed at Manheim. Adopting the conjecture of Humboldt as to the gradual retardation of the November shower, others, more than twenty-three years since, ventured to predict that the great November shower of shooting stars and fire-balls intermixed, falling like flakes of snow, would not recur till between the 12th and 14th of November, 1867, taking for granted that the great November star-showers occurred once in thirty-three years, when the earth intersected the hypothetical ring of minute planetary bodies.

These showers are not equally visible from all parts of the earth's surface. The shower of 1799 was only seen in America; those of 1831 and 1832 were only visible in Europe; those of 1833 and 1834 only in the United States of America; and while a very splendid meteoric shower was seen in England in the year 1837, a most attentive observer at Braunsberg, in Prussia, on the same night, which was there uninterruptedly clear, only saw a few shooting stars, radiating from no particular point of the heavens, between the hours of seven in the evening and sunrise the next morning.

Though such occurrences as the great star-shower on the 19th of October, 1202, and 21st of October, 1366, seem to indicate a gradual retardation of the November shower, the relation of Theophanes, one of the Byzantine historians, that in November of the year 472 the sky appeared to be on fire over the city of Constantinople with the coruscations of flying meteors, may make us pause before assuming the November shower to be the retardation of the October phenomenon. Again, in the year 1766, just before the fearful earthquake at Quito, Humboldt states that the volcano of Cayambe was so enveloped with falling stars for the space of an hour, that the inhabitants fancied the mountain on fire, and endeavoured to appease Heaven by religious processions. The year corresponds with the 33-year period; but as the earthquake occurred on the 21st of October, the shower would seem to belong rather to the October manifestations of the 19th of October, 1202, and 21st of October, 1366. This should caution us not to generalize too hastily on a few recurrences of similar dates. Again, not to speak of the November showers for two years pre-

viously and for three years successively to that of 1833, the showers of 1787 and 1822 cannot be brought into the 33-year period of maximum manifestations of falling stars.

Besides the November period, there is another well-marked periodical fall of stars between the 9th and 14th of August. The 10th of August (St. Lawrence's day) was traditionally famous for "the fiery tears of St. Lawrence." As early as 1762, Muschenbroek remarked the large number of falling stars in the month of August. But the periodic return on St. Lawrence's day was first shown by Quetelet, Olbers, and Benzenberg. Bessel and Erman pointed out that the radiant point for the August shower was in Perseus. In April it is probable that there may be another period. On the 25th of April, 1095, "innumerable eyes in France saw stars falling from heaven as thickly as hail;" and on the 25th of April, 1800, a great fall of stars was observed in Virginia and Massachusetts; it was a "fire of rockets that lasted two hours." On the night of the 6th and 7th of December, 1798, Brandes counted 2,000 falling stars. At Quito on the 4th of February, 1797, shortly before the terrible earthquake of Riobamba, stars were seen to fall in swarms.

It may be well to remark that the train seen to follow a shooting star is no mere optical delusion, produced by the impression of light remaining impressed on the retina. It sometimes continues visible for a minute, or even longer, and even changes its shape. The falling stars which ordinarily occur, that is, which cannot be traced to any periodic display, and do not seem to emanate from any particular point of the heavens, are termed "sporadic." Eight is supposed to be the mean number to be observed in the course of an hour on any night. Perhaps they are more abundantly seen at some places than others. Burnes, describing the clear atmosphere of Bokhara, says, "At night the stars have uncommon lustre, and the Milky Way shines gloriously in the firmament. There is also a never-ceasing display of the most brilliant meteors, which dart like rockets in the sky: ten or twelve of them are sometimes seen in an hour, assuming every colour,—fiery red, blue, pale and faint." Jansen, again, describing the night scenes of the Java Sea, says, "The starlight, which is reflected by the mirrored waters, causes the nights to vie in clearness with the early twilight in high latitudes. Numerous shooting stars weary the eye, although they break the monotony of the sparkling firmament. Their unceasing motion in the unfathomable ocean affords a great contrast to the seeming quiet of the gently-flowing aerial current of the land breeze. But at times, when 30° or 40° above the horizon, a fire-ball

arises which suddenly illumines the whole horizon, appearing to the eye the size of the fist, and fading away as suddenly as it appeared, falling into fiery nodules; then we perceive that, in the apparent calm of nature, various forces are constantly active, in order to cause, even in the invisible air, such combinations and combustions, the appearance of which amuses the crews of ships."

The Reports of the British Association on Meteors from 1848 to 1853, from observations so zealously collected by the late Mr. Baden Powell, show how very frequent are the phenomena of fiery meteors, and what remarkable appearances some of them present. Considering the difficulty of determining the height of bodies presented so suddenly, and so transitory in their appearance, it is no wonder there should be considerable discrepancy among calculators. Olmsted thought the radiant point in Leo of the November meteors could not have been less than 2,238 miles above the earth's surface. Humboldt considers that the heights at the points of which shooting stars begin and cease to be visible fluctuate between 16 and 140 miles. Professor Brandes gives from 240 to 400 miles, and Olbers considers all determinations for elevations beyond 120 miles doubtful, owing to the smallness of the parallax. Brandes ascribes a diameter varying from 80 to 120 feet for shooting stars, and a luminous train extending from twelve to sixteen miles. The relative velocity of their motion he computes to be from 18 to 36 miles per second, their motion being frequently opposite to that of the earth.

Having now described the phenomena of the falling stars, and the larger meteors that accompany them, we proceed to the consideration of another class.

The falling stars, and the larger fire-balls sometimes associated with them, make their appearance suddenly, and, after describing an arc in the heavens, are as suddenly extinguished without passing below the horizon. No sound is heard to accompany this phenomenon. There is another class of fire-balls which are seen to traverse the whole vault of heaven, seen often simultaneously over a large extent of country, whose course can sometimes be traced as passing, for instance, from one end of Great Britain to the other,—of large apparent magnitude, and of such brightness as sometimes to emit a light dazzling even at midday, and superior to the light of the sun. They are sometimes seen to burst into fragments with an explosion heard over a large area.

In the year 1676, on the 21st of March, O.S., about two

hours after sunset, a large meteor passed over Italy: it came over the Adriatic Sea as if from Dalmatia, crossing the country in the direction of Rimini and Leghorn, disappearing out at sea towards Corsica.

It was heard to make a hissing sound as it passed, like that of artificial fireworks. At Bologna the head of the meteor appeared larger than the moon in one diameter, and above half as large again in the other. At Leghorn it was heard to give a very loud report, like a great cannon; immediately after which another sort of sound was heard, like the rattling of a great cart running over stones. Its velocity was estimated at 160 miles per minute, its height about 38 miles, and its lesser diameter about half a mile. Another meteor was observed to pass over all England on the 19th of March, 1718. It was seen by Sir Hans Sloane in London at about a quarter after 8 at night. He was surprised by a sudden light far exceeding that of the moon. Turning towards it, he observed a large spherical meteor not so large as the moon, near the Pleiades, whence it moved after the manner of a falling star, but more slowly, in a seeming direct line, descending beyond and below the stars in Orion's belt. Its brightness was so dazzling that he was obliged to turn his eyes several times from it, as well when it appeared as a stream as when it became pear-fashioned and a globe. It left behind a track of a faint reddish-yellow colour, that continued for more than a minute. He heard no noise. Through Devon and Cornwall, and along the opposite coast of Bretagne the meteor was heard to explode. The report was like that of a very great cannon, or, rather, a broadside at a distance, followed by a rattling noise, as if many small-arms had been promiscuously discharged. Halley estimated the height of this meteor at 60 miles, and its rate at 300 miles per minute.

A similar meteor was observed in England on the 11th of December, 1741, while the sun was shining brightly in a serene sky, and was heard to explode in Sussex. A friend of Humboldt, in the year 1788, at Popayan, found his room lighted up at noonday by a meteor, while the sun was shining brightly in a cloudless sky.

Hundreds of such meteors have been described, and though explosions have been heard over parts of the country favourable for recovering anything solid if it fell from a meteor, in but some four or five cases has anything been picked up likely to have fallen from a meteor; and out of these few cases some are considered doubtful.

We now proceed to consider another phenomenon,—the fall

of stones or hard masses of iron from the heavens. In spite of many recorded instances in ancient and modern times, the account of these falls was regarded with scepticism by the scientific world.

In the year 1794 Chladni published a tract at Riga, on the supposed origin of a mass of iron found by Dr. Pallas in Siberia, which the Tartars called a holy thing, and asserted that it had fallen from heaven. In this tract Chladni called attention to many authentic instances of stones falling from heaven, adducing, among others, the testimony of the celebrated Cardan, that in the year 1510 he himself had seen 120 stones fall from heaven, one weighing 120 and another 60 pounds;—that they were mostly of an iron colour, very hard, and smelt of brimstone.

In the same year that Chladni published this tract, a remarkable shower of stones fell in Tuscany on the 16th of June. This was described in a pamphlet by Ambrose Soldani, Professor of Mathematics in the University of Sienna. In 1795 a large stone, now in the British Museum, fell near Wold Cottage, the house of Captain Topham, in Yorkshire, and was exhibited in London. Mr. Edward King, a fellow of the Royal Society, having received from Sir Charles Blagden some manuscript accounts of the Sienna fall of stones, and having also seen the pamphlets of Soldani and Chladni, called the attention of English men of science to this phenomenon in the first English work on meteoric stones. It is called *Remarks concerning Stones said to have fallen from the Clouds both in these Days and in Ancient Times*, and was published in London in 1796. It is an exceedingly clear, well written, and scientific account of a remarkable phenomenon, to which little can really be added, with all our increase of knowledge on the subject. It was very unfairly treated and ridiculed, at the time it was published, by the reviewers. In 1799, Sir J. Banks received some specimens of stones which were seen to fall at Benares, in Bengal, on the 19th of December, 1798, and perceived a remarkable similarity between these stones and that of the Yorkshire stone, and a specimen of one of the Sienna stones which he possessed. In 1802, Mr. Luke Howard published in the *Philosophical Transactions* a paper entitled "Experiments and Observations on certain Stony Substances which, at different times, are said to have fallen on the Earth." In this paper will be found the first chemical analysis of an aërolite.

The year after this, when an official account was received in Paris of a shower of stones at L'Aigle, in Normandy, on the 26th of April, 1803, the matter was treated with ridicule.

But the Academy of Sciences, influenced doubtless by what had been published in England, deputed Biot to examine the matter. His report being satisfactory, the fall of meteoric stones was admitted to be a well-ascertained fact coming within the domain of science.

Mr. King, in his treatise, refers to Holy Scripture in confirmation of the fall of stones from heaven in these words:—

In the Acts of the Holy Apostles we read that the chief magistrate at Ephesus began his harangue to the people by saying, “Ye men of Ephesus, what man is there that knoweth not how that the city of the Ephesians is a worshipper of the great goddess Diana, and of the *image* which fell down from Jupiter, or rather, as the original Greek has it, “of *that* which fell down from Jupiter.” And the learned Greaves leads us to conclude this image of Diana to have been nothing but a conical or pyramidal stone that fell from the clouds; for he tells us, on unquestionable authorities, that many others of the images of heathen deities were merely such.

And again:—

And in Holy Writ also a remembrance of similar events is preserved. For when the royal psalmist says, “The Lord also thundered out of heaven, and the Highest gave his thunder: hailstones, and coals of fire”!—the latter expression, in consistency with common sense, and conformably to the right meaning of language, cannot but allude to some such phenomena as we have been describing. And especially, as in the cautious translation of the Seventy, a Greek word is used, which decidedly means *real hard substances made red hot*, and not mere appearances of fire or flame.

Whilst, therefore, with the same sacred writer, we should be led to consider all these powerful operations as the works of God, “Who casteth forth his ice like morsels;” and should be led to consider “fire and hail, snow and vapours, wind and storm, as fulfilling his word,” we should also be led to perceive that the objections to Holy Writ, founded on a supposed *impossibility* of the truth of what is written in the Book of Joshua concerning the stones that fell from heaven on the army of the Canaanites, are only founded in ignorance and error.

The earliest record that we have of the fall of an aërolite is of one that fell at Ægos Potamos, 465 B.C. It is so well described by Plutarch in his life of Lysander, that I quote the passage in full, more especially as it throws light on the opinions held by the ancient Greeks on the causes of such phenomena.

There were those who said that the stars of Castor and Pollux appeared on each side the helm of Lysander's ship, when he first set out against the Athenians. Others thought that a stone, which according to the common opinion fell from heaven, was an omen of his overthrow. It fell at Ægos Potamos, and was of prodigious size. The people of the Chersonesus hold it

in great veneration, and show it to this day. It is said that Anaxagoras had foretold that one of those bodies, which are fixed to the vault of heaven, would one day be loosened by some shock or convulsion of the whole machine, and fall to the earth, for he taught that the stars are not now in the places where they were originally formed; that being of a stony substance and heavy, the light they give is caused only by the reflection and refraction of the ether; and that they are carried along, and kept in their orbits, by the rapid motion of the heavens, which from the beginning, when the cold ponderous bodies were separated from the rest, hindered them from falling.

But there is another and more probable opinion, which holds that falling stars are not emanations or detached parts of the elementary fire, that go out the moment they are kindled, nor yet a quantity of air bursting out from some compression, and taking fire in the upper region; but that they are really heavenly bodies, which from some relaxation of the rapidity of their motion, or by some irregular concussion, are loosened and fall, not so much on the habitable part of the globe as into the ocean, which is the reason that their substance is seldom seen.

Damachus, however, in his treatise concerning religion, confirms the opinion of Anaxagoras. He relates, that for seventy-five days together, before that stone fell, there was seen in the heavens a large body of fire, like an inflamed cloud, not fixed to one place, but carried this way and that with a broken and irregular motion; and that by its violent agitation several fiery fragments were forced from it, which were impelled in various directions, and darted with the celerity and brightness of so many falling stars. After this body was fallen in the Chersonesus, and the inhabitants, recovered from their terror, assembled to see it, they could find no inflammable matter, or the least sign of fire, but a real stone, which, though large, was nothing to the size of that fiery globe they had seen in the sky, but appeared only as a bit crumbled from it. It is plain that Damachus must have very indulgent readers, if this account of his gains credit. If it is a true one, it absolutely refutes those who say that this stone was nothing but a rock rent by a tempest from the top of a mountain, which, after being borne for some time in the air by a whirlwind, settled in the first place where the violence of that abated. Perhaps, at last, this phenomenon, which continued so many days, was a real globe of fire; and when that globe came to disperse and draw towards extinction, it might cause such a change in the air, and produce such a violent whirlwind, as tore the stone from its native bed, and dashed it on the plain. But these are discussions that belong to writings of another nature.

Now this passage is most instructive, not only as to the ancient opinions held on the subject of falling stars and meteoric stones; but read by the light of well-known and authentic cases which I will afterwards bring before you, we see that Damachus, in spite of the scepticism of Plutarch and even of some of our modern philosophers, has given

us, in all probability, a most truthful account of a real phenomenon.

Pliny, though sceptical as to the prophecy of Anaxagoras, gives an account, not only of the fall of the stone at Ægos Potamos, but of several others.

The Greeks boast that Anaxagoras, the Clazomenian, in the 2nd year of the 78th Olympiad, from his knowledge of what relates to the heavens, had predicted that, at a certain time, a stone would fall from the sun. And the thing accordingly happened, in the daytime, in a part of Thrace, at the river Ægos. The stone is now to be seen, a waggon-load in size and of a burnt appearance: there was also a comet shining in the night at that time. But to believe that this had been predicted would be to admit that the divining powers of Anaxagoras were still more wonderful, and that our knowledge of the nature of things, and indeed everything else, would be thrown into confusion, were we to suppose either that the sun is itself composed of stone, or that there was even a stone in it; yet there can be no doubt that stones have frequently fallen from the atmosphere. There is a stone, a small one indeed, at this time, in the gymnasium of Abydos, which on this account is held in veneration, and which the same Anaxagoras predicted would fall in the middle of the earth. There is another at Cassandria, formerly called Potidæa, which from this circumstance was built in that place. I have myself seen one in the country of the Vocontii, which had been brought from the fields only a short time before. (*Pliny*, bk. ii., ch. 59.)

From the passage quoted by Plutarch, it is not clear that Anaxagoras predicted the precise day on which a stone would fall from heaven, but, believing that the stars were stony bodies, he predicted that at some time or other some of them would fall from the firmament.

Pliny relates, in the second book of his *Natural History*, chap. 52, that M. Heremnius, a magistrate of Pompeii, was struck by lightning when the sky was without clouds. He also, in his 57th chapter, gives from ancient monuments several strange meteoric phenomena, not without interest to our subject.

Besides these, we learn from certain monuments, that from the lower part of the atmosphere it rained milk and blood, in the consulship of M. Acilius and C. Porcius, and frequently at other times. This was the case with respect to flesh, in the consulship of P. Volumnius and Servius Sulpicius, and it is said, that what was not devoured by the birds did not become putrid. It also rained iron among the Lucanians, the year before Crassus was slain by the Parthians, as well as all the Lucanian soldiers, of whom there was a great number in this army. The substance which fell had very much the appearance of sponge; the augurs warned the people against wounds

that might come from above. In the consulship of L. Paulus and C. Marcellus it rained wool, round the castle of Caripantum, near which place, a year after, T. Annius Milo was killed. It is recorded, among the transactions of that year, that when he was pleading his own cause, there was a shower of baked tiles.

Livy gives an account of several showers of stones, and states that it was the ancient custom of the Romans to expiate the fall of stones from heaven by a nine days' festival.

After the defeat of the Sabines, when the government of Tullus and the whole Roman state was in high renown, and in a very flourishing condition, word was brought to the king and senators, that it rained stones on the Alban Mount. As this could scarcely be credited, on persons being sent to inquire into the prodigy, a thick shower of stones fell from heaven in their sight, just as when hail collected into balls is pelted down to the earth by the winds. . . . A festival of nine days was instituted publicly by the Romans also on account of the same prodigy, either in obedience to the heavenly voice sent from the Alban Mount (for that, too, is stated) or by the advice of the aruspices. Certain it is, it continued a solemn observance, that whenever the same prodigy was announced, a festival for nine days was observed. (*Livy*, bk. i., ch. 31.)

The accounts also of prodigies which arrived just at the time of the news of the revival of the war, had occasioned great alarm. At Cumæ the orb of the sun seemed diminished, and a shower of stones fell; and in the territory of Veliternum the earth sank in great chasms, and trees were swallowed up in the cavities. At Aricia the forum and the shops around it, at Frusino a wall in several places, and a gate, were struck by lightning; and in the Palatium a shower of stones fell. The latter prodigy, according to the custom handed down by tradition, was expiated by a nine days' sacred rite; the rest with victims of the larger sort. (*Livy*, bk. xxx., ch. 31.)

Several prodigies were observed at Rome that year, and others reported from other places. In Forum, Comitium, and Capitol, drops of blood were seen, and several showers of earth fell, and the head of Vulcan was surrounded with a blaze of fire. It was reported that a stream of milk ran in the river at Interamna, that, in some reputable families at Ariminum, children were born without eyes and nose; and one in the territory of Picernum that had neither hands nor feet. These prodigies were expiated according to an order of the pontiffs; and the nine days' festival was celebrated, because the Hadrians had sent intelligence that a shower of stones had fallen in their fields. (*Livy*, bk. xxxiv., ch. 45.)

Before the consuls cast lots for their provinces, several prodigies were reported: that in the Crustumine territory a stone fell from the sky into the grove of Mars. (*Livy*, bk. xli., ch. 9.)

I am well aware that, through the same disregard of religion, owing to which the men of the present day generally believe that the gods never give

portents of any future events, no prodigies are now either reported to government, or recorded in histories. (*Livy*, bk. xliii., ch. 13.)

Towards the close of this year (584) it was reported that two showers of stones had fallen, one in the territory of Rome, the other in that of Veii; and the nine days' solemnity was performed. (*Livy*, bk. xlv., ch. 18.)

To come to the Middle Ages: a stone fell at Ensisheim, on the Rhine. It was ordered to be preserved in the church near which it fell, together with a record, which thus commences:—"In the year of the Lord 1492, on Wednesday, which was Martinmas eve, the 7th of November, a singular miracle occurred; for, between eleven o'clock and noon, there was a loud clap of thunder, and a prolonged confused noise, which was heard at a great distance; and a stone fell from the air, in the jurisdiction of Ensisheim, which weighed 260 pounds, and the confused noise was, besides, much louder than here. Then a child saw it strike on a field in the upper jurisdiction, towards the Rhine and Inn, near the district of Giscano, which was sown with wheat; and it did no harm, except that it made a hole there; and then they conveyed it from that spot; and many pieces were broken from it, which the landvogt forbade." After remaining in the church for centuries, it was carried to Colmar during the French revolution. Many fragments were broken from it, which have found their way to many museums; but the remainder of the relic was afterwards restored to the church of Ensisheim.

A pamphlet published at the time, and now preserved in the King's Library, British Museum, gives such a quaint and instructive account of the fall of a meteorite at Aldborough, in Suffolk, that I quote it at some length:—

A signe from Heaven, or a fearfull and Terrible Noise, heard in the Ayre at Alborow, in the county of Suffolke, on Thursday, the 4th day of August, at 5 of the clock in the afternoone. Wherein was heard the beating of Drums, the discharging of Muskets and great ordnance for the space of an houre and more, as will be attested by many men of good worth, and exhibited to some cheife members of the Honorable House of Commons. With a stone that fell from the sky in that Storme, or Noise rather, which is here to be seene in Towne, being of a great weight.—Aug. 12. London: Printed by T. Fawcet, 1642.

Upon Thursday, the 4th day of this instant August, about the hour of foure or five o'clocke in the afternoone, there was a wonderful noyse heard in the ayre, as of a Drum beating most fiercely, which after a while was seconded with a long peale of small shot, and after that a discharging as it were, of great ordnance in a pitcht-field. This continued with some vicissitudes of small shot and great ordnance for the space of one hour and an halfe, and then making a mighty and violent report altogether; at the ceasing

thereof there was observed to fall down out of the skie a stone of about foure pounds weight, which was taken up by them who saw it fall, and being both strange for the forme of it, and somewhat miraculous for the manner of it, was by the same parties who are ready to attest this Truth brought up and shewed to a worthy member of the House of Commons, upon whose ground it was taken up, and by him to divers friends who have both seen and handled the same. Now the manner of finding of this stone was on this wise : one Captaine Johnson and one Master Thompson, men well knowne in that part of Suffolke, were that day at Woodbridge about the lanching of a ship that was newly builded there, who hearing this marvellous noise towards Alborow, verily supposed that some enemy was landed, and some sudden onset made upon the Towne of Alborow. This occasioned them to take Horse and hasten homewards, the rather because they heard the noise of the battel grow lowder. And being at that instant when that greatest cracke and report was made in conclusion, on their way upon an heath betwixt the two Townes, Woodbridge and Alborow, they observed the fall of this stone, which grazing in the fall of it along upon the heath, some 6 or 7 yards, had out run their observation where it rested, had not a dog which was in their company followed it by the scent as was hot, and brought them where it lay covered over with grasse and earth, that the violence of its course had contracted about it. This is the true relation of the finding of this stone, which is 8 inches long and 5 inches broad, and 2 inches thik.

Having described these falls of stones as given by contemporary writers, I will now come to some modern instances. I will first quote from Mr. King the phenomena attending the fall at Sienna.

On the 16th of June, 1794, a tremendous cloud was seen in Tuscany, near Sienna and Radacofani, coming from the north about seven o'clock in the evening ; sending forth sparks like rockets, throwing out smoke like a furnace, rendering violent explosions, and blasts more like those of cannon, and of numerous muskets than like thunder ; and casting down to the ground hot stones ; whilst the lightning that issued from the cloud was remarkably red, and moved with less velocity than usual.

Signor Andrew Montauli, who saw the cloud as he was travelling, described it as appearing much above the common region of the clouds, and as being clearly discerned to be on fire, and becoming white by degrees ; not only where it had a communication by a sort of stream of smoke and lightning, with a neighbouring similar cloud ; but also, at last, in two-thirds of its whole mass, which was originally black. And yet he took notice that it was not affected by the rays of the sun, though they shone full on its lower parts ; and he could discern, as it were, the basin of a fiery furnace in the cloud, having a whirling motion.

The stones that fell were numerous, the largest weighing five pounds and a half—some only a quarter of an ounce. They fell over a space of ground of from three to four miles,

and several were so hot as to burn the fingers of those who attempted to pick them up.

Four years before, a similar phenomenon occurred in France, and was attested by a legal document signed by the magistrates of the municipality and several hundreds of the inhabitants of the district where it occurred. It is as follows:—

In the year 1790, and the 30th day of the month of August, we, the Lieutenant Jean Duby, mayor, and Louis Massillon, Procurator of the commune of the municipality of La Grange-de-Juillac, and Jean Darmite, resident in the parish of La Grange-de-Juillac, certify in truth and verity that, on Saturday, the 24th of July last, between nine and ten o'clock, there passed a great fire, and after it we heard in the air a very loud and extraordinary noise; and about two minutes after there fell stones from heaven; but fortunately there fell only a very few, and they fell about ten paces from one another in some places, and in others nearer, and finally, in some other places farther; and falling, most of them of the weight of about half a quarter of a pound each, some others of about half a pound, like that found in our parish of La Grange; and on the borders of the parish of La Grange, and on the borders of the parish of Creon they were found of a pound weight; and in falling they seemed not to be inflamed, but very hard and black without, and within of the colour of steel; and, thank God, they occasioned no harm to the people, nor to the trees, but only to some tiles which were broken on the houses; and most of them fell gently, and others fell quickly with a hissing noise; and some were found which had entered into the earth, but very few. In witness whereof we have written and signed these presents.

DUBY, Mayor. DARMITE.

On December 13th, 1795, on the afternoon of a mild but hazy day, a report of a violent explosion followed by a hissing sound was heard in the neighbourhood of Wold Cottage, the house of Captain Topham, in Yorkshire. A ploughman saw a large stone fall to the earth eight or nine yards from the spot where he stood. It threw up the mould on every side, and, penetrating through the soil, lodged some inches deep in the solid chalk. The greater part of this stone is now in the British Museum, and weighs forty-five pounds eight ounces.

The next account to which I shall draw your attention is to the great fall of meteoric stones in Normandy which created such a sensation in France, and caused the Academy of Sciences to send a commission of inquiry on the subject, with M. Biot at its head. From this date the fall of meteoric stones has been received as an established scientific fact.

On Tuesday, April 26th, 1803, about one in the afternoon, the weather being serene, there was observed, in a part of Normandy, including Caen, Falaise, Alençon, and a large number of villages, a fiery globe of great brilliancy moving through the atmosphere with great rapidity. Some moments after there was heard at L'Aigle and in the environs to the extent of more

than thirty leagues in every direction, a violent explosion, which lasted five or six minutes. At first there were three or four reports like those of a cannon, followed by a kind of discharge which resembled the firing of musketry; after which there was heard a rumbling like the beating of a drum. The air was calm, and the sky serene, except a few clouds, such as are frequently observed. The noise proceeded from a small cloud which had a rectangular form, and appeared motionless all the time that the phenomenon lasted. The vapour of which it was composed; was projected in all directions at the successive explosions. The cloud seemed about half a league to the N.E. of the town of L'Aigle, and must have been at a great elevation in the atmosphere, for the inhabitants of two hamlets, a league distant from each other, saw it at the same time above their heads. In the whole canton, over which it hovered, a hissing noise like that of a stone discharged from a sling was heard; and a multitude of mineral masses were seen to fall, to the gross number of nearly three thousand. The largest weighed $17\frac{1}{2}$ pounds.

Many meteoric stones have fallen in India. On December the 19th, 1798, at eight o'clock in the evening, a large luminous meteor was seen at Benares, and other parts of the country. It was attended with a loud rumbling noise, like an ill-discharged platoon of musketry, and about the same time the inhabitants of Krakhut, fourteen miles from Benares, saw the light, heard an explosion, and immediately after, the noise of heavy bodies falling in the neighbourhood. The sky had been previously serene, and not the smallest vestige of a cloud had appeared for many days. Next morning, the mould in the fields was found to have been turned up in many spots, and unusual stones of various sizes, but of the same substance, were picked out from the moist soil, generally from a depth of six inches.

Professor Maskelyn, who has devoted such pains to the collection of meteorites in the British Museum, has given in the *Philosophical Magazine* an account of several falls in India, nearly all occurring by day, in a serene sky, and almost all unaccompanied by the appearance of any luminous meteor. Among the most interesting of these is the fall of five stones at Gunduk, on May 12th, 1861. They fell in four spots about three miles apart. Their fall out of a cloudless sky was heralded by a sound like that of ordnance succeeded by several peals of thunder. Those who witnessed the fall of these stones, with one exception, saw nothing peculiar in the sky, and had their attention called to the spot where the stones fell by the dust and gravel thrown up by their fall. The exception was a native, who was taking his cattle to the water when he was startled by three loud reports, and saw in the air on high a "light," which fell to the ground within two hundred yards. Sky serene, weather fiercely hot; but there was a very

small cloud, out of which this witness stated the report and the luminous body to have come. He adds, "there was the loud report, and about the same time I saw the light like a flame; then the stone fell, and in falling made a great noise; and after it fell, the sound was taken up high into the air." He found five pieces of stone; they were hot, as was the sand around, which was thrown to the height of a foot. Two of these fragments brought to this country fit together exactly.

Professor Haughton, of Trinity College, Dublin, gives an analysis of a remarkable meteoric stone which fell at Dhurm-salla, in the Punjab, on the 14th July, 1860, at 2.15 p.m. Contrary to what has been observed in all other cases, the fragments of this stone were said to be cold, and not hot, when they fell. "The cold of the fragments that fell was so intense as to benumb the hands of the coolies who picked them up, but who were obliged, in consequence of their coldness, instantly to drop them."

The last account of the fall of meteoric stones to which I will call your attention is that described by Dr. Smith in the *American Journal of Science*, as taking place in Guernsey county, Ohio, on the 1st of May, 1860. He catalogues twenty-four stones, the largest weighing one hundred and three pounds, and the smallest half a pound. They were scattered over a space ten miles long, by three miles broad. The following are some of the facts he collected from persons on the spot:—

We, the undersigned, do hereby certify, that at about half-past twelve o'clock on Tuesday, May the 1st, 1860, a most terrible report was heard immediately overhead, filling the neighbourhood with awe. After an interval of a few seconds, a series of successive reports, the most wonderful and unearthly ever before heard by us, took place, taking a direction from meridian to south-east, where the sounds died away like the roaring of distant thunder, jarring the houses for many miles distant.

This is the testimony of those who heard the noises, but did not witness the fall of the stones. Among others who saw stones fall, Mr. Preben affirms:—

I heard the reports and roaring as above described, and a few seconds afterwards, I saw a large body or substance descending and striking the earth four or five hundred yards from where I then stood; and that I, in company with Andrew Lister, repaired to the spot, and about eighteen inches beneath the surface found a stone weighing fifty pounds.

Mr. Noble states:—

I distinctly heard the roaring and sounds as above described, and a few seconds after the above report, I saw descending from the clouds a large body that struck the earth above a hundred and fifty yards from where I then

stood, and I immediately repaired to the spot, and about two feet beneath the surface found a stone weighing forty-two pounds. A second or two after seeing the first stone, I saw another descend and strike the earth about the same distance from where I stood. I also took the last-mentioned stone from the earth about two feet beneath the surface; both the above stones, when taken from the earth, were quite warm. I also saw a third stone descend.

As to the temperature of the stones, we are told that several of the largest stones were picked up ten minutes after their fall, and are described as being about as warm as a stone that had lain in the sun in summer. One fell among dry leaves that covered it after it had penetrated the ground; the leaves, however, showed no evidence of having been heated; no appearance of ignition was discovered in places or objects with which the stones came in contact at the time of their fall; so that their temperature must have been far short of red heat, while it may not have reached that of 200° .

It may further be remarked that the day was cool, and the sky covered at the time with light clouds. No thunder or lightning had been noticed that day, nor could anything unusual be seen in the appearance of the clouds. Immediately on hearing the report, one observer looked in the direction it came, and noticed the clouds closely, but could not see anything unusual.

Those who were in the district where the stones fell, and witnessed their fall, saw no fire-ball or meteor. Others at a considerable distance, however, saw a ball of fire flying with great velocity; to one it appeared as white as melted iron. Another saw a ball of fire of great brilliancy emerging from behind one cloud and disappearing behind another. The course of this meteor seemed to be over the district where the fall of stones occurred. Whether these two phenomena were connected, is a point of some importance to be determined.

On other occasions, when a bright meteor has been observed by those at a distance from where a shower of stones has fallen, no meteor, but only a cloud, has been seen by those witnessing the fall of the stones. Professor Shepherd, who has devoted his life to the collection of meteorites and of all the facts connected with them, remarks that "only four or five large detonating meteors, out of several hundreds whose paths have been observed with more or less precision, have been known to throw down stones."

Generally speaking, but little damage has been done by the fall of meteorites. Humboldt relates that, on the 4th of September, 1511, a monk at Crema, near Milan,—another

monk in the year 1650, and in 1674 two Swedish sailors on board ship, were struck dead by *aërolites*.

These meteoric stones have been divided into three classes : *aërolites*, *siderolites*, and *aëro-siderolites*. The first class, the *aërolites*, comprise the greatest number of meteoric stones that have been seen to fall. They all, wherever they have fallen, whether in Europe, Asia, Africa, or America, present a most striking resemblance to each other. They are stony masses, covered with a very thin black rind, where they have not been broken after their fall. Internally, they are of a greyish white, and of a somewhat gritty structure, like coarse sandstone. They consist of various silicates interspersed with isolated particles of nickeliferous native iron, meteoric pyrites, &c.

Professor Daubr e proposes to divide these *aërolites* into two classes—(1) Those which give after fusion a crystalline mass, and (2) those which give a vitreous mass. The first corresponds to those meteorites composed principally of magnesian silicates, and the second to those composed principally of aluminous silicates ; the latter being extremely rare, Professor Daubr e having found four specimens only out of 150 different stones preserved in the collections examined. It is certain, says M. Daubr e, that some terrestrial rocks, and at their head *lherzolite*, present a composition identical even in its variations with that of the common type of meteorites. This *lherzolite* is a common eruptive rock in the Pyrenees, and is considered generally to be a massive variety of pyroxene. The structure of *aërolites*, though chemically identical with some of the basaltic or eruptive rocks, is not mechanically the same. Mr. Clifton Sorby, in his microscopical researches into the composition of meteorites, states that “some isolated portions of meteorites have also a structure very similar to stony lavas” ; and again : “this sometimes gives rise to a structure remarkably like that of consolidated volcanic ashes ; so much so, indeed, that I have specimens which might at first sight be mistaken for sections of meteorites.”

The second class of meteorites—the *siderolites*—consist of a sponge-like body of nickeliferous native iron, whose cavities are filled more or less with crystals of siliceous minerals, principally olivine. Of those preserved in the British Museum, not one has been observed to fall from the sky. The third class, called the *aëro-siderolites*, are composed almost entirely of masses of native iron, more or less combined with nickel. Out of eighty specimens preserved in the British Museum, only five have been seen to fall from the heavens. The remainder are believed to be meteorites, for the following reasons. Such

masses have been known to fall, and they all possess the same characteristics as those that have fallen. Native iron, that is, iron in a metallic state, is very rarely found on the earth's surface, and when found, only in very small particles, owing to the ease with which iron combines with oxygen. Iron, again, when obtained from the ore, is rarely combined with nickel. The masses, when found, have been in positions far removed from any iron ore from which they could have been formed; and, lastly, when these meteoric irons are cut and their surfaces are polished, the application of a dilute acid sometimes, but not always, brings out on their surface crystalline lines and figures, like those sometimes seen formed by frozen moisture on a sheet of window-glass in frosty weather. These are called after their discoverer, "Witmannstaetten figures." No one has succeeded in producing these figures by acting on ordinary iron, whether cast or malleable, in the same manner; not even in the case of iron axle-trees, which have become crystalline after long use. M. Daubr e, by using a peculiar furnace producing a very great heat, established the fact that fused meteoric iron will not reproduce the figures, and that malleable iron melted with nickel in the same proportions as found in meteoric iron, would not produce the Witmannstaetten figures artificially, until from two to ten per cent. of phosphide of iron was added to the mixture.

Meteoric iron is sometimes malleable; at others, scarcely so at all. Knives made from malleable meteoric iron by the Esquimaux may be seen in the British Museum. In the year 1620 a mass of meteoric iron fell in the Punjab, and was dug out of the earth while still violently hot. It was conveyed to the court of the emperor Tchanjire, who ordered a sabre, a knife, and a dagger, to be forged from this iron of lightning. After a trial, the workmen reported that it was not malleable, but shivered under the hammer; and it required to be mixed with one-third part of common iron, after which the mass was found to make excellent blades. I need not, perhaps, remind you that there is no similarity of structure whatever between any of the known meteorites, and the concretionary balls and oblong masses of iron pyrites washed out of the chalk cliffs of Dover, and often sold to the visitor as genuine thunderbolts.

I must also tell you that the existence of nickel and cobalt combined with iron is no proof that the mass in which it is found is necessarily a meteorite. On June 21st, 1855, Sir R. Murchison read a short paper before the Royal Society "On a supposed a rolite found in the trunk of an old willow-tree in the Battersea Fields." This "a rolite" contained a large percentage of iron, and also traces of nickel, cobalt, and manga-

nese. It was pronounced to be an undoubted meteorite by most competent authorities, and was supposed to have fallen into the tree, and to have been imbedded in the timber by its growth. Some circumstances caused a degree of scepticism to be entertained as to the meteoric origin of the mass; a further search was made. Digging about the root of the tree, several similar masses were found, having the same chemical composition, but possessing other characteristics which showed that they were nothing more than the slag of an old iron-furnace which once stood near the spot, and a piece of which must have been thrown up into the fork of the tree.

It will readily be imagined that the fall of meteorites was no sooner established as a fact, than philosophers speedily invented theories to account for their appearance. Ignoring the theory of Soldani, "that the stones were generated in the air by a combination of mineral substances, which had risen somewhere or other as exhalations from the earth; and the more precise one of Mr. King, who traced the origin of these meteorites to the matter projected from our own volcanoes into the upper regions of the air, and then condensed by chemical and electrical forces; the most popular theory for many years was to ascribe their origin to lunar volcanoes. Herschel, senior, fancied he saw numerous volcanoes in an active state of combustion in the moon, though modern observers tell us that this was a delusion.

Laplace, Biot, Brandes and Poisson all adopted the theory of lunar volcanoes, and calculated the projectile force necessary to throw the volcanic ashes of the moon so far within the earth's sphere of attraction as to bring them to its surface. Laplace put this force as not greater than five or six times that of an ordinary cannon. The reason why the lunar rather than the terrestrial volcanic origin of the meteors was chosen, was because of the moon's supposed freedom from water on its surface, or moisture in its atmosphere, if it had any; it being assumed that the native iron could not be formed in the presence of oxygen or water.

The discovery, however, of the large number of bodies called the asteroids, caused the complete abandonment of the lunar theory, and the adoption of what is now called the cosmical origin of meteorites.

Bode, the astronomer, discovered a peculiar arithmetical law in the distances of the planets from the sun. Assuming the distance of Mercury to be as 4, the following is very nearly the order of the distances of planets from the sun:—

Mercury	= 4.
Venus	= 4 + 3 = 7.
Earth	= 4 + 3 × 2 = 10.
Mars	= 4 + 3 × 2 ² = 16.
————	= 4 + 3 × 2 ³ = 28.
Jupiter	= 4 + 3 × 2 ⁴ = 52.
Saturn	= 4 + 3 × 2 ⁵ = 100.
Uranus	= 4 + 3 × 2 ⁶ = 196.

It will be observed that there is a blank between Mars and Jupiter, which has been supplied by the discovery of not one, but a series of ninety small planets. In 1801, Piazzi discovered Ceres; in 1802, Olbers discovered Pallas; in 1804, Harding discovered Juno; and in 1807, Olbers again discovered a fourth—Vesta. These four small planets lie between Mars and Jupiter; their orbits intersect each other, and their mean distance from the sun agrees with Bode's law. Herschel, senior, called them asteroids. Herschel, junior, in writing his most admirable *Popular Astronomy* (by far the best in any language), in 1833, laughs at what he calls the philosophical dream of Bode, which led to their discovery, in these words:—“This may serve as a specimen of the dreams in which astronomers, like other speculators, occasionally and harmlessly indulge.”

From the fact that the orbits of these four asteroids all intersect in one point, Olbers, the discoverer of two of them, conjectured that they were fragments of one planet. Lagrange determined the force necessary to blow the planet into pieces. This theory led to a careful mapping and survey of the heavens in the zone of the asteroids' path; and now the asteroids number ninety—and how many more “fragments” may be discovered no one can conjecture. Sir John Herschel withdrew this passage from the larger astronomy which he published a few years since—somewhat prematurely some may think; for the discovery of Neptune proved that Bode's law of distances altogether failed as far as that new member of the planetary system was concerned. Now, whether deservedly or not, the destruction of Olbers' planet is generally consigned to the limbo of hypotheses, as no better than a mere philosophical dream.

The history of the discovery of this ring of small planetary bodies circulating between Mars and Jupiter is very instructive. It shows us that discoveries may be made, even by a law deduced from numerous observations and coincidences, capable of mathematical expression, which may, after all, turn out to be no law of nature at all, in the philosophical sense. Since the small planetary bodies revolving round the sun

between Mars and Jupiter have been found to be so numerous, and many of them so very small in diameter, the lunar origin of the meteorites has been altogether abandoned. The popular theory now is that all the meteoric phenomena I have been describing—the falling stars, the flaming meteors or fire-balls, and the meteoric stones which have fallen from the heavens—are connected together, and are all due to the attraction, within the limits of our atmosphere, of interplanetary masses, similar to those forming the ring of asteroids between Mars and Jupiter.

In the first place it must be remarked that no law of periodicity whatever has been observed in the fall of meteoric stones. Looking over a list of all the observed falls of meteoric stones, I can find no periods of maximum numbers of falls near the same day of the month. A few years ago it seemed as if more falls occurred at one period of the year than at others; but the addition of recent observations to the list proves such deductions to have been fallacious. For instance, looking at the list, the 13th of December would seem at first sight to give a period for the fall of meteoric bodies. Up to the year 1813 four stones fell in different years on the 13th of December, and one on the 14th, and no others were recorded as falling in that month. Since that year seven falls have been recorded in December, not one of which on any day near the 13th and 14th. The first five recorded instances for the month of December must therefore be regarded as simply a curious coincidence of dates, especially as the dates for every other month fail to point out the existence of any periodical days for the fall of meteorites.

The same want of period-days applies to the fire-balls, or large flaming meteors, or bolides as they are sometimes called, passing very near the earth's surface, and often exploding with a loud report.

With regard to the falling stars, I have already observed that the remarkable period-days for their manifestation apply only to what we may call the great showers, or star-storms. Falling stars are seen at all places on the earth's surface more or less frequently by night, every night in the year. The periodical showers, such as those of August and November, are not seen every year. They appear for a few years perhaps in succession, and then almost disappear altogether for several years in any notable number on those particular period-days; so much so that before the great fall of last year, one French scientific observer, devoting himself to the observation of falling stars, was altogether sceptical as to the existence of these periodic days.

The theory which attributes falling stars, fire-balls, and meteoric stones, to the attraction of minute planetary or cometary bodies revolving round the sun, within the sphere of attraction, seems to be the following. An immense number of such bodies are scattered through what is called inter-planetary space. When these bodies are drawn within the sphere of the earth's attraction by its disturbing force pulling them out of their orbit, they enter within the limits of the earth's atmosphere. Coming into this atmosphere, even where, from its height above the earth's surface, it is very greatly attenuated, nevertheless, the friction produced by their passing through this attenuated atmosphere, with their own planetary velocity of motion, combined in most instances with that of the earth itself, produces such an enormous heat as to inflame the matter composing the body, and in most instances to convert all its solid particles into vapour. A falling star, therefore, is caused by the passage of an inter-planetary body with enormous velocity through the earth's atmosphere, causing its rapid combustion and speedy dissipation into vapour. Attempts have been made (though I cannot but regard all such calculations as most fallacious) to calculate the velocity necessary to produce the combustion of a meteoric mass, such as a meteorite, at some forty or fifty, or even a hundred miles' height from the earth's surface, and the light which would be emitted by a given mass of matter; this, too, in spite of our admitted ignorance of the density, or rather tenuity, of the atmosphere at such heights.

Some of these bodies are supposed not to be entirely consumed, but their apparent track as a luminous body is supposed again to be produced by their passage through a portion of the earth's atmosphere, as they dip only through a part of the atmosphere in their motion through space. According to this theory, other flaming meteors or fire-balls consist of masses of matter too large to be so dissipated into vapour, which move for a longer time through the lower regions of the earth's atmosphere, till the nucleus of the meteor bursts by the action of intense heat, and meteoric stones and masses fall to the earth.

The wandering small planetary bodies are supposed to be more thickly distributed in some parts of space than others, like the ring of known and observed planetoids between Mars and Jupiter. Two or more such rings are supposed to intersect the earth's path. Such a ring would be subject to perturbation by the earth's attraction, causing a change in the periods at which it would intersect the earth's orbit. Great star-showers are supposed only to occur when a rich or thickly

studded part of the ring is swept into the earth's atmosphere. As a period of maximum star-falling occurs about the 13th and 14th of November in periods of thirty-three years, this period gives the clue as to the period when the ring approaches most nearly the earth's orbit, and also accounts for the maximum showers being manifested in less intensity a year or two before and after these periods, and not in the interval between. The coincidence of last year's display has been everywhere quoted as a triumphant demonstration by mathematical calculation of the truth of this whole theory. I call that a coincidence, for which we may more fairly perhaps be indebted to the law of probability than to any more-abstruse calculation of the retrogression of the nodes of the assumed ring of planetoids. For in the first place the number of recorded recurrences of falling stars on these period-days is far too small to found so great a theory, when we consider that they are merely maximum manifestations of a nightly phenomenon of greater or lesser intensity. That the recurrence of the 33-year period has but three occurrences in its favour,—the years 1799, 1832, and 1866, even making allowance for an increase of a year for the last display; the star-storm of 1799, which has been imported into this periodical display, being, as I have before observed, a mistake, as it occurred not in November, but in the month of October. On the other hand, within these limits the great November showers of 1787 and 1822, as well as many others of less brilliancy, cannot be brought within the period of the thirty-three years. Again, the ancient October displays, which have been regarded as a proof of the gradual alteration of the planetary ring's intersection of the earth's orbit, are more readily accounted for without this alteration as being connected with that of 1799. If the planetary origin of falling stars is to be made out, it can only be demonstrated by a much larger collection of facts than have yet been observed.

Again, the inclusion of the meteorites and flaming meteors or fire-balls in this planetary theory, only tends to throw doubt upon the theory.

In the first place the passage of fiery meteors in the lower atmosphere coursing over the earth, and then exploding, or of clouds casting stones to the earth, has never yet been found to accompany the great displays of falling stars. Both these phenomena seem destitute of any period-days whatever. Nor yet has the connection of flaming, bursting meteors with the fall of meteoric stones been at all made out as conclusive; out of many hundred recorded instances where stones have been seen to fall, only some four or five have been shown to be connected with any appearance of a fire-ball. Even in these

cases, except perhaps in one instance, the fire-ball was not seen by those witnessing the fall of the stone. So that it is doubtful whether the two phenomena were connected. And in the only instance in which a fire-ball and a meteoric cloud shooting stones to the earth were observed to be identical, it by no means follows that that fire-ball was identical in composition or nature with ordinary fire-balls.

Again: we are to suppose that, when the earth passes through those parts of space the richest in planetoids, all those producing the phenomena of falling stars are reduced by frictionally developed heat into vapour. And yet these bodies, assumed to be identical in composition with meteoric stones, thus converted in such extraordinary numbers into vapour, are followed in no known instances by any remarkable showers of meteoric dust. Again: the meteoric stones which reach the earth pass through a much denser portion of the earth's atmosphere without being so dissipated. If we are to account for this latter fact on the supposition that they are larger planetary masses than those causing a falling star, we are to suppose that the larger bodies are found in those parts of the planetary ring in which the planetoids are most sparsely scattered. Again: I cannot at all account for the smaller bodies being totally dissipated into vapour in the highest regions of the atmosphere, where the density and consequent friction of the moving mass is the least, with the appearance of every meteorite that has been seen to fall. These indicate the action of an intense heat indeed, but penetrating only a line or two into the thickness of the stone. According to Professor Thomson's and Professor Joule's estimate, every meteorite that has reached the earth from the supposed planetary ring ought to have been fused into vapour, like those supposed to produce the falling stars. The meteoric stones, so far from reaching the earth in a state of fusion, are not even red-hot. We have seen that they have fallen on dry leaves without setting them on fire. If the case reported by Professor Haughton is to be believed, on the testimony of the natives who handled the stone after it fell, it was so far from being hot, that it was colder than ice.

On the whole, I cannot but conclude that the modern theory of the planetary origin of falling stars, fire-balls, and meteoric stones, is far from being supported by the facts which have been recorded;—that the common origin of these three phenomena has by no means been proved;—and that the planetary origin and combustion of the falling stars cannot be admitted, if we refer the meteoric stones to the same source.

This is just one of those subjects where a confession of

ignorance is the best wisdom, and where science will be better served by a close and honest observation of phenomena than by faulty, ill-digested theories. In conclusion, I would remark that, for aught we know to the contrary, falling stars may be an electrical phenomenon, somewhat like, but differing in intensity from, the aurora borealis. They both seem to appear in the upper regions of our atmosphere; both seem to radiate from fixed points; both can be imitated artificially by the passage of electricity through rarefied gas or air; both have many points of resemblance. Moreover, both phenomena seem to be connected. Aurora has been seen more than once to accompany the display of falling stars. It has also been noticed that the passage of a falling star through the sky has lit up, as it were, a flash of aurora, where it had not previously been seen; showing, at least, some connection between the phenomena.

Again: there are electrical displays, such as the fires of Elmo, and globular lightning, and fire-balls slowly advancing on the sea, and bursting as an electric shock on a vessel, which would seem to show that some of the fiery meteors at least might be referred to an electric origin.

With regard to the origin of meteorites, the first English theory of their terrestrial origin has not lost all supporters. They are identical in chemical and, in some measure, even in mechanical structure, with our own volcanic rocks.

The phenomena which so persistently accompany the fall of meteoric stones by no means accord with their supposed passage through the atmosphere with planetary velocity. They fall to the earth with no greater velocity than they would attain by falling from the clouds they are seen to be projected from. Tons upon tons of dust, rich in the shells of foraminifera of South America, are carried into the atmosphere by tornadoes. This dust rises above the trade winds, descends after a flight of thousands of miles, and covers areas of many square miles of the ocean in the Atlantic or Mediterranean. If wind can thus carry dust and sand, who can tell what vapours of metals and other materials may be projected from our volcanoes? Some electrical condition of the atmosphere may condense these vapours, just as masses of ice are formed in mid-air by the same agency. The same crackling, rumbling sound which presages the formation of masses of ice in the atmosphere is a never-failing accompaniment to the mysterious cloud which projects its stony mass to the earth. Electricity can reduce metals from their combinations, as well as resolve them into vapour. At any rate, this theory is not wilder than many others which have been framed about meteors. It is not

wilder than that which gives the sun its heat by a constant shower of meteors, the arrest of whose motion supplies the heat lost by the sun by constant radiation; or the opposition theory, which, instead of pelting the sun with meteors, accounts for these meteors as masses of vapour escaping from the bubbling, boiling surface of the sun, and projected with such velocity as to reach the earth after condensation by the extreme cold of planetary space.

The CHAIRMAN.—I am sure you will allow me to return thanks to Mr. Mitchell for this very interesting and instructive paper. In this age there is so great a tendency to attach so much to authority, that it is very valuable to see how very little authority is sometimes worth, and how great is our ignorance and how little our knowledge of that which we profess to know very well. We shall be glad to hear any gentleman who has any remarks to add or suggestions to offer.

Mr. REDDIE.—I think the paper that we have heard this evening (which I am sure we have all listened to with much pleasure) is one that scarcely admits of discussion. That is one of the disadvantages of having very good papers. We had Professor Kirk's paper at our penultimate meeting, and Mr. Mitchell's paper to-night, both giving us such able discourses on the subjects they treat of, that there is nothing left for us to say. (Hear, hear.) Mr. Mitchell will complete his paper for our *Journal of Transactions*, I beg leave to say, although the latter part of it was delivered *extempore*. With reference to some of his remarks, I should be very glad if he could collect some of the various reports respecting the recent meteoric shower as seen at different places. I think they would demonstrate the truth of what he has said as regards the uncertainty there must be as to the real heights of those bodies; for the accounts have varied so much that either the witnesses must have stated very incorrectly what they saw, or else they did not all see the same things. If you will take the accounts published in London and different parts of England, and others at Malta, you will observe that both as to the numbers of the falling stars, and in various other particulars, they do not agree with one another. And I think it will yet prove that most probably this is an electrical phenomenon, in which there are brilliant scintillations, all more or less tending in one direction. But there is certainly a great discrepancy as to the quantity of those observed; and I may say even as to their apparent distances from the earth. Even in this country I observe in the various accounts in *The Times* there was a great difference as regards the number of the meteors; and even people in the same house, describing what they saw, gave different accounts to one another the next morning. I think it is almost impossible to consider that those majestic slow-moving fire-balls (one of which I saw two years ago, in November, the only one I have ever seen in my life, it was about the size of the moon, and moved in a south-westerly direction,) can be considered similar either to those heavy masses of meteoric matter, or to those mere scintillations called falling stars. You

might just as well consider them as actually falling stars, because they are like the stars in heaven ; for although we call them falling stars, we know they have nothing in common with stars. I am sure Mr. Mitchell's account will be a most valuable record on the subject in our *Transactions*, and it will very likely complete No. 4 of our *Journal*.

Professor OLIVER BYRNE.—I have a few remarks to offer to you, and they are based upon demonstration, and not conjecture. I am going to base what I have to say upon what Archimedes based his mechanics. It is, "the law of sufficient reason," carried out by Leibnitz, and made great use of by Laplace. It is known to all philosophers, who make use of it to prove one thing, but reject it when you want to prove another. Leibnitz made great use of it, and I should have said that our very learned and worthy Vice-President has brought before us a subject that requires our most serious consideration, because it is the only index we have left, it is really the only weather-vane by which men can discover the motions of the heavens. Now, I have taken 13 of the principal stars, and I have calculated their positions up to the 1st January, 1867, and their proper motions and declinations. It was a great deal of labour, and I am sure that each of these stars loses place, as regards the observer, by 600 or 700 yards. The pole star and others have travelled 666 yards out of their places. These stars all move, and there is a delusion in astronomers about them ; they all say they have a proper motion, and it is a curious thing that all the negative quantities of these 13 great stars differ but 16" from all the positive motions of the larger stars in the heavens—

The CHAIRMAN.—The difference between the positive and the negative quantities.

Professor BYRNE.—This motion takes place, which I am going to prove by the law of sufficient reason. No philosopher has ever been able to prove the parallelogram of forces ; and all attempts to prove have failed when the quantities compared are incommensurable. If these had relations to one another, we could get a law, but it is impossible. If you give me the diagonal of the square, no one can tell the length of the side—the diagonal may be 20 feet, but you cannot tell the length of the side—that seems simple, yet it is impossible that any one can find it out. The diameter of a circle may be 10 feet, no one can tell the circumference. There is no law for the incommensurability of quantities, and the law of sufficient reason will not apply. What I am going to prove will be proved with the exception that I am not taking incommensurable quantities, and the only specimen of human reasoning totally perfect is the 5th Book of Euclid, because it takes in the doctrine of incommensurable quantities altogether ; and consequently what I am going to say is subject, not to comparison with incommensurable quantities, but quantities that can be measured by practice. I suppose I have taken the right motion of the stars ; but to show I have not done so, my empirical rule differs 16 seconds, which is very small. We will take 13 of the larger stars, and each one in its turn operates upon its neighbour. The question is this,—the conclusion I am coming to, the object I wish to prove is this,—and

I wish to prove it in this way, that the actions of the forces of these stars act on one another. If I take hold of this book, and Mr. Mitchell attempts to pull it at an angle to me, and I pull it at the same angle, there is no reason why the book will fall to him or to me, if both pull at the same angle with the same strength. It will remain in the position in which it is, and consequently obey neither one nor the other. There can be no action in the matter, and there can be no motion in the stars unless some force is operating in favour of one rather than the other. When a man tells me that this meteoric stone came down on the ground with a certain velocity, it depends on the short time in which it stopped; it is not in the velocity,—the force depends on the shortness of the time. (Question.) This may be very awkward; I will try and do my best, because Mr. Mitchell's paper bore on the velocity and force of the aërolites falling on the earth. I returned from the subject to the equal pulling of the proper motion of the fixed stars, showing the balancing of one another (which I did not like to read one by one), not all going one way, but balancing one another. There is no system of the law of gravitation whatever, it is a secondary thing compared with the actions of the stars on one another—

Mr. REDDIE.—You began with the fixed stars, and then you passed from them to the planets; but the difficulty is to understand how you mean to connect them together and with the subject of meteors.

The CHAIRMAN.—Keep to the question.

Professor BYRNE.—Am I in order? I am afraid I wish to carry the thing one way too far; but to go back to the force of a body and the blow it gives, as an aërolite coming any distance; does that depend upon the impression so much as the space of the time in which the body comes. My whole object in rising is this, to show that there is an action in the fixed stars, upon which the force of gravitation is secondary—

Mr. REDDIE.—I do not think this question of the fixed stars has anything to do with meteors.

Professor BYRNE.—I got up to show that it had. Mr. Chairman, I submit I got up to show that. Perhaps Mr. Reddie will show me that it had not, and I will then sit down.

Mr. REDDIE.—It is not for me to do so. I should be sorry to interrupt unnecessarily any gentleman when speaking, but now I must throw myself on the good-nature of the meeting. I must say, that I do not see that Mr. Byrne has shown that there is any connection between the fixed stars and meteors; and I do think it irregular to go into such elaborate questions as he has entered upon, when we have a specific subject before us. If, however, the other question is to be gone into, I think we ought to have it treated a little more coherently; and if Professor Byrne will write a paper on the motions of the fixed stars, which it appears to me is a totally distinct subject, I am sure we shall all be most glad to hear him. Professor Byrne is a great mathematician, and is entitled to bring those things forward; but we must keep to one subject at a time; and I certainly do not understand how these remarks of Professor Byrne can be considered as having any reference to the

paper of Mr. Mitchell, if Mr. Byrne will excuse me for saying so. He knows I am a sincere friend of his, and that I should be glad to hear him upon any point connected with astronomy, but pray let us have it at the proper time and place. (Hear, hear.)

Mr. WARINGTON.—I should like to ask one question of Mr. Mitchell. I never before heard the theory started, which seems a probable one, that the origin of the shooting stars is electrical rather than cosmical. And I would ask, whether there is anything in the phenomena of the aurora borealis similarly periodical, as to particular seasons or days of the year, with the periodical display of meteors? Because, if there is any such periodicity here also, it would very materially help out the hypothesis. I am not aware whether there is anything of the kind, and perhaps Mr. Mitchell will tell us.

The Rev. WALTER MITCHELL.—In reply to Mr. Warington, I may state that I am unacquainted with any period days marking a great display of aurora borealis. I only wished to point out several analogies between the two phenomena. In some latitudes the aurora is almost nightly visible, like the display of falling stars in other latitudes. Then there is something similar in the intermission of the brilliant displays of both phenomena—the aurora appearing in lower latitudes for a few years, and then disappearing altogether, like the maxima exhibition of falling stars. With regard to the period days of falling stars, I may state that these are not the only meteoric phenomena (using the term meteor in its widest sense), which are periodic. There are certain latitudes where the return of the monsoons and the change of the trade winds occur with such regularity as to allow their prediction nearly to a day. In defence of the theory first put forth by Soldani as to the terrestrial origin of meteorites, I think many facts might be urged, though I doubt whether they would be considered sufficient to demonstrate its truth. The majority of meteorites are admitted to be identical in composition with solid masses ejected from our own volcanoes. These masses, for aught we know, might have been projected in a state of vapour, and might remain for some time uncondensed in our upper atmosphere. Or, if condensed, they might remain, as Professor Shepherd has stated, in minute subdivision till condensed into a solid mass by some such known agency as electricity. We know that some metals do evaporate like water, and their vapour ascends like that of water into the atmosphere; mercury is an instance. We are ignorant, because our analysis is not sufficiently sensitive to tell us, how many of the constituents of meteorites may be diffused through our atmosphere. If not in a state of vapour, yet in a state of minute subdivision, such constituents could be carried by the upper trade winds thousands of miles. Vessels on the Mediterranean and in the Atlantic sometimes pass through a red fog for days together. A red dust may be collected on the rigging of ships, and Professor Ehrenberg has shown that this dust is composed for the most part of the shells of foraminiferæ, which have been wafted thousands of miles from the plains of South America by the upper trade winds. These fogs, covering as they do some hundreds of square miles, must contain many tons of material

thus wafted by the winds. Under certain meteoric conditions, this minutely subdivided matter returns again to the earth. Just as, in ordinary conditions of the atmosphere, the moisture descends to the earth as rain or snow, we know that under certain more extraordinary conditions, large masses of ice are formed, supported during that formation contrary to the laws of gravity, and then hurled to the earth. There appears some analogy between this latter phenomenon and that of the formation of a meteorite. The peculiar noise, like a discharge of small arms, which heralds the fall of a meteorite from a cloud, in a somewhat modified form, accompanies the formation of blocks of ice in the air. We know, as in the beautiful test for arsenic discovered by Marsh, that a solid metal arsenic may be combined with an invisible gas, hydrogen, and form together an invisible gas. When this is combined with oxygen, a spark of electricity is sufficient to combine the oxygen and hydrogen into water, and precipitate the arsenic in a pure metallic state. May there not be some analogy between this fact and the formation of meteoric iron? I may add, as it appears to militate against the electrical origin of falling star storms, that I have ascertained that no disturbance was observed in the delicate magnetic needles of Greenwich Observatory during the late November display. On the other hand, I believe that it is recorded that the most delicate electrometers have not been in the slightest degree affected during a magnificent display of aurora borealis.

The Rev. Dr. IRONS.—I think Mr. Warington's point was this. There is admitted to be a certain moment of periodicity respecting the wonderful displays of the meteors called falling stars, and we know that the last shower was predicted. Could you affirm anything about displays of the aurora borealis being predicted? because, if not, it would seem hard to connect the two things together—the one being predictable, and the other casual.

The Rev. WALTER MITCHELL.—I may say in reply to this question that I do not know of any display of aurora borealis being predicted with the same degree of precision as to any particular day as these exhibitions of falling stars, but I have called attention to the fact that the maximum appearance on any day does not follow any period of years; that for a number of years in succession so few stars have been seen to fall on the 13th or 14th of November, or from the 10th to the 12th of August; that certain of the French observers, one of whom devoted attention night after night to counting them, gave up altogether the theory of periodicity. I might perhaps say that the prediction of the meteoric display of 1866 was a philosophical "fluke"—it was a fair guess from probabilities founded upon the years 1766, 1799, 1833. It was a good guess to say 1866; but, as I have before pointed out, there have been displays between those years which have not and could not have been predicted; that of 1766 was included by mistake; nor can we predict whether in November, 1867, we shall have a more abundant shower of falling stars than we had last year, or in 1864 or 1865.

The CHAIRMAN.—I quite agree with Mr. Mitchell that there is no periodicity with regard to meteoric showers, for I have been a great deal in tropical latitudes, where falling stars are constantly seen night after night,

and displays so brilliant that it would be said, if such displays occurred in England, that these were some of the great periodical exhibitions of falling stars, and the whole argument of periodicity would be brought into question at once. I think there is a mixing up of these questions of falling stars and meteorolites, that are perfectly distinct. With respect to the latter, I remember in 1829 being at Malta, when one of them came through the roof of the house in which I was. It was associated at the time with thunder and lightning; and a spire of one of the churches was struck. I can quite understand that a certain condition of the atmosphere would facilitate the formation of these bodies from the elements, as has been suggested. Captain Maury has mentioned that he has called these bodies floating in the atmosphere "tallies;" a "tally" being a mark a sailor puts on a rope, in order that he may know the particular use to which it is appropriated. So Maury terms these "tallies," and has thus been enabled to mark out the circuits of the winds. Thus by volcanic action these things are carried into the upper regions of the atmosphere, above the influence of the trade winds, carried along by the upper return current, and then come down to windward, having gone against the trade winds apparently, but in reality having risen above them. I must say, in justice to Professor Byrne, that he may have been a little discursive, but what he was going to say was not altogether from the point; and I did not stop him because he was endeavouring to show that the fixed stars are not at those extreme distances they are imagined to be, and that the sun has not got the motion astronomers assert, but that they have mistaken an oscillatory for a direct motion. I think that was his object, and I think his remarks were pertinent in this way, because, if astronomers err so widely with respect to the distances of heavenly bodies, you cannot expect them to be accurate in their suppositions respecting evanescent bodies, as to which Mr. Mitchell said it would be impossible to make calculations, and it is mere charlatanism to attempt it. Then, with respect to these masses striking the earth, they cannot go with the enormous velocity which is supposed, because in all the records concerning them, they are merely said to have penetrated a few inches into the earth, which shows that the velocity cannot be very great; and we know that at the trials of rifled guns mentioned in *The Times*, the shot has penetrated the ground for fifteen or twenty feet.

The Rev. WALTER MITCHELL.—One passed quite through the butt at Woolwich recently.

The Meeting was then adjourned.