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JOURNAL OF THE TRANSACTIONS
OF
THE VICTORIA INSTITUTE.

VOL. XVII.

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

EDITED BY THE HONORARY SECRETARY,
CAPT. FRANCIS W. H. PETRIE, F.R.S.L., &c.

VOL. XVII.



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** * * The Institute's object being to investigate, it must not be held to endorse the various views expressed at its Meetings.*

PREFACE.

THE Seventeenth Volume of the *Journal of the Transactions* of the VICTORIA INSTITUTE is now issued. It contains papers by the following authors:—The Ven. Archdeacon BARDSLEY, M.A., on the “Origin of Man.” Sir EDMUND BECKETT, Bart., LL.D., Q.C., on the recent writings of Mr. Herbert Spencer, inquiring into his premises, and analysing the logic of his arguments in a clear and popular style. Surgeon-General C. A. GORDON, M.D., C.B., contributes two papers, one on “Climate in relation to Organic Nature,” the other on “Certain Theories of Life.” The volume also contains the last paper written by (the late) Mr. J. E. HOWARD, F.R.S., to whom the Institute has for a series of years been indebted for his labours in its cause. Mr. W. P. JAMES contributes a valuable paper, “On the Argument from Design in Nature, with some Illustrations from Plants.” Professor J. J. LIAS, M.A., now Hulsean Lecturer, adds to his valuable earlier papers one entitled, “Is it possible to know God?—Considerations on the ‘Unknown and Unknowable’ of Modern Thought.” It is followed by the last communication received from the (late) Right Hon. the Lord O’NEILL, which,

though brief, will be found to contain one of those perfect pieces of argument not often met with, and which is itself sufficient to enable us to realise how great a loss the Institute has sustained by his death. " Mr. HORMUZD RASSAM contributes a paper on " Babylonian Cities," and Mr. W. St. CHAD BOSCAWEN has kindly added an appendix giving striking instances of the great interest attaching to Mr. RASSAM'S recent discoveries. Mr. TRELAWNEY SAUNDERS gives a paper on the recent survey of Western Palestine: the part he has taken in the work of the Palestine Exploration Fund, in laying down on the maps of that Society the water basins and the boundaries and names of the Old and New Testaments, has enabled him to show how the cloud of geographical Biblical difficulties advanced by many, from the late Bishop COLENZO downwards, is vanishing before the matter-of-fact work of the surveying parties of the Royal Engineers—an apt illustration of the remark made in the preface to Volume XV., that " Truth is only in danger from a want of knowledge." Finally, Professor G. G. STOKES, F.R.S., contributes a paper " On the Absence of Real Opposition between Science and Revelation," a title which itself is a protest against that thoughtless cry to which so many outside the Institute are found to give utterance: the paper, coming as it does from one who ranks second to none in the scientific world, and who has long held the position of Secretary to the Royal Society, demands special notice; in it the author deals with the more extreme views of the Darwinian theory, showing where scientific induction ceases and conjecture, in default of fact, is called upon to support a theory. So important a paper on a subject which has long attracted public attention—and upon which some, even in the ranks of Science, have spoken with far too little caution—has been

supplemented by remarks and contributions from Sir J. Risdon Bennett, Vice-President of the Royal Society; Professor Lionel S. Beale, M.D., F.R.S.; Vice-Chancellor J. W. Dawson, LL.D., C.M.G., F.R.S.; Sir Joseph Fayrer, M.D., K.C.S.I., F.R.S.; and others. To these authors and to others who have taken part in the discussion of the subjects treated, the best thanks of the Members and Associates are due. They have sought to carry on their investigations strictly on the lines of the Institute; searching for the actual philosophical or scientific truth on all questions; and where any question bearing on Holy Scripture, and which had been turned against it, has been examined, the opponents of Revelation have been disarmed by impartial inquiry, which has proved the baselessness of the alleged facts which were relied on to support erroneous theories.*

The mention of this subject induces a reference to a statement which has often been made of late by the opponents of *all* religious teaching, namely, that the progress of Science has given a death-blow to all belief in the truth of the Bible, and that men of Science no longer regard that book or the religious belief it inculcates.† So false a statement might not be worthy of notice, but that it has been credited even

* That this is the true way of "reconciling apparent discrepancies between Christianity and Science" (see Object 1) was urged by the Institute's leading founder, Mr. J. Reddie, in a Pamphlet, on "The True Character of the Institute," entitled *Scientia Scientiarum*, 1865, in which he says:—"I would beg leave to adopt the prudent language employed by the Rev. Canon H. B. Tristram, F.R.S., 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.'"

† In reference to this it is remarkable to find Professor Huxley, when lecturing at Liverpool on Education (February 16, 1883), mentioning the Bible as the first of the books which, in his opinion, our youth should study. "I have said it before, and I repeat it here: if a man cannot get literary culture of the highest kind out of his [*sic*] Bible he cannot get it out of anything." Again, he wrote in the *Contemporary Review*, December, 1870, "I must confess I have been no less seriously perplexed to know by

by some charged with the regulation of education both at home and in our Colonies. Such a fact is an additional reason for the earnest efforts of every Member for the advancement and extension of the influence of this Institute, for surely only ignorance of the tendency of true scientific inquiry can tend to make belief of such a statement possible.

During the year 1883 the steady development of the Institute, both at home and abroad, has been marked, and it has been gratifying to note the value placed upon its "Journal," as evidenced by Public Libraries in various parts of the world subscribing for the whole of the Institute's volumes.

The translation of portions of the "Journal" into other languages has long been a fact, and is now beginning in India; but it rests with local members to foster it.

what practical measures the religious feeling, which is the essential basis of conduct, was to be kept up, in the present utterly chaotic state of opinion on these matters, without the use of the Bible." Again, Professor Tyndall, at Manchester, stated, "I have, not sometimes, but often, in the spring-time . . . observed the general joy of opening life in nature; and I have asked myself the question, Can it be that there is no being in nature that knows more about these things than I do? Do I in my ignorance represent the highest knowledge of these things existing in the universe? Ladies and gentlemen, the man that puts that question fairly to himself, if he be not a shallow man, if he be a man capable of being penetrated by profound thought, will never answer the question by professing that creed of atheism which has been so lightly attributed to me." Again, Dr. Darwin, in his *Origin of Species*, sixth edition, page 146, says, "Have we any right to assume that the *Creator* works by intellectual powers like those of man?" Also, Sir Charles Lyell, in *Principles of Geology*, tenth edition, page 613, says, "In whatever directions we (geologists) pursue our researches, whether in time or space, we discover everywhere the clear proofs of a *Creative Intelligence* and of its foresight, wisdom, and power." Pasteur, Sir R. Murchison, and many other leading men of science have written to the same effect, but the authors here quoted are those whose works are most used (often unfairly enough) by the opponents of religion. Again, speaking of language, Professor Max Müller says it may be a product of man's nature, or of human art; but he adds, "If it be the gift of God, it is God's greatest gift; for through it God spake to man, and man speaks to God in worship, prayer, and meditation." Finally, as regards agnosticism, the opinion in regard to it, as expressed by Carlyle and quoted in his *Life* by Froude, vol. ii., p. 216, may conclude this note: "The agnostic doctrines are to appearance like the finest flour, from which you might expect the most excellent bread; but, when you come to feed on it, you found it was powdered glass, and you have been eating the deadliest poison."

As regards recent Eastern discovery, it is satisfactory to note the remarkable results of the labours of that highly-trained Egyptologist, M. Naville, in the discovery of Succoth ; also the results of Professor Hull's geological work along the Gulfs of Suez and Akaba, which "have induced him to be of opinion that at the time of the Exodus there was a continuous connexion of the Bitter Lakes and the Red Sea."

It is again impossible to conclude without giving expression to a feeling of regret that Eastern exploration continues, both in Babylonia and Palestine, to be at a standstill, by reason of the Porte still withholding the *firmans* once accorded to our Government, and under which such important discoveries have been made.

FRANCIS W. H. PETRIE,

Hon. Sec. and Editor.

31st December, 1883.

JOURNAL OF THE TRANSACTIONS

OF THE

VICTORIA INSTITUTE,

OR

PHILOSOPHICAL SOCIETY OF GREAT BRITAIN.



ANNUAL GENERAL MEETING,

HELD AT THE HOUSE OF THE SOCIETY OF ARTS,

THURSDAY, JUNE 15TH, 1882.

THE RIGHT HON. THE EARL OF SHAFTESBURY, K.G., IN THE CHAIR.

The HON. SECRETARY, Capt. F. PETRIE, read the following Report :—

Progress of the Institute.

1. IN presenting the SIXTEENTH ANNUAL REPORT, the Council are glad to be able to state that, although the Institute's progress at home* has been somewhat impeded by those influences which have adversely affected every interest in the United Kingdom, yet abroad it has been most encouraging; the net increase in the number of members being fifty-three, a large proportion of whom are residents in India, the Colonies, and America.

2. In America, the publicity given to the Institute has led to a most satisfactory event, viz., the formation of "The American Institute of Christian Philosophy," an independent Society, founded on the lines of the Victoria Institute—whose statement of objects has been wholly adopted by it—

* It is worthy of note that some earlier members have recently rejoined.

5. The Library of Reference is gradually receiving additions.

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

The Right Rev. J. Barclay, D.D., Bishop of Jerusalem (Associate); the Rev. J. Stevenson Blackwood, D.D., LL.D. (a Foundation Member, whose kind interest this and many another Society will miss); the Rev. J. J. Evans, M.A. (Associate); the Right Hon. Sir R. Lush, Kt., P.C. (Member); Admiral M. S. Nolloth, R.N. (Life Member); T. Prothero, Esq. (Foundation Member); the Rev. T. Ragg (Associate); the Rev. T. Romney Robinson, D.D., F.R.S. (Associate); Colonel J. T. Smith, R.E., F.R.S. (Member); R. Stewart, Esq. (Member); E. W. Stewart, Esq. (Hon. Local Sec.); and L. A. Vessey, Esq. (Foundation Associate).

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

	Life		Annual	
	Members.	Associates.	Members.	Associates.
Numbers on 29th June, 1881	41	29	329	451
Deduct deaths			6	5
			323	446
Withdrawn or struck off			9	27
			314	419
Changes.....			— 5	+ 5
			309	424
Joined between June 25th, 1881, and June 8th, 1882	2		21	76
	43	29	330	500
	72		830	
Total.....	902			

Hon. Foreign Correspondents and Local Secretaries, 64. Total..... 966

Finance.

8. THE EARLY PAYMENT OF THE YEAR'S SUBSCRIPTIONS IS CONTRIBUTING GREATLY TOWARDS THE SUCCESS OF THE YEAR'S WORK; the Treasurer's Balance Sheet for the year ending 31st December, 1881, audited as usual by two specially qualified unofficial members, shows a balance in hand after the payment of every liability. The amount standing invested in the New Three per Cent. Annuities is £1,250. 16s. 7d.

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

From	1872.	1874.	1876.	1877.	1879.	1880.	1881.
Members	1	1	3	2	3	7	9
Associates	0	0	0	4	6	12	21
	<hr/>						
	1	1	3	6	9	19	30

Meetings.

MONDAY, DECEMBER 5, 1881.—“On Herbert Spencer’s Theory of the Will.”
By Rev. W. D. GROUND.

MONDAY, JANUARY 2, 1882.—A Paper. By Rev. J. FISHER, D.D.

MONDAY, JANUARY 16.—“Biblical Proper Names, personal and local, illustrated from sources external to Holy Scripture.” By Rev. H. G. TOMKINS.

MONDAY, FEBRUARY 6.—“Breaks in the continuity of Mammalian Life at certain Geological periods fatal to the Darwinian Theory of Evolution.” By T. K. CALLARD, Esq., F.G.S.

MONDAY, FEBRUARY 20.—“The Theory of Evolution taught by Hæckel, and held by his followers, Examined.” By J. HASSELL, Esq.

MONDAY, MARCH 6.—“The Supernatural in Nature.” By J. E. HOWARD, Esq., F.R.S.

MONDAY, MARCH 20.—“Climatic influences as regards Organic Life.” By Surgeon-General GORDON, C.B., M.D.

MONDAY, APRIL 3.—“Materialism.” By Judge C. W. RICHMOND.

MONDAY, APRIL 17.—“On the Fallacy of the Materialistic Origin of Life.”
Lecture by Dr. WALLICH.

MONDAY, MAY 1.—“Investigations as regards the formation of Coal.” By Professor REINSCH.

MONDAY, MAY 15.—“Dictatorial Scientific Utterances and the Decline of Thought.” By Professor LIONEL S. BEALE, M.D., F.R.S.

THURSDAY, JUNE 15.—ANNIVERSARY. (Paper by T. SAUNDERS, Esq.)
Held at the House of the Society of Arts, John Street, near Charing Cross.

10. The meetings have been held as usual.

The Journal.

11. The fifteenth volume of the *Journal of Transactions* has been issued, and its value is increased by the larger number, both at home and abroad, that have contributed to the investigations carried on by the Institute. A much larger Edition—almost three times as great as that issued a few years ago—is now published, and the *Journal* is subscribed for by several Institutions at home and abroad.

Lectures.

12. An increasing number of members, at home and abroad, use the Papers in the *Journal* as lectures, or as the basis of such.

The People's Edition.

13. The selected popular papers published in this Edition are still sought for, especially abroad, where the republication of some of our papers continues.

Sales.

14. The sales of the Publications of the Institute have doubled during the past year.

General Remarks.

15. Four years ago the Institute called attention to the growing Scepticism amongst Europeans in India, through the large importations of English pseudo-philosophical and quasi-scientific publications of a class avowedly intended to promote Scepticism; these are circulated among the Europeans and educated natives and systematically translated into some of the dialects of India. A large meeting, presided over by one of the leading members of the Institute, and including some natives, was held early this year at Madras, at which the necessity for counteracting such a state of things was discussed, and the secretary of the meeting took occasion to recommend as one means the desirability of making this Institute and its publications more known in India.

16. Letters have been received from members and others in many parts of the world, expressing warm approval of the Institute and their sense of the great value of the Papers and discussions in the Society's *Journal*, on account of "their impartial character," and because they contain careful examinations of those questions of Philosophy and Science which are said to militate against the truth of Revelation, and which questions are used against it by its active and unscrupulous enemies, who are ever ready to avail themselves of the press and platform to attain their ends.

17. Fully to meet the needs expressed in these letters is at present beyond the power of the Council, although they have done all they could; it would need a greater number of members and a far larger "People's Edition Fund" than at present exists, to accomplish all that the Institute has been asked to do.

The Gunning Fellowship and Scholarships.

18. Three years ago Dr. R. H. Gunning, a member of the Institute, assigned to the University of Edinburgh a sum of £200 annually, for nine years at least, for the encouragement of the study of the Natural Sciences amongst students of Theology, so that they might be the better able to contend "against false science in the districts in which they might hereafter labour." As some have thought that the example set by Dr. Gunning might be followed with advantage in other localities, the whole scheme is given in Vol. XV., page 365, of the Journal of the Institute, and it seems desirable to call attention to it, as we are still—to use the words in the first Circular issued by the Institute*—“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.”

Conclusion.

In conclusion the Council desires to express its thankfulness for the success which continues to attend the Institute, but each year shows more fully that, according as the body of its members in England is numerous and powerful to accomplish the objects in view, so will its influence and strength increase throughout the world. This is a point meriting present attention, and indicates a work in which all may bear their part, *ad majorem Dei gloriam.*

Signed on behalf of the Council,

SHAFTESBURY,

President.

* Copies of "Scientia Scientiarum" containing this circular may still be had at the office.

DONATIONS IN 1881.

	£.	s.	d.
PEOPLE'S EDITION FUND.			
W. Peek, Esq.	25	0	0
J. E. Howard, Esq., F.R.S.	20	0	0
R. H. Gunning, Esq., M.D.	10	0	0
G. Harries, Esq.	10	0	0
Rev. Sir G. Glyn, Bart. ...	2	18	0
Rev. J. Gould, M.A.	2	2	0
W. E. Stanford, Esq.	2	2	0
J. Langham, Esq.	2	0	0
Rev. T. Powell	2	0	0
Rev. Hay Sweet Escott, M.A.	1	1	0
Rev. W. D. West, D.D. ...	1	1	0
	<hr/>		
	£78	4	0
	<hr/>		

The following Balance-Sheet was then read :—

THE Rt. Rev. BISHOP SHORT, D.D. (late Bishop of Adelaide).—My lord, ladies, and gentlemen. As a stranger among you—this being the first occasion upon which I have been able to attend one of the meetings of this most interesting Society—I desire, even if I should fail adequately to enforce the motion that has been placed in my hands by the Council, to express my regret that I have hardly had the opportunity, while working up, during a residence of thirty-four years, the diocese of Adelaide, of attending so much as I might, perhaps, otherwise have done, to the interests and extension of this Institute in that new and flourishing colony. If, therefore, I seem inadequately to set forth its value and importance, which, I conceive, cannot be surpassed, you must attribute the failure to an imperfect acquaintance with the details of its working, and with the valuable papers which, from time to time, it has been enabled to issue on the important subjects that have been engaging the attention of the scientific and religious communities of this country. I was requested, in the first instance, to move a vote of thanks to your lordship, which I felt I might have been entitled to do, because I had, some sixty-two years ago, the good fortune to go up to Christ Church, Oxford, at the time when your lordship was entering upon your valuable and creditable career in that old and famous House. (Hear, hear.) I well remember thinking at that time that if I saw before me a fair representative of the English nobility in talent, diligence, and conduct, then this country possessed in the House of Lords an institution such as no other country in the world could boast. I have marked your lordship's conduct through a period of more than sixty years, and I may say that, if your great ancestor thought fit to scoff at the characteristics of his fellow-men, the one prominent characteristic I have observed in your lordship is a persistent pursuit of the most wide and extensive charity and benevolence towards your poorer fellow-countrymen based on the great principles and doctrines of Christianity. (Applause.) I will say no more on this head, except that I believe this Society owes much of its prosperity, importance, and influence, to the character of its President. And now allow me to pass to the subject of the Society itself, or rather to the report of its progress during the past year. I am glad to remark that, although it has had to contend against the difficulties of the times,—and those difficulties are very great,—the number of its members has, nevertheless, increased, and it has given evidence of its powerful influence and vitality in a sister, less, perhaps, than a daughter, Institute which has grown up among our Anglo-Saxon brethren on the other side of the Atlantic in the form of a great American Institute of Christian philosophy. I think it a fitting subject for congratulation that, through your influence and by your aid and assistance and your example, several members of that Society belong to this, while some members of this Society belong to that. (Hear, hear.) I trust that this is an augury of fellow feeling and of united sympathy in the great objects for which we are assembled together in this hall to-night, and that, by means of mutual help, you will carry effectually to the whole Anglo-Saxon race, which is spread over the surface of the globe, and in the language which

seems destined to prevail from east to west, and from north to south, as that of the commerce, the law, and the literature of the world, a real knowledge of the sacred Scriptures, the inspired Word of God. (Hear, hear.) This, then, is a sign of the progress of our Society, and another evident sign of your growth and stability is to be found in the fact that many old members who had left you have rejoined the Society, regretting that for a time, even, they had turned from it, and anxious to help forward the great work in which they were so deeply and strongly interested. Let us not fail to observe, likewise, how this Society is attracting the attention of scientific men in other countries,—men of the highest character and intelligence, and the highest scientific repute. What name is there at the present day in the circle of scientific society in Europe which stands higher than that of Pasteur? And I am thankful to see the evidence which he, in the great French capital, has given of his deep appreciation of religious truth. Then, let us look abroad at our own possessions. First of all there is India, that enormous country which the providence of God has placed under the dominion of England, not merely in order to add to her imperial greatness, but that the people of that territory may be instructed in the great truths of Christianity. There we have the Brahmin and the Buddhist, and the great basis of a literature and a priesthood, with literary writings going back for 3,000 years, founded on a materialism of a most subtle character. We find that the sceptical writings of the present day are so much spread abroad by Englishmen, that they are being translated by the native press of India and by the native priests among the Indian population, in order to counteract the effects of the religious teaching of the Christian missionaries. In Madras there is an association formed for the purpose of meeting this evil, and by translating into the native languages the papers furnished by your Society, and the facts which they supply in opposition to the spread of this sceptical science, it will, of course, be combating what is one of the greatest possible hindrances to the reception of religious truth. And, if this be true of India, let us look further and see the extent to which Buddhism prevails in the Eastern world. We find it pervading Burmah, Japan, and China, and wherever that religion prevails there will be need of the counteracting influence of Christian philosophy in order to pave the way to the removal of the objections which exist in the native mind to the reception of the simple truth of the Gospel of the grace of God. Here you see what a field is opened for the exertions of this Society; you see the value that must attach to its labours; and I can bear testimony that they are needed in our own colonies, where, for years, there has been a secret spread of an infidel tone of mind, and where writings have been issued against the Gospel of St. John, wherein the Jesus of history has been put forth as against the Jesus of inspiration and of the Gospel of truth. In Melbourne, too, there is a vast body of scientific unbelief, against which the great and noble Bishop Moorhouse (one of our members) is contending with a pure and striking efficacy in defence of the Holy Scriptures. We hope that this spirit of Christian zeal will spread, and that the means of helping to refute these errors

will be found in the efforts of this Society to distribute some of its most valuable papers with a view of meeting the varied forms of scepticism around us. I might refer to some of the papers here mentioned, but I will not pursue the subject, except so far as to speak of the paper written by the Rev. W. D. Ground, in answer to the philosophy of Herbert Spencer,—a paper in which the author has shown the wide chasm that exists between the conclusions Spencer has drawn and the principle of Consciousness on which he based his philosophy. The tone of the discussion sustained by Mr. Ground was such as became a Christian gentleman. In this respect the papers of the Victoria Institute are of much value and deserve the highest encomiums. I will now, however, bring my remarks to a close. I shall, no doubt, be followed by more able advocates; but I must state my earnest desire to further, as far as I can, the interests of this Society both here and in the Diocese over which I have lately been presiding. (Applause.) I beg to move “That the Report of the Council now read be received and adopted, and circulated amongst the Members and Associates.”

Mr. J. F. BATEMAN, F.R.S.—I have great pleasure in seconding the resolution. After the very able manner in which Bishop Short has advocated the cause of the Society I need add no words of mine to recommend it to the attention of this audience.

The motion was carried *nem. con.*

The Right Rev. the Bishop of Nelson (New Zealand).—My lord, ladies, and gentlemen, I have been entrusted with the following resolution, which I have great pleasure in moving:—“That the thanks of the members and associates be presented to the Council, Honorary Officers, and Auditors, for their efficient conduct of the business of the Victoria Institute during the year.” I received a summons to attend this meeting, and came intending to remain a humble listener to what might be said; but your honorary secretary met me on the threshold and insisted on my taking charge of this resolution. I felt that I could not refuse his request, inasmuch as I am confident that the thanks of the Society are most deservedly due to all who are included in this resolution, and to none more than to your honorary secretary. (Hear, hear.) Allow me to say, in connexion with this subject, that I am thankful for this opportunity of sitting at the feet of one of the Australian bishops, Dr. Short; and I may state that I have come over here chiefly for the purpose of keeping myself *au courant* with what is going on in matters of this kind. I think you will agree with me that this is desirable for us as bishops, exposed as we are to many difficulties such as those which beset you here, while at the same time we have not the privilege and means of meeting those difficulties which you in England possess. I should like here to say,—for, although some of you may know it very well, others may not, and many of the questions put to me show that it is not generally known,—that I am often asked, “Has this or that form of infidelity reached you? Surely you have not got this sort of thing in your portion of the globe?” Why, my lord, we have every form of infidelity as soon as it is published, and even the very rumour of it somehow seems to reach us

beforehand. The people out in New Zealand and our other colonies are as eager to grasp at things that are new as is the case here, and this tendency is, perhaps, more noticeable in the colonies than at home. There is a sort of feverish anxiety to obtain everything that is fresh and novel, whether it be in matters of books or dress, or whatever else excites the imagination or curiosity of the people. Many persons who go to the colonies fancy they are about to breathe a freer atmosphere than they are leaving behind. Therefore I say that if a society like this is needed in England it is also needed in the colonies, and with tenfold urgency; and seeing what this Society is doing, not only here, but in other parts of the world, I think we are greatly indebted to its officers for the work they perform. (Hear, hear.) I may say further that that work is much appreciated by us. I am glad to see, from the report that has been presented to-night, that we are not only receivers, but that we are also contributors; for in the list of meetings you have held this year I find that, on April 3rd, a paper on "Materialism," which was read here, was written by a New Zealander. (Hear, hear.) Judge Richmond, who was the author of that paper, is one of our most distinguished legal authorities, and you will be glad to know that this lecture on "Materialism" has proved in New Zealand a great help to many wavering minds among our people. (Hear, hear.) Therefore it is not a mere matter of theory of which I speak. On the contrary, you are really working in connexion with, and to the great advantage of, the colonies, whose people are greatly encouraged by what you do, as well as by the fact that you recognise ability where it is to be met with, and are sending forth papers of great value to a much wider audience than a writer can ensure in a new country like New Zealand. You will, I think, agree with me when I say that we have a claim upon the help you can render us, not so much because of the magnitude of our colonies, but because of their potentiality. (Hear, hear.) There is such a future before them, and we, who have to lay the foundation of that future, have a constant feeling that the work we have to do is quite sufficient for those who have it to perform. You have probably often heard of the kind of duties a colonial bishop has to discharge: he is often in the saddle, moving about from place to place; and, under the circumstances in which he is placed, what can he do? Even if he had the power, he could not do much in the direction taken by societies such as this. He has not a library full of scientific books, and he naturally turns to you as a legitimate authority which is known and recognised, not alone as an authority of titles and names, but as one possessing a real and tried power, numbering among its members men of great learning, thought, and experience. Therefore, it is that we feel the greatest satisfaction in knowing that we have the help of an Institute like this; and, although we are aware that wisdom is not necessarily tied to reputation, we feel pretty sure, after all, what we are looking to and what kind of assistance we shall have when we take advantage of the means your Institute affords. I ask you, then, on behalf of the colonies, to continue the help you have given us, even in a larger degree than heretofore. I have noticed a statement in the

report that it is considered necessary that certain selected papers should be published in the form of a popular edition, and I would throw out the suggestion that some wise and competent person should be employed to draw up the collective results of these contributions. There are, of course, in the learned productions that are brought under the notice of the Institute, many things that are above the heads of the people. Still these things are necessary, and should be preserved in all their primitive keenness, and I believe that a popular *résumé*, issued from time to time, would prove of great advantage. I know very well that some of these matters cannot be popularly explained, but must be addressed to the understanding of those who are really qualified to form a judgment upon them. But, for all this, I am glad to be able to come here and observe what is going on. I was glad also, after an absence of nine years, and in view of the increased interest that is taken in matters of this kind, to be present at a recent meeting where I heard from M. E. de Pressensé an address on "The Origin of Man," in which he laid down the distinct provinces of science, theology, and philosophy, that the scientist is bound to keep to questions of fact, and not to neglect them to pursue the study of cause. Before concluding I may mention a fact which I think will be of interest to this society. I came to England expecting to meet among my friends one who was well known as a man of science,—the late Professor Clark Maxwell, of Cambridge and Aberdeen. He was a man of consummate ability, and one whose word was law on all questions which came within his special province. I hoped to have had the opportunity of conversing with him during my stay in this country; but a year or so ago heard that he had been prematurely removed. I think I may use the word "prematurely," as he was only forty-five years of age—a very youthful man for the reputation he had attained. I am, however, somewhat consoled for his loss by what I have heard of the state of mind in which he passed away. In the stillness of the sick-room where he then lay dying, and only a short time before his death, he was heard to say, unaware that any one was listening to take down the remark, "Every good gift and every perfect hope is from above, and cometh down from the Father of Light, with whom is no variability, neither shadow of turning." This was the expressed conviction of a thorough man of science, and it is a fact that we ought all to be thankful for. (Hear, hear.) This statement almost reconciled me to his removal; because it is such a decided expression of what a man in his position could feel with regard to these matters. I am afraid I have taken up too much of your time; but what I have said is not the mere utterance of formal views, but an expression of opinion on behalf of the young and distant colony of New Zealand. (Applause.) I now beg most cordially to move the resolution with which I have been entrusted.

Mr. G. HEAP.—I have much pleasure in seconding the resolution.

The motion having been put was carried unanimously.

Mr. D. HOWARD, V.P. Chem. Inst.—I have to thank you very heartily on behalf of the Council and Honorary Officers of the Victoria Institute for the vote of thanks you have given us. I can assure you that it is with no small

sense of responsibility that we do the work devolving upon us. It ought to be comparatively easy work. It would seem, at first sight, to be a simple thing to watch the progress of science and to guard against any apparent clash between the study of the book of God's work and the book of His word, as Lord Bacon expressed it; and if this were all that was required of us,—if we really had only to deal with a patient wise study after truth,—it would be an easy matter, comparatively speaking. But, unfortunately, this is not the case. Along with the progress of science, which is the one distinguishing character of the present day, there is the progress of science falsely so called, manifested in a determination to assert that the results obtained by science are everywhere against revelation and the belief in a supernatural power,—a determination which certainly does not necessarily belong to the study of natural science, although, undoubtedly, there has always been a reason to think that the exclusive study of nature does, in some minds, dim the power of looking through nature to the God of nature. Although many of the greatest scientific thinkers in the present, as in the past, find no antagonism in Religion and Science, there are too many of an entirely opposite disposition. Discoveries in natural science, which you would think at first sight had as little to do with questions of faith as they have to do with the cube-root, are eagerly seized upon, and in some way or other used to discredit revelation and a belief in God; and, when we see this tendency abroad, we cannot afford to wait until time has worked a cure,—until false theories have been exposed and the truth has taken their place. We cannot, I say, afford to wait. We hear complaints from the colonies of the eagerness with which sceptical productions, embodying the worst tendencies of thought in the mother country, are sought after and read. We know the tendency there is to accept anything in this false science which seems to throw discredit on the faith of our ancestors, and we cannot always wait until time has set the matter right. There is undoubtedly a very heavy responsibility on the officers of this Institute, of which they are deeply conscious, in choosing the time when, and the means how, to controvert the scepticism which is growing up around us, and in doing their best to enable the Society to answer wisely the challenge thrown down to it. We do most heartily thank the members of the Institute for the way in which they have helped and supported us. There are, undoubtedly, great difficulties to be encountered. There are some questions which we think it wiser not to be in a hurry to attack, and yet, when we find that these questions are raised, we are obliged fearlessly to attack and answer them to the best of our means and ability. Again, the scope of our efforts is well defined, and the council have to watch that none are tempted to go a little outside it, and to enter into subjects which belong to other societies.*

Mr. Trelawney Saunders then read the following paper :—

* "Scientia Scientiarum," a paper on the origin and objects of the Institute, will be found in vol. i. It is also published separately.

*THE RECENT SURVEY OF WESTERN PALESTINE,
AND ITS BEARING UPON THE BIBLE.*

THE subject of the discourse which I have been requested to deliver this evening is the Maps of Western Palestine now exhibited. They are the results of the labours supported by the Palestine Exploration Fund during the last ten years. This work of the Fund is of such a unique character, that it may be interesting to tell how it was brought about. The Fund was a consequence of the preparation of Dr. William Smith's *Dictionary of the Bible*, in three large volumes. The researches for that great work forced upon its numerous learned contributors, and especially upon Mr. George Grove, who wrote the principal articles on the topography of Palestine, a keen sense of the defective state of the geography of the Holy Land, especially with reference to the understanding of the Bible. The Palestine Exploration Fund was established to supply the want in 1865. Its first work was an experimental journey made by Captain (now Colonel Sir Charles) Wilson, and Lieutenant, afterwards Major, Anderson, lately deceased, who surveyed a track from Damascus to the Sea of Galilee, Samaria, and Jerusalem, on the scale of a mile to an inch, and thus confirmed the instructive character of the results that were expected from a similar Survey of the whole area. Other preliminary journeys and the Survey of Jerusalem next engaged the attention and resources of the managers of the Fund; and it was not till the year 1872 that the complete Survey of Western Palestine was commenced. The maps now exhibited are derived from that Survey. The larger map is on the scale

of a mile to an inch, and it is printed in twenty-six sheets. The smaller maps are reduced from it to a scale of three-eighths of an inch to a mile, and each of them occupies six sheets. The maps on both scales exhibit all the waters and water-courses, roads and tracts, mountains and hills, plains and valleys, woodlands, plantations, and remarkable trees, the cultivation of olives, figs, vines, palms being expressly distinguished. Towns and villages, whether inhabited, deserted, or in ruins, caverns, tombs, cisterns, and rock-cut presses for oil and wine, wells, springs and fountains, and every vestige of antiquity, are comprehended in this Survey. The altitudes of many prominent heights and places above the sea are also given. The work was executed by Surveyors of the Corps of Royal Engineers, trained on the Ordnance Survey of Great Britain, and permitted to undertake it by favour of the Government, and the officers in charge were Lieuts. C. R. Conder and H. H. Kitchener.

It will be perceived that the Survey is at present confined to the country on the west of the Jordan, including the ancient sites of Dan on the north and Beersheba on the south. This includes so large and important a part of the Holy Land that it was determined by the managers of the Fund to proceed at once with the application of the Maps to the illustration of the Old and New Testaments, without waiting for the extension of the Survey to the east and south, where many very interesting Biblical and other historical sites remain to be explored, being often quite unknown. The Survey has been already commenced on the east of the Jordan, and I would strongly urge upon the members of the Victoria Institute, and all other lovers of the Bible and students of history, the claims of that interesting part of the Survey upon their liberal support. It was my good fortune formerly to direct, in Stanford's Geographical establishment, the preparation of the Biblical maps for Dr. Wm. Smith's Ancient Atlas, when all that could be done with the materials existing before the present Survey was attempted, under the learned editorship of Mr. Grove. This and other labours in Biblical geography probably led the managers of the Fund to request me to bring my old studies to bear upon the new Survey. I heartily availed myself of the opportunity, and I am here to-night to give you some idea of the work.

The study of Biblical geography is placed by the present Survey to a great extent on a perfectly new footing. The abundant local details of the most interesting and dramatic Biblical narratives had escaped out of knowledge, in numerous instances, before the beginning of the Christian era and the

times of the Jewish authors of the Talmuds and Josephus. Since the beginning of the Christian era, from the fourth century onwards, valuable works have been written at successive intervals to preserve the knowledge that remained, and their stores of ancient and mediæval learning were systematically incorporated in the exhaustive researches of Hadrian Reland, composed in Latin, and entitled *Hadriani Relandi Palestina ex Monumentis Veteribus Illustrata*, printed at Utrecht in 1814.

About the commencement of the present century it was perceived that an accurate knowledge of the existing state of the ground was a necessary basis of archæological inquiry; and several attempts were made by governments and individuals to satisfy the general desire for the application of such inquiries to Palestine. An instructive list of the writings on this subject, from the fourth century onwards, with critical remarks, is given in an appendix to Dr. Robinson's *Biblical Researches*; Dr. Bonar's work on the "Land of Promise" adds to the number; and the most important are notified at the end of Mr. Grove's article on "Palestine" in Dr. William Smith's *Dictionary of the Bible*.

The method pursued throughout these long centuries of studious labour failed to satisfy critical examination. Its very aim was imperfect. Scraps of information picked up here and there on the spot, or laboriously extracted from past literature,—surveys of varying quality along beaten tracks, and sometimes unfrequented byways, however successfully compiled,—were neither complete nor accurate, for great blanks remained without examination. Such a method ought never to have been expected to reveal the fully delineated features of the face of nature, in which might still be traced the stories of ancient days, that told of the histories and destinies not only of the chosen people in the faith of Abraham, but also of their Christian brethren and of the whole human race along with them.

Now, I desire to assure you that the Surveyors of the Palestine Exploration Fund have succeeded in delineating the surface of Western Palestine with a degree of perfection that has already thrown light upon many obscure and misunderstood parts of the Biblical record. As a student of the documents that existed before it, the New Survey appears to me like a revelation, and it sustains that character in requiring for its understanding prolonged and patient attention. It would be folly to assume that the study of the Bible in the light of that Survey has been, or could be, exhausted or perfected in the brief time that it was possible to allow me to apply to it. Still

I trust that it will be found that considerable progress has been made in opening up a new line of Biblical investigation, and I proceed to submit to you some idea of the process and of the results.

There is reason to believe that many intelligent and educated persons turn aside from an elaborate map as from an insoluble problem. It must be confessed that at first sight the great Map now exhibited looks like a mass of confusion. It is consoling to a map-maker to think that a page of print must be little else to one who cannot or who declines to read. But the first step in the present inquiry is the understanding of the ground; and, to assist in that object, I have prepared this special edition of the reduced Map for publication, and the present copy of the large Map is also coloured similarly for this occasion.

The first point to notice is the COAST LINE, defining the boundary between the land and sea. In this case the coast line is very simple, running from north to south, with a trend to the westward for about 150 miles. Its prominent features are:— (1) The small peninsula or island of the ruined city of Tyre; (2) the famous headlands of the White Cape and Hewn Cape, or Ras el Abiad and Ras en Nakura, along the precipitous faces of which is carried the Tyrian Ladders, or passage of the very ancient coast road, so often traversed by the armies of the Assyrians, Egyptians, Greeks, and Romans; (3) the City and Bay of Acre, the Bay being formed at the southern end by the projection of the famous Mount Carmel for about two miles further west than the more northerly shore; (4) the coast to the south of Carmel, which is unbroken, and has no natural harbour. The only maritime cities that now remain along this coast are Jaffa and Gaza, both of great antiquity. Formerly the Biblical cities of Dor, Cesaræa, Ashdod, and Ascalon also peopled this coast, and possessed strong fortifications, magnificent temples and public buildings, and artificial harbours.

The attention should be next directed to the rivers, water-courses, and inland lakes. A part of the course of the River Jordan forms the eastern limit of the Map, along with the inland lakes which pertain to it. The river enters the Map at an altitude above the sea of about 1,000 feet, and rapidly descends to the plain of Huleh, which is only about 200 feet above the sea where the Jordan enters it. From the plain the river flows southward to Lake Huleh through a dense growth of papyrus, which fills the upper part of the lake, except some narrow passages which were explored by Mr. Macgregor in the *Rob Roy* canoe. The lake has open water in its

southern part, and its altitude is only 7 feet above the Mediterranean. The Jordan passes from the southern end of the Huleh Lake, through a rugged gorge, in which it forms a continuous rapid, till it enters the Sea of Galilee, the surface of which is depressed to 682 feet below the level of the Mediterranean. The Sea of Galilee is fourteen miles in length and nearly seven miles broad in its widest part; its greatest depth is about 150 feet. The Jordan leaves the Sea of Galilee at its southern end, and continues its descent with an increasing depression below the Mediterranean till it enters the Dead Sea, the surface of which is no less than 1,292 feet below the Mediterranean. I refrain from entering into further particulars about this unique river, except to point to the line on the Map which defines approximately the great extent to which the western bank of the Jordan would be submerged if its waters rose to the level of the Mediterranean. One of the vertical sections also illustrates the descent of the river.

The next subject includes the rivers and watercourses that lie between the Jordan and the Mediterranean coast line. These present a very complicated problem. They certainly display at first sight an appearance of great confusion, and look almost too much entangled to be unravelled. The reduction of this labyrinth to its natural elements will be found described at length in my published *Introduction to the Survey of Western Palestine*, illustrated by the special edition of the Reduced Map. In a few words the explanation is as follows:—All the watercourses and streams, with a very few remarkable exceptions, fall either into the Mediterranean or into the Jordan. Each outfall pertains to a distinct drainage area or basin. The limit of each basin is called its water parting, and it is ascertained originally by tracing up every stream from its outfall to its source; and, if the stream has branches, the principal branches would be traced likewise. On the Special Map the water parting of each basin is distinguished by a coloured line, which could easily be made bolder, and the basin is named after its main channel. Thus the outfall to which each part of the country belongs is seen at a glance, and then it becomes easy to distinguish the division of a large basin among its principal branches. Having defined the limits of the basins and traced their chief features, it will be found that the basins differ in the following respect. Only some of those on the Mediterranean slope are contiguous to Jordan basins, while some only of the Jordan basins are contiguous to those of the Mediterranean. Those basins which fall short of the Mediterraneo-Jordan water-parting are distinguished on the Special Map by a green tint, and the

distinction often has reference to the important subject of natural lateral communication through the highlands of the country. The definition of the limits of the basins also enables the main water-parting to be distinguished, and thus the whole of the region belonging to the western side of the Jordan is made visible upon the Map, apart from the Mediterranean slope or watershed. Three intermediate basins are also brought to light which have no superficial outfall. By this analytical process every part of the country is referable to its proper natural division, and then it becomes a simple matter to subdivide the larger natural divisions or basins in accordance with the water-partings and outlets of their main channels and principal branches. Thus, the most intricate combination of valleys is rendered intelligible, and a thorough knowledge of the country becomes practicable to perseverance.

The next step in this inquiry relates to the hill-shading on the Map. It occupies the space between many of the water courses, and indicates the undulations of the surface, especially distinguishing the mountains and hills from the plains and valleys. The significance of the shading is often aided by the insertion of the actual altitude of the locality above the sea; but in the Jordan valley, instead of altitudes above, there are depressions below the sea. A right representation and understanding of the hill-shading will be found of essential value with reference to points of Biblical geography that have hitherto eluded research, and to some of which attention will be presently drawn.

There remain to be noticed the works of man upon the natural surface, indicated by stamps and symbols to denote the position of towns, villages, and ruined sites, cisterns, monuments, and various objects, together with the lines of communication or roads and tracks between them. It was to these points and lines that the attention of the old geographers was mainly given. They estimated or measured the distances from place to place along the lines of road, but anything like a complete delineation of the entire surface of the ground was beyond their conceptions. Thus, whenever a town ceased to exist, and the roads became diverted from it, there was but little prospect of its site being remembered after a lapse of ages, or of being again recovered when once forgotten. But, with the larger Map now exhibited, we may turn to the ancient record, and bring *it* to bear upon the various features named and unnamed that still exist upon the surface of the ground, and are here accurately and adequately indicated; and then we may proceed to inquire how far it is possible to identify one with another.

A few examples will serve to illustrate the foregoing remarks. The subject of "Galilee in the time of Christ" has for some years engaged the attention of a well-known American theologian, himself a traveller in the Holy Land. In the last edition of his work, bearing the date of 1881, it is stated that "the boundary line of this province, so explicitly laid down by Josephus (*Wars*, iii. 3, 1) is lost to us, as well as the line dividing between Upper and Lower Galilee." Allow me, in reply, to expound very briefly this passage of Josephus by the light of the Maps before you, reserving a fuller argument for a more ample opportunity.

Josephus says, in substance, that the two Galilees are bounded by the territory of Ptolemais and by Carmel, by Samaria and Scythopolis, as far as the River Jordan; its northern parts by Tyre and the country of the Tyrians;—that Lower Galilee extends from Tiberias to Zebulon, and of the maritime places Ptolemais is its neighbour; its breadth is from Xaloth, in the Great Plain, to Bersabe. The extent of Upper Galilee is also taken from Bersabe as far as Baca, which divides Galilee from the land of the Tyrians; and in the other direction it has Melloth on the one side, and Thella, near to Jordan, on the other.

Now, the Map displays Ptolemais or the modern St. Jean d'Acre, at the northern end of the Bay of Acre, in the midst of the maritime plain which extends from the Tyrian Ladders on the north to Carmel on the south, a distance of twenty miles. The plain is bounded on the east by the highlands of Upper and Lower Galilee, and its width varies from four to eight miles. Now Josephus defines the limit of both Galilees in this direction by the strong city of Zebulon, and a place called Meloth.

On the summits of a hill overhanging the Plain of Acre at the present moment is a place still partly fortified, bearing the name of 'Abellîn, in which both Van de Velde and Guerin find the obvious trace of the Hebrew Zebulon. Further north, in Upper Galilee, is the present village of Malia, on a summit that forms a part of the culminating line of heights that divide the slope which descends westward to the maritime plain from the edge of the high plateau of Upper Galilee, that spreads out its very varied surface to the eastward. This Malia was a noted place of strength in the time of the Crusaders, and corresponds well both in name and situation with the Melloth of Josephus. Further north, Josephus names Baca as a locality marking the frontier between Upper Galilee and the country of the Tyrians. If we proceed from Malia along the culminating line that divides the western slope from the interior plateau, we arrive at length at the Wady el Bakk,

where the waters of the Upper Ezziyeh Basin pass from the Galilean Plateau into a deep gorge of the western slope, on their way to the Tyrian Plain. This Wady el Bakk corresponds well both in name and situation with the Baca of Josephus, as it dominates one of the principal passes between the Upland of Galilee and the Lowland of Tyre. While, then, Ptolemais and Tyre commanded the maritime plains north of Carmel, the Uplands pertained to, and formed, the Galilees of the Jewish historian; and probably the dividing line between them was never more distinctly marked than it is by the three places now identified. We cannot agree, then, with the author of *Galilee in the time of Christ* that the boundary on this western side of the Galilees is any more lost to us now than it was to Josephus.

There is no more difficulty since the Survey, in defining the separation between Upper and Lower Galilee. Josephus, in the passage quoted, makes Bersobe indicate it. One eminent authority who has abundantly contributed to the literature relating to Palestine, both Biblical and Modern, includes in Upper Galilee "all the mountainous region north of the Plain of Esdraelon or Jezreel, the present Merj Ibn Amir." Thus he places the tribe of Zebulon with Nazareth in Upper Galilee. But Josephus names Xaloth, as denoting the southern limit of Lower Galilee; and there is no question about the identity of Xaloth with Iksâl, which is at the very foot of the mountains. But Iksâl cannot be at the same time the southern limit of Lower Galilee and also the southern limit of Upper Galilee, which would be the case if Upper Galilee were brought so far south as the northern edge of the Plain of Esdraelon. Besides, Josephus expressly names several cities as being in Lower Galilee,—including Sepphoris, Jotapata, and Selamin, all further north, the latter being identified by several authorities with Khurbet Sellameh, a ruined site about fifteen miles north of Iksâl.

It is in this direction that the natural features of the ground attract the student in search of the boundary between Upper and Lower Galilee, and also in search of the situation of Bersobe. The natural features alone clearly exhibit the distinction between Upper and Lower and demarcate it.

Lower Galilee is bounded on the west by the Bay of Acre. From that bay, the main channel of the Mukutta River (the Biblical Kishon) carries the boundary in a south-easterly direction to the head of the Valley of Jezreel, and along the present Nahr Jalûd to the Jordan.* The River Jordan and the Sea

* The Jewish commentators, in the Mishna, extend the division between

of Galilee form the eastern boundary. The whole of the intermediate region consists of lowland hills rising from the great plains of Acre, the Mukutta or Esdraelon, and the Jordan, and enclosing other plains, the largest of which is the Plain of Buttauf. All of these lowland hills are less than 2,000 feet above the sea. The separation between Upper and Lower Galilee lies along a succession of watercourses that form the definite southern base of a chain of mountains rising above 2,000 feet, and culminating in 3,440 feet on the summit of Neby Heider. This range has its western terminus near St. Jean d'Acre, and passes from thence eastward to the Jordan, where that river forms a rapid at the bottom of the gorge between the Huleh Lake and the Sea of Galilee. I will not trouble you now with the names of the watercourses that define this natural line of separation; but they will be found in my *Introduction to the Survey*. Suffice it to say that the natural distinction between Upper and Lower Galilee is due to their difference of altitude, which is made manifest to the eye in the Vertical Section before the meeting. The Section is published in my special edition of the Reduced Map. It is worthy of remark that this difference of altitude is suggested by the old Jewish commentators in the Mishnah, when they remark that the sycomore fig-tree, found in Lower Galilee and other warm parts, never grows in Upper Galilee, no doubt owing to the colder climate of the latter. The highest mountain of Upper Galilee is nearly 4,000 feet above the sea; and heights above 3,000 feet frequently occur.

We might rest the definition of the southern limit of upper Galilee on altitude alone, but the identification of the localities employed for the purpose by the ancients is still interesting. The nearest approach at present found to Bersobe is Khurbet Abu esh Sheba, near the foot of Jebel Heider, and close to Kefr Anan. This suggestion appears to be the more worthy of notice on account of its proximity to Kefr Anan, that being a place mentioned in the Mishna, under the slightly different name of Kefr Hananiya, as marking the frontier between the two Galilees.

The boundaries of Samaria supply another illustration of the value of the Survey; but, for lack of time, I pass on to an old Bible story, with distinct names of localities which have hitherto eluded discovery. I allude to Saul's eventful journey in search of his father's lost asses, narrated in the

Lower Galilee and Samaria further south; but they were only guided by religious considerations concerning the local application of ritual. I refrain from enlarging further on the statements of Josephus, as time forbids.

First Book of Samuel, chapters ix. and x. It is scarcely to be questioned that Saul started from his home; but the starting-point is not mentioned, as if it were unnecessary to do so. Saul's home was undoubtedly Gibeah, as we are told in 1 Sam. x. 26. Gibeah of Saul, in the Tribe of Benjamin, is generally identified with Tell el ful, a prominent site on the road between Jerusalem and Nablus, the Biblical Shechem; but other sites have been proposed. For the present purpose it is sufficient to accept that site, as either of the others would serve equally well in this case, though objectionable in some. Saul passed through Mount Ephraim, the Land of Shalisha, the Land of Shalim, and the Land of Benjamin, to the Land of Zuph, and the City of Samuel. Thence he returned by Rachel's Tomb, in the border of Benjamin, at Zelzah, to Mount Tabor, and the Hill of God, or Gibeath Elohim, garrisoned by Philistines, and afterwards called the Hill or Gibeatha.

At the beginning of this inquiry it is necessary to fix on the situation of the Land of Shalisha. The only sites hitherto proposed have been towards the north-west of Gibeah, about fifteen Roman miles north of Lydda, according to the Onomasticon or Name List of Eusebius and Jerome, written in the fourth century. In that direction the existing names of Khurbet Sirisia and Kh. Kefr Thilth have been thought to indicate the locality. But it is sufficient to consider the nature of the ground between Tell et Ful and those places, to be assured that no wandering herd of any kind of cattle would ever be thought likely, by a master herdsman like Saul, to wander up and down the steep hills and ravines that cross in that direction. On reflection, the memory recurs to an older Biblical story about the movements of flocks and herds. The young lad Joseph was sent out of the Vale of Hebron to Shechem, by his father Jacob, to inquire after his brothers, who had taken their flocks to Shechem. Tell el Ful, or Gibeah, was on the same road, which was doubtless the great highway for traffic of all kinds, pastoral especially. A wandering herd would probably follow a well-known track, and not strike up and down hills and ravines, unfamiliar, steep, and probably trackless. Let us now look at the name Shalisha. It means a Third, and it occurs often in the Hebrew Bible. My attention was particularly riveted by the 19th chapter of Deuteronomy, where Moses commands three cities to be separated and the land to be divided into three parts to secure protection for the accidental man-slayer. Now, Shechem, where Joseph at first sought his brethren and their flocks, was a city of refuge and the centre of one of these third parts; and, considering the importance of the

cities of refuge to every man, it seems likely that these neighbourhoods might come to be familiarly known as Land of the Third or Third Land, as we speak of Tithe-land. Thus I understand the Land of Shalisha to be the neighbourhood of Shechem, to reach which from Gibeah Saul would have passed through Mount Ephraim, according to the narrative. The next locality in the series is the Land of Shalim. It must be borne in mind, that if Saul went as far north as Shechem, he had travelled thirty miles from home, and he would probably think of returning. Observe, then, that he came out of the Land of Benjamin, and passed from the Land of Shalim through the Land of Benjamin, before he passed to the Land of Zuph. Note also that he passes through Benjamin on his return without calling at his home, so that the circumstances of his route were probably such as to prevent him from doing so. His way back was different to that which he had taken to reach Shechem or Shalisha, and as it was different and longer, for it could not be shorter, so it would have been taken for an object, or the further search for the asses. On arriving at Shalisha, then, Saul finds himself near Shalem, which the history of Jacob has also made familiar. Shalem was to the east of Shechem, leading to valleys which dip down into the Ghor or Hollow of the Jordan. Saul's Land of Shalim is another word altogether. Fully transliterated in the *Englishman's Hebrew Concordance*, Jacob's Shalem is שָׁלֵם (*Shāh-lēm*'), meaning "Peace"; while Saul's Shalim is שְׁלֵימָה (*Shah-gāleem*'), meaning "Hollows," and corresponding exactly with the meaning of the present Arabic name of the Jordan valley, which is *el Ghor*, or the Hollow.

Thus Saul proceeds from the Land of Shalisha, probably in the Plains of Mukna and Rajib, in the neighbourhood of Shechem; and, turning eastward, he passes Shalem and descends into the Ghor of the Jordan, or Land of Shalim. Thus he was brought again southward to the Land of Benjamin, which extended to the Jordan, but in that part was separated from the highlands of his home by tremendous declivities broken by deep and precipitous defiles and ravines. If the lost animals had turned from the highland on to these declivities, and had descended to the plain of the Jordan by the summit of a spur or the depth of a ravine, by taking this route Saul would intercept them. Once in the deep valley, he goes on passing his distant home until he arrives at the end of the Plain of Jericho, where the Dead Sea blocks further progress in the valley, and an easy passage upward to the highland occurs. Then he commences his ascent by one of the ancient

roads, which take him to the Land of Zuph, obviously beyond the Land of Benjamin, and therefore in the tribal territory of Judah.

Zuph, as the name of a place, occurs in the Bible only in this passage. In the plural form it occurs twice, but joined with different words and differently spelt.* As the name of a man it occurs twice in one form and twice in others, but the root of the words is the same. The meaning has puzzled the lexicographers; but the word always implies something *over*, as overwhelming, overflowing, overseeing, and hence seeing beyond, both with reference to a fine view or prospect, and also as a seer or prophet.

The land of Zuph, which Saul was entering on his ascent from the plain to the highland, is still an emphatic example of the appropriateness of the Hebrew names of natural features. The present Arab occupants of the country have changed the Hebrew name for an Arabic word of the same meaning, and el Muntar, the watching-place or look-out, is the name of the dominant height on the route which we believe that Saul was taking. At different points along the highland road from its commencement in the plain of Jericho upwards, the road branches off towards Jerusalem and Gibeah on the right hand, and towards Bethlehem on the left. In the land of Zuph, Saul intimated to the servant with him his intention to return home. But the man said that in the city, *this* city, that is near at hand, there was a man of God of high repute who might show them the way that they should go. That city was Ramah, or Ramathaim-Zophim, the birthplace and residence of Samuel the Seer, identified by the Prophet Jeremiah, and in the New Testament with Bethlehem.† At the present time, about a mile eastward of Bethlehem, is the hamlet of Beit Sahur, a name which means "The House of the Seer or Magician"; and this name not unreasonably suggests a reminiscence of the great prophet Samuel. The identification of Ramah with the neighbourhood of Bethlehem, but in a different direction near Rachel's Tomb, was made by Dr. Bonar, and by other authorities noticed by Dr. Robinson, but not confirmed by him. Dr. Stewart objects to such a position, as being too near Rachel's Tomb, in which I agree. The same objection is not applicable to Beit Sahur.

The next point in Saul's progress homeward from the City of Samuel is Rachel's Tomb, the place of which, about a mile

* It is only necessary to mention one instance of it now, namely, Ramathaim=Zophim, or Ramah, the birthplace of Samuel the prophet.

† Jeremiah, xxxi. 15; Matt. ii. 18.

on the north of Bethlehem, is beyond dispute. There is something to be said about Zelzah, the Plain or Oak of Tabor, and the Hill of God or Elohim, with its Philistine garrison; but, having touched upon the essential points of Saul's route, it will perhaps be more useful to apply the brief remainder of the time at my disposal to another subject.

In the Book of Joshua the numerous cities of the Tribe of Judah are arranged as follows:—

1. "The uttermost cities towards the coast of Edom southward," or in the Nejeb.
2. Three groups "in The Valley," or Shephelah.
3. Three groups in the Philistine Plain encircling Ekron, Ashdod, and Gaza.
4. Five groups in "The Mountains."
5. One group in "The Wilderness," or Midbar.
6. A group in the north of Judah named only in the Septuagint.

Only the northernmost part of the first group falls within the present limits of the Survey. The interest attracted by the Nejeb, or country of the South, is displayed in the masterly work of the Rev. C. Wilton, and we must hope that the Palestine Fund will be enabled to survey that unknown region.

The three groups in the second series are said to be in "The Valley," according to the authorised version; but the Hebrew word is "Shephelah." The Shephelah is amply discussed in Dr. Wm. Smith's *Dictionary of the Bible* under the Greek form of Sephela. It is there assumed to be a "low-lying flat district" between the central highlands and the Mediterranean. The article quotes the various English words by which the same Hebrew word is rendered in the authorised version, as "the vale," "the valley," "the low plains," and "the low country." The article also remarks that "no definite limits are mentioned to the Shephelah, nor is it probable that there are any." The article also asserts that "a large number of the towns mentioned in Joshua were not in the plain, nor even on the western slopes of the central mountains, but in the mountains themselves." This is said "to seem to show that one district might intrude on the limits of another," or, "which is more probable," says the article, "that the name Shephelah did not originally mean a lowland, as it came to do in its accommodated Hebrew form." The article goes on to identify the Shephelah with the maritime Plain of Philistia, with what accuracy will be presently seen. The article is an example of the keen and logical criticism with which it was attempted to penetrate the obscurity which had always prevailed, at least, in literature,

from times anterior to the Christian era. This obscurity is now removed by a study of the present Maps.

It is now clearly observable that the Shephelah is quite distinct from the Plain of Philistia on the west, and the mountains of Judah on the east. It is neither "the valleys" nor "the low plains," but it is in every respect a hilly lowland, exactly similar to the Lowlands of Scotland, which are well known to be hilly enough.

One consequence of the accuracy with which the hilly surface of the Shephelah is now displayed for the first time since the Creation is the remarkable distinctness of the separation of its low hills, from the high mountain range to the eastward. The hills of the Shephelah never reach an altitude of 1,800 feet above the sea, and seldom rise to 1,500 feet. But the mountain range of Judah has many points above 3,000 feet, and culminates in 3,747 feet at Yutta, the reputed birthplace of John the Baptist. The distinct separation between the mountains and the Shephelah is found in a succession of valleys running north and south, notably the Wady es Sur and the Wady en Najil, from which the hills of the Shephelah rise suddenly on the west, with steep escarpments facing the east, and opposed to the general slope of the country. From the same valleys the mountains of Judah rise on the east, in general gradually, and with a long slope, in striking contrast to the abrupt and opposing face which forms the eastern limit of the Shephelah.

Between the maritime Plain of Philistia and the system of valleys now brought to light, the remains of the three groups of cities of the Shephelah are, I believe, to be found. In like manner the five groups of cities in "the Mountain" are eastward of those valleys, and beyond them again is the group of towns in the Midbar or Wilderness of Judea, which descends in a series of terraced calcareous downs to the cliffs of the Dead Sea. These downs are burnt up in the summer, but they afford good pasture in the proper season.

I have now concluded this attempt to give you some idea of the invaluable aid that the study of the Bible derives from the Survey of Western Palestine, if it be thoroughly pursued with the helps which the managers of the Fund are bringing to it. My Map of Western Palestine, according to the Old Testament and the Survey, will be published in a few weeks; and a similar Map for the New Testament has been prepared, and will be taken up by the engravers immediately. So much that is new will appear in those Maps as to render it necessary to accompany them by an explanatory volume, the character of which has been foreshadowed by the paper which is now finished.

Rev. H. A. STERN, D.D.—It affords me great satisfaction to move “That our best thanks be presented to Mr. Trelawney Saunders for the paper now delivered, and to those who have read papers during the session.” As the hour is late, I will not trespass on the indulgence of the meeting by making any lengthy remarks upon the very excellent paper to which we have listened; but I may say that I am certain every one present fully appreciates the instructive remarks on the geography of Palestine just made. (Hear, hear.) I am convinced that when the paper is printed it will not fail to throw some new light upon places so familiar to the student of Scripture. There is something peculiarly interesting in everything connected with that land which is so minutely described in the Word of God. Whether we look back to the past or contemplate that country as it is at present, we see how strikingly the threatenings contained in the Scriptures have been fulfilled. Two thousand years ago it was a land flowing with milk and honey; at the present day it is a land utterly desolate, so that any one who visits Palestine or Syria with a Bible in his hand, even if he goes there as an unbeliever, must be very much prejudiced indeed against that Book if he does not come away a believer. We, however, look forward to the day,—and perhaps the signs of the times justify us in anticipating that it is not far distant,—when that land, at present so desolate and down-trodden, will become again, to use the language of Scripture, “the glory of all lands.” It has been my privilege to visit Palestine, and I have followed with the greatest interest those spots that were pointed out to us on the Map while Mr. Saunders was reading his paper. I confess that when, with the Bible in my hand, I first saw those mountain regions, valleys, and low lands, I felt at almost every step I took, and every locality I visited, that prophecy had exactly anticipated that which actually took place so many hundreds of years subsequently. Surely as the curses there given have been fulfilled, we may hope, nay, have we not every reason to believe, that the blessings still bound up with the country will also receive their fulfilment? To me it seems something perfectly marvellous that, with such striking illustrations of the truth of God’s Word, sceptics can still argue against what palpable facts incontestably prove. But as time rolls on, and event after event rapidly succeeds each other, I have not the least doubt that the truth of Scripture will be more strikingly illustrated, and that the spirit of unbelief will receive such a severe blow as will compel multitudes, who are at present the advocates of rationalism and infidelity, to admit that the Bible is indeed the Word of God,—that it comes from God,—that it was revealed by the Spirit of God, and that it contains predictions which only He, who sees the end from the beginning, could have foretold. Thus, perhaps, the day will be ushered in when all men will acknowledge that God has indeed revealed His Word for our comfort and for the salvation of our souls. I will now conclude by simply moving the resolution that has been placed in my hands, merely adding that we are all exceedingly obliged to Mr. Saunders for the very interesting paper with which he has favoured us. (Applause.)

Rear-Admiral H. D. GRANT, C.B.—I will not at this hour occupy your time by doing more than briefly seconding the resolution that has just been moved. It affords me peculiar pleasure to speak here for the first time, although I have been a member of the Institute since its foundation by my dear friend, Mr. Reddie, who has gone to his rest. I remember that when he proposed its formation his first idea was the motto under which we are acting,—“Ad Majorem Dei Gloriam,”—and I think that such a paper as we have heard to-night, as well as the remarks we have had from those who have already spoken, cannot but help to advance the glory of God through the medium of this great Institute. (Hear, hear.)

The resolution was put and carried.

The Rt. Hon. A. S. ARYTON, P.C.—I have very great pleasure in asking you to bring our proceedings to a close by moving a resolution in which I have no doubt every one present will readily concur; not because our proceedings will thus be terminated, but because the noble lord who is the object of the resolution is one whom we all most highly value. (Hear, hear.) Every one who has observed the course of public affairs for many years past must have been struck by the fact that, wherever there was a movement of great social importance for the moral welfare of the country, my noble friend in the chair has been found ready to lend his assistance in the promotion of that object, actuated always by the most disinterested feelings, and constantly achieving the most beneficent results. Although we might differ as to the cause of some of those things that we so often see and deplore, yet, I think, every one will agree in this, that in regard to the culture of the educated classes of this country there has been, and there still is, a wide and palpable gulf. (Hear, hear.) How this has been occasioned it might take some time to explain, and even then we might not all be of one mind; but, with a knowledge of the fact, this Society undertook what I regard as a great and most laudable duty when it endeavoured to fill that gulf, and set itself to the task of reconciling those divergencies which had arisen as the consequence of ages of indifference and neglect. (Hear, hear.) I think, therefore, that no work of greater importance could have been presented to the consideration of the noble lord than that which he undertook in giving his support to this Institute, and in accepting the office he now holds with so much distinction to himself and, I may add, with so much advantage to this Society. (Applause.) Therefore, I, for one, regard with great pleasure his presence here this evening as furnishing practical testimony to the opinions I am sure he entertains in common with all the members of this Institute. The objects you have in view are very simple, and yet they are very difficult to attain. There are many difficulties to be surmounted in this intellectual age, and in the endeavour to meet and overcome them this Society has been making great progress. I trust that at no distant day it will reach that point when it will not only be able to afford its own members the gratification of seeing how error is to be arrested, but will also be able so to expand its efforts in limiting and correcting the evils which have been inflicted on society in all parts of the world. (Hear, hear.) This, of course, will be a work of labour and of cost; but I

hope there will be found men who will not scruple to devote themselves to the work for which so wide a field is open to them, and pockets that will be available for defraying the expense to be incurred. I am quite sure we shall always derive advantage from having so conspicuous a member of society as my noble friend in the chair, and I have no doubt you will concur with me in tendering to him our most hearty thanks for his services as President of this Institute. (Applause.)

The Rt. Rev. S. A. CROWTHER, D.D., Bishop of the Niger.—It is with great pleasure that I second the resolution calling upon this meeting to offer its thanks to our noble President, and I may add, that not only now, but on many previous occasions whenever I have read the reports of benevolent and philanthropic societies, I have scarcely ever missed the name of the Earl of Shaftesbury as President.

The resolution was then carried amid general applause.

The PRESIDENT.—Those who have proposed and seconded this vote of thanks have spoken of me in terms far beyond my deserts. The Right Rev. Bishop Short told you that he appeared before you as a stranger. I, at least, cannot claim to be a stranger, for I have been before you a great many years,—I am afraid, very much in the character of a dummy. I have been connected with this Society from its very commencement; but I have never been able to attend many of its councils, nor to give much personal supervision to its proceedings; and, in point of fact, I have only retained my position by the kindly and generous forbearance of those who desire to maintain in the post I occupy one who was among the living founders of the Institute. But you will all admit that the age at which I have now arrived will hardly justify me in thinking that I can remain your President for many years to come. Turning, however, to the subject more immediately before us, I may say that this has been a very remarkable night, because it has shown how ably and how safely we can discuss those matters which specially engage the attention of this Institute; and, further, that we are carrying towards completion the objects for which the Society was founded. This Institute was not founded solely as a religious society for the promotion of Christianity and maintaining its evidences, but also, among other things, for insuring that religion should have the same fair play that is accorded to science. (Hear, hear.) I can well remember the time when a good deal of overbearing spirit was displayed, and a desire to suppress those who wished to give their opinions in defence of religious truth against the attacks of its opponents. Scientific men, in many instances, endeavoured to arrogate the ascendancy, and looked down upon their opponents as low and uninformed. This Society was founded and maintained by able and enlightened men who have controverted the objections put forward by certain scientists; and, if we have done no more than issue the papers that have been printed during the past few years and obtained the adhesion of the men who have been brought into our ranks, we have at least shown that we are able to assert and promote the objects for which the Victoria Institute was established. When we introduced the sentiment of religion we were told by our scientific opponents, "We can have nothing to

to do with that; you are for religion and we are for philosophy." This Society has proved, however, that true religion is true philosophy, and that, on the other hand, true philosophy is also true religion. It has shown that these two things are combined and inseparable. And now I may observe, in reference to the deeply interesting paper which has been read by Mr. Saunders, what a change it exhibits in the mode of thought adopted in the present day as compared with what we were formerly accustomed to. I remember that when the present Lord Albemarle published his *Journey Overland*, and the report of the investigations he made in the East, and quoted two or three passages from the Scriptures in marginal notes, he was instantly pronounced "a confounded saint" for bringing the Bible into a book of that description. It is very different now, when every day is bringing forward new facts in support of the authenticity of the Bible narrative. The completion of the Survey of Palestine will produce an accumulation of evidence which will make that narrative irresistible, and, although a man may continue to be an unbeliever if he so determine, he will be regarded as utterly unreasonable in the judgment of every thinking man. A great astronomer, — a friend of mine, — told me that once, in conversation with Laplace, the latter said to him, — "We have principles enough in science; what we want are facts, facts, facts!" This I presume to repeat, and to say, The more facts we get, the more certain will be the progress we shall make in real science, and the only complaint I have to make against science is that it does not go fast enough in this direction. In the career of facts it lags very much. The greater the number of facts the greater are the means of approaching truth, and the accumulation of facts that will arise from the Survey of Palestine will be such that, as a geographical work, it will settle positively all questions of this sort. I believe that if our friend, Mr. Saunders, had treated us to some details as to the survey of the peninsula of Sinai, he would have proved that if Moses had existed at the present day he would, most undoubtedly, have been President of the Royal Geographical Society. (Hear, hear, and laughter.) The accuracy of the geography of Moses, as attested by the Ordnance Survey, and the officers to whom that great work was entrusted, is such that it is not to be surpassed by anything which is done at the present day. I have only now to congratulate you on the progress made by this Institute. It is extending its sphere of usefulness, not only in England, but also in the colonies and in America. The popular edition of the works of the Institute is circulating among the mass of working people, and I believe you will be able to date from the commencement of this Society a very great change in the aspect of religion and the truth of God's Word in their relation to science, and God be praised for it. (Applause.) Before we separate I ought to propose to the meeting a vote of thanks to our Secretary. (Hear, hear.) We are indebted to Captain Petrie to an extent we can hardly realise, and he is fully entitled to our gratitude. I therefore assume at once that you accord to him a hearty vote of thanks. (Applause.)

The proceedings then terminated.

ORDINARY MEETING, MARCH 20, 1882.

SIR JOSEPH FAYRER, K.C.S.I., M.D., F.R.S., V.P., IN THE CHAIR.

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

MEMBERS:—The Right Rev. the Bishop of Bloomfontein, South Africa ; S. R. Bosanquet, Esq., Monmouth ; Rev. Preb. J. W. Reynolds, M.A., London ; W. H. Trenwith, Esq., United States.

ASSOCIATES:—The Rt. Rev. Bishop Tuttle, S.T.D., United States ; A. E. Blair, Esq., M.D., United States ; Rev. H. Cotton, South Africa ; C. D. Fox, Esq., New Zealand ; Rev. J. N. Fradenburgh, Ph.D., United States ; Rev. T. E. Marsh, South Africa ; Montreal Library (Rev. J. Empson, Librarian), Canada ; D. Macintosh, Esq., F.G.S., Birmingham ; Rev. E. Price, Hounslow ; C. D. Price, Esq., F.G.S., Hounslow ; W. H. Peters, Esq., J.P., Devon ; Rev. Canon Tait, LL.D., F.R.S.E., Ireland ; W. Wheelhouse, Esq. (Nom. Assoc.), Huddersfield.

Also the presentation of the following works for the library:—

“Proceedings of the Royal Society.” *From the same.*

“Proceedings of the Royal Asiatic Society.” *Ditto.*

“Proceedings of the American Geographical Society.” *Ditto.*

“The Christian Philosophy Quarterly.” *From the Institute.*

“Climatic Effects in the Mauritius.” *From Dr. C. Meldrum, F.R.S.*

Also Three Smaller Works from the Rev. F. Field, Mr. W. J. Knowles, and Mr. W. H. Trenwith.

The following paper was then read by the Author:—

REMARKS ON CLIMATE IN RELATION TO ORGANIC NATURE. BY SURGEON-GENERAL C. A. GORDON, M.D., C.B. Honorary Physician to Her Majesty the Queen. In France, Officier de la Légion d’Honneur, &c., &c.

SYLLABUS.—Preliminary.—Definition of Climate.—Causes of Climate, and effect on flora and fauna.—Changes and their effects.—Forest denudation ; Italy ; Exceptions.—India.—Hindoo writers ; climate ; season.—Climate and Plant Life : zones and localities ; variation ; artificial culture.—Plants in India.—Seeds and young plants.—Tropics.—Food plants.—Fruits.—Floral calendar.—Determining causes.—Plant diseases, in relation to animals and man.—Famine.—Bacteria, &c.—Animal Life ; torpidity, hybernation.—Personal view.—Evolution.—Seasonal changes.—Diseases in animals, plants, and man.—Thunder blight.—Cattle disease.—Man—characteristics ; man and soil.—Geography of disease ; tropical ; temperate ; Scotland ; polar ; England ; public health.—India.—Acclimatisation ; plants ; animals ; man.—Conclusion.

1. **E**VERY extensive geographical region presents certain characters peculiar to, and distinctive of, itself. These characters include such as pertain to the physical con-

struction of the locality, its climate, its flora, its fauna, and its human inhabitants. So far I but give utterance to a most commonplace truism. Yet, if we follow for a little the train of thought which this truism naturally awakens, we shall, I trust, find that the conclusions at which we hope to arrive are not altogether unimportant, or unworthy of our consideration. To my mind our subject presents a large field for study, too large to be more than touched upon in some of its more salient points within the limits to which we now are necessarily restricted. Hence I fear my further remarks must partake, to some extent, of a fragmentary rather than continuous style.

2. The *climate* of a locality is thus defined:—"It includes all those modifications of the atmosphere by which our organs are affected, such as temperature, humidity, barometric pressure, the tranquillity of the atmosphere, its subjection to winds, its purity or admixture with gaseous emanations, its transparency,—that clearness of sky, so important through its influence, not only on radiation of heat from the soil, the development of organic tissues, and the ripening of fruits, but also on the outflow of moral sentiments on the different races."* A careful study of the climate of a locality, and of its natural history, includes all those circumstances which chiefly combine to determine the character, physically and mentally, of its inhabitants.

3. Climate is itself the result of conditions dependent upon geographical position, variations of temperature which accompany the changes of season, the succession of day and night, the incidence of the sunbeam upon a given locality, the greater or less meridian altitude of the sun, the relation of hill and plain, of continent or district to sea, the circumstances upon which periodical winds depend, the relative proportion of cloud and sunshine, hygrometric condition of the air, the state of its ozone, and so on. According to the particular combination of these conditions, so the phenomena of life, as presented by the flora and the fauna of a locality, district, or extensive tract of territory, are determined.

4. Are the conditions of climate in the same locality during successive seasons alike and regular? Far from it. They vary from season to season, from year to year, and return according to more or less clearly defined cyclical periods. Some of these changes and variations are clearly traceable to causes of a physical nature, others to more intangible influences, as electricity, and, perhaps, magnetism.† Certain

* Humboldt. *Hayden's Dictionary of Sciences.*

† See *Handy Book of Meteorology.* A. Buchan, p. 170, et seq.

conditions are recognisable by our senses, others by delicate instruments; but there are conditions that neither barometer, thermometer, nor any other artificial means enable us to detect. We recognise some of these in their influence upon our bodily comfort, on our sensations, and so on. Others, however, make themselves known by particular forms of maladies which may affect plants or animals, or the more terrible epidemics which devastate humanity, as do tropical hurricanes forest tracts that lie in their course. Is it not the case that irregularity or derangement in the order of what by general consent is designated "seasonable weather," is accompanied or speedily followed by deranged health conditions in plant and animal life? Popular proverbs indicate that such is the fact.

5. Although, upon their grand scale, such changes in climatic conditions as have occurred in the progress of time have been brought about altogether independently of human agency, instances are numerous in which by the intervention of man and by other physical agency such alterations have been effected. A very few instances must suffice. In the Cape de Verd Islands, destruction of the forests by burning had the effect of drying up the springs and rendering the climate sultry. Persia, Greece, and other countries have from a similar cause had their climate deteriorated. In the Pyrenees the cutting down of the forests had rendered tracts* unhealthy by the destruction of the barrier which formerly had excluded the southern winds. In Castile and Arragon similar complaints were made long ago. In America cutting down the forest has rendered localities drier and more healthy, as "the wood fever" has disappeared.† And there are many other examples of climate being affected by means of forest denudation. While these notes are being arranged, a striking illustration of the subject now in hand occurs in Italy. In certain districts, during the last ten years, terrible inundations have destroyed much life and property, and have moreover caused considerable sickness where formerly the localities were healthy. Public inquiry has established the point that these unfortunate changes were due to what is described as "the mania which has impelled proprietors to cut down forests."‡ Mountains which for centuries had been covered with pine and oak-trees were reduced to bare rocks; picturesque valleys were converted into swampy marshes. As a result of measures taken to restore the original state of

* The Valley of Azun. † Hopkins' *Atmospheric Changes*, p. 83.

‡ *Morning Post*, Nov. 3, 1881.

things by replanting denuded tracts, barren hills have again become healthy and picturesque. Moreover, vineyards, the produce of which has been deteriorated, and themselves liable to inundations while the forests were destroyed, are once again free from such risk, and the quality of their wine is of its old standard.* And yet the rule must not be looked upon in all cases as absolute. At Murree and Simla coniferæ abound, in the former place as extensive forests. As painful experience has for some years back demonstrated, cholera is localised in both. At Ootacamund, forests of eucalyptus globulus exist; several other species of that genus have also been planted in that locality. Malarial fevers, however, originate there in persons long resident in the place, and since 1877 cholera has obtained a footing in that once beautiful station. It is evident, therefore, that neither coniferæ nor this much-lauded member of the Myrtaceæ necessarily and absolutely abolish endemic disease affecting persons foreign to particular localities.

6. By similar means the climatic conditions of Upper India have undergone change and deterioration within historical times, although the date is somewhat ancient according to accepted chronology. During the wars preceding the subjugation by the Arian invaders of what now constitutes a considerable portion of the Punjab, dense forests covered the surface of the country. As at the present day, in the far west of America, clearings in the forest took place, and, ultimately, tribes thus became permanent settlers. Visits of ceremony and friendship were interchanged by rulers, rajahs, and maharajahs. Among the duties of hospitality was to clear away the intervening jungle, open up a road, make straight the way by which the distinguished visitor was to travel attended by his retinue. And a similar custom still exists.

7. According to the great Hindoo epic poem, the Mahabarata, prosperous cities, richly cultivated lands became established; the inhabitants had abundant food; they were long-lived; as far as can be gathered, epidemics among them were of very rare occurrence; illness was looked upon as punishment by the gods for some sin committed; † the natural

* At the Polambella.

† A similar theory of disease existed in ancient Egypt. A tablet of the time of Rameses XII. (12th century B.C.), to be seen in the Paris Library, and translated in *Records of the Past*, where the Egyptian god, Khons, was sent to cure the little princess Bentaresh of the evil movement in her limbs. When he came, the demon said, "Great god, who chasest demons, I am thy slave, I will go to the place whence I came."—*Anthropology*, by E. B. Taylor, p. 354. Throughout India, China, Syria, and in other countries a similar theory of disease held good. In times more recent,

duration of life among them was said to be one hundred years; and their domestic condition may be judged of from the characteristic recorded, that men loved *their own* wives. But now, and for long cycles of years back, much of the forest thus alluded to has ceased to exist; long wastes of semi-desert country have taken its place; the surface yields only stunted acacias, capers, and asclepias; rivers which then existed are decreased in size; one historic stream, the sacred Suruswattee,* has for centuries ceased to flow, and cities situated in the less arid localities, are periodically swept by epidemics, terrible by their fatality.

8. From times the most ancient, the relation of climate to organic nature was recognised by Hindoo writers.† A very few examples must here suffice. A swampy country was indicated as *Anupa*. In such a tract "lilies and other water-flowers abound; the air is cool; geese, ducks, cranes, fish, and serpents abound. In such a situation the inhabitants are unhealthy and short-lived." The hilly country, or *jungala*, was characterised by "arid plains, on which dwarf trees and prickly shrubs grew sparsely; the heat of the air is great, and hot winds prevail. In such a country there is little water upon the surface, and wells have to be dug." Diseases of air and bile—that is, intestinal and hepatic—prevail, but the climate is healthy, and the inhabitants long-lived. It is further added, that when the above-enumerated conditions are found in the same country the general climate of that country is described as mixed.

the *demon* of disease in Western nations is believed to manifest himself under the name of "specific germs." The subject of so-called "specific germs" in relation to zymotic diseases obtains a great deal of attention. With regard to it the following are some of the conclusions arrived at by speakers at the meeting of the International Medical Congress, and by writers subsequent to that occasion. Although "germs" have been found in the products of inflammation, they have not always been so. The "specificity" of germs is still an unsettled question. The theory in regard to their presence and character is no more than an assumption. Each theory is contradicted by another. Were the presence of "germs" definitely determined, which it is not, the question would still remain, whence do they obtain their specific properties? Also, how do they start into activity; how cease to be in activity, and what becomes of them while "dormant"?

* Suruswattee passes by the holy town of Thaneshur. In ancient times it seems to have flowed across the Rajputana plains to join the Indus below its confluence with the Punjab rivers. Its deserted bed can still be traced as far as Mirgarh, in Bhawalpore; but the water now only penetrates to Bhatneir in Rajputana. In "the upper part of its course it dries up partly in the early part of the year, becoming then a series of pools (whence its name). Many of the early Arian settlements were on the banks of this river."—From Hunter's *Imperial Gazetteer*.
 † Chakrata.

9. Similarly, the relation of the seasons to health was carefully noticed. The year was divided into six seasons, namely, the cold, the spring, the hot, the rainy, the moist, and again the cold; so that the first-named included our months of January and February, the last-named our November and December. As to instructions with regard to what would now be designated personal hygiene in each of these seasons, I select one, namely, the hot, including our months of May and June. Chakrata said: "Use cool foods, and food prepared with ghee (clarified butter); drink sherbets; use broths of wild animals and birds; eat rice with milk and ghee; little wine is to be used, and always mixed with much water; do not take much exercise; sleep during the day in a cool room; at night in the upper rooms; use the hand-punkah sprinkled with sandal-wood and water." The date when these instructions were first issued is variously given as the sixth to ninth century before the Christian era. And yet there are those who say, and perhaps believe, that not until the nineteenth century of our era—that is, twenty-five centuries after the time of Chakrata—was hygiene, as a practical thing, evolved from man's "inner consciousness." But time prevents the further consideration of this portion of our subject.

10. Of all the influences to which plants are exposed, climate is the most important; it sets absolute limits to species.* Plants have been referred† to divisions in classification according to their relation to climatic conditions—namely, 1, Macrotherms, those of inter-tropical regions; 2, Mesotherms, those of sub-tropical and warm, temperate zones; 3, Meiotherms, or those inhabiting cool, temperate zones; 4, Microtherms, or those inhabiting alpine or arctic regions. With reference to the local characters of climates, another method of classification has been adopted, as Xerophiles, or such as pertain to very dry climates; Hygrophiles, or those which abound in abundance of moisture; and Noterophiles, or those intermediate in character. Structural conditions of plants also correspond to the character of climate and soil in which they exist—monocotyledones in hot climates, dicotyledones in cold. Those deep-rooted for extremes of heat and cold; those with shallow roots for equable climates.‡ The character of foliage, alike in type and in continuance, differs in unison with differences in climate.

* Changes of climate must also have their influence upon the migration of plants. A region, when its climate was different, may have been a high road for migration for plants, although it is now impassable.

† By Decandolh.

‡ Henfrey's *Elementary Course of Botany*, pp. 660, 661.

11. Variation in the character of plants according to locality, even within the zone in which they are indigenous, is a phenomenon familiar to all. When those of one zone are transferred to one more torrid, or one more frigid, whether by reason of latitude or elevation, changes in character, as in appearance, become still more defined.* Even in Britain the same species presents very different characters, according to its position in these respects. Trees, shrubs, and other plants, introduced from climates more or less closely approximating to that of these islands, in many instances refuse to propagate their kind. In some of these inflorescence does not take place, in others the flower drops to earth or withers, but without producing fruit; in others there is, for a time, a promise of fruit, but soon the seed vessels die away, and gardeners, when they desire to propagate the species, are only able to do so by "slips." In other instances the properties of plants become altered; in others the species flourishes for a time, then gradually fades, and becomes extinct. In man analogous phenomena to some extent occur. And yet there are phenomena in relation to the distribution of plants which are unaccounted for by conditions of climate alone. Thus, localities the "climate" and rainfall of which are nearly as possible alike, have not necessarily identical floras, any more than identical faunas. Certain plants also have only a local distribution. For example, *Erica vagans*, or Cornish heath, on soil of broken down serpentine; *Cypripedium*, or lady's slipper, on alpine limestone in the Swiss Alps. The *Oxytropis campestris* is confined to one spot on the Clova hills. *Cotoneaster vulgaris* is, in Britain, found only on the limestone cliffs at Great Orme's Head, in Wales. *Potentilla rupestris*, in Britain, only on the Breddin Hills, in Montgomeryshire. A flowering plant may be found in the arctic and temperate regions, and then reappear in the southern temperate and antarctic regions, but none range from pole to pole. Every species which at once exists on two continents is also found on the intermediate islands.

* The American water-weed (*Anacharis*), first introduced into this country in 1847, has spread with great rapidity, expelling the native species with which it came in contact, though it has never yet produced seed. In America it is not more troublesome than other weeds. In the Neilgherry Hills the *Lantana* threatens to choke the coffee on some plantations. In New Zealand the *Rumex acetocella* and the cat's ear (*Hypochaeris radicata*) are destroying native pastures. The spread of *Vallisneria* in the Hudson is as extensive as that of *Anacharis* in Britain.—Daubeny on *Climate*, p. 73.

12. Even when protected by artificial means, as in green-houses and conservatories, the characters of plants in this, or to them other alien climate, differs much from those in places where the same species are indigenous. This circumstance is, no doubt, familiar to all of us who have noted conditions as seen in tropical regions, and in the houses in which the same plants are maintained for use, ornament, or luxury, in and near London, as elsewhere. With every care that can be bestowed upon the management of such places, extending to heat, moisture, degree, and kind of light, and so on, the fact remains that these plants are in an alien *climate*, and their condition suffers accordingly. Attempts are made, more or less successfully, to lead to the inflorescence of particular plants in seasons other than those in which that phenomenon naturally occurs. One familiar to most of us is the common lilac (*Syringa vulgaris*), forced into blossom at Christmas-time; the result, pale, sickly, etiolated flowers and leaf. And so it is in other instances.

13. Residents in India, whether in the plains or hills, are well aware how great and rapid are the changes which occur in the character and life of plants imported from England. In former years the sight might be witnessed of a daisy, the common crimson-tipped flower so named (the *Bellis perennis*), being despatched, like human invalids, to the hills, so as to avoid the coming heat of summer; the same plant brought down and restored to its accustomed shelf, as the cold season again set in. English shrubs become so altered in appearance as to be unrecognisable; our favourite flowers change their time of expanding, and gradually lose their well-known fragrance. In like manner, English vegetables deteriorate, and that so rapidly, as, after the second crop, to be of no farther value. In the hilly districts, exotic trees become attacked in great number by some of the many species of *Loranthus* there met with. In this way the parasite is multiplied; it attacks and destroys the native forest trees in yearly increasing numbers.

14. Seeds introduced from cold and temperate climates into those more torrid are found in a large proportion of instances to have lost their power of germination. Notwithstanding the great care dictated by experience as necessary in the attempt to rear such plants as have germinated, the circumstance is within the personal knowledge of all who have observed phenomena that the young shoots, pale, etiolated, and delicate from the hour they show their tiny leaves above ground, at first thin and lanky—soon bend, droop, then die and decay, leaving the few of what in the phraseology of the

day may be indicated as survivals of the fittest to come up, grow, lose the characters of the originals, or assume others strange to them. And so, the question comes to be, For what purpose are they the fittest? Certainly not for that served by them in their own natural conditions. Neither for that served by those indigenous. But the expression, so long as it is used in an abstract sense, serves its purpose.

15. The processes alike of development, growth, and decay of plants proceed with the greatest degree of rapidity the nearer their locality approaches the equator. Everywhere in those regions forest vegetation is rank and luxuriant; everywhere do decay and decomposition taint the hot, damp atmosphere, the lower organisms of plant life preying upon and accelerating the destruction of the higher. There being little, if any, difference of season or of atmospheric conditions, there is not, as in temperate regions, cessation at regular periods or at any period to these processes. Life and death proceed side by side, creatures of the animal world suited to the locality and conditions inhabit the rivers, swamps, and forests. Human inhabitants there are too in many such localities, though not in all; but in them *intellectual* man exists not indigenous.

16. Food plants differ in their genera, and in several other particulars, according to geographical position, including climate. In tropical regions rice, for the most part, flourishes in low-lying, swampy tracts, although what is named hill-rice is an exception; maize, or Indian corn, upon less swampy, but alluvial soil; millets of several kinds, and *eleusine* (in Madras called by natives, *ragi*), on the dryer kinds of soil. For temperate climates, as in that of England, the relation of particular kinds of cereal and other crops to local conditions, alike of soil and climate, determines to a great extent the success or failure of the agriculturist.

So it is also in regard to fruits. These, even when of the same species, differ in respect to size, shape, colouring, flavour, and in other respects, according to climatic conditions. This applies equally to tropical and to temperate climates. Nor are medicinal plants exceptional in these respects. Their active properties differ according to local climate and soil. And similarly with beverage-yielding plants—the tea shrub, coffee shrub, and so on—their produce varies in quality and flavour infinitely.

17. The entire succession of phenomena which occur in plant life is connected with, and dependent upon, season; but this relation is not alike as regards all genera. By the order in which the several stages of vegetable existence

occur, it were easy to illustrate a floral calendar, for this or any other country. How comes this difference about? Atmospheric conditions suitable for the regular succession of phenomena in one series of plants are not suitable for the same order of phenomena in other series. The fact is familiar to the most ordinary observer. But the ultimate cause of the fact is only to be indicated by a word—adaptation, a quality inherent in the individual. Here, in England, with questions connected with agricultural industries prominently before the public, as of late years they have been, and still are, the dependence of these industries upon conditions of the nature already indicated is a fact prominently brought to the knowledge of persons and classes concerned.

18. Neither are we able to indicate, in a manner more precise and definite, the actual nature of the determining influences to which are due the variation experience demonstrates as existing in such phenomena of plant life, as differences in growth, luxuriance, fructification, &c. In no two successive years are these alike. The quality of fruit grown upon the same ground, and as nearly as possible under precisely similar conditions, varies from year to year; nor can the most observant nurseryman supply a plausible explanation of the circumstance. In India, where from ages the most remote the natives have carefully and accurately noted the relation that manifestations of nature bear to each other, the circumstance is acknowledged that unusual developments and profuseness of inflorescence often precede the recurrence of epidemic disease in man. In this country, not only have particular kinds of plant disease made their appearance within recent years, but their recurrence takes place in relation to season. The disease in our most common esculent, the potato, caused immediately by the fungus, *peronospora infestans*, occurs and recurs, as a rule, in July and August; the *beet* disease, due also to a fungus, occurs sometimes in the winter season. With the failure, from seasonal causes, of particular plants, more especially those that yield food supplies, disease among animals and man follows so regularly that pestilence and famine are considered as bearing to each other a relation similar to that of effect to its cause. The intimate connexion which exists between the conditions of meteorology in a given district and productiveness of food-yielding plants has obtained many and very terrible illustrations in our great dependency, India. Never, since 1770, has so great a famine befallen that country as that which, in 1876-7, extended over the Madras Presidency and a considerable portion of the Deccan. The vast importance attached to this consideration appears from the circumstance,

officially recorded,* that notwithstanding the immense exertions by the local government, and by individuals, to grapple with that famine by the importation of food, distribution of money, and other means, the actual loss of human life during the two years it continued, including the excess of mortality over ordinary years and diminished birth-rate, did not fall much short of three millions of lives. Besides this, the physique of survivors was lowered to so great an extent that they were less capable than before that event to prosecute their regular avocations.

19. Certain forms of organic matter, under the names of Bacteria, Vibriones, Zooglea, and so on, have of late obtained a large amount of scientific attention. It is an open question still, whether the nature of these forms is vegetable or animal, or intermediate between them. Their development, however, appears to be enhanced by atmospheric conditions which favour decomposition of tissues. And this circumstance furnishes the only point in regard to which reference to them is here appropriate. The result of recent discussions as to the part played by these organisms in the direct causation of disease is that, like several other favourite theories, so, in regard to this one, strict investigation is unfavourable to its stability.

20. With regard to animal life, much of what has been said in reference to the relation existing between climate and plant life applies. Thus, families, orders, genera, have their geographical limits; relatively small numbers are restricted to particular territories and localities; characters and habits have a distinct relation to climatic and seasonal conditions. But, unlike plants, many animals capable of and performing migrations thus avoid alternations and changes, as regards atmospheric conditions, to which others, like plants, are subjected. Of the particular sense by which these are guided, alike as to the period and direction of their migrations, we are not able to speak, further than that in our own persons there occurs nothing analogous to it, unless, indeed, it be the capacity, not very common, of knowing directions. As with plants, so changes occur in the character and appearance of man and animals in accordance with localities and circumstances in which they are placed. Finally, health, and the loss of it, have relation to circumstances connected with climate and season, besides others more personal to individuals. As with plants also, the rates of increase and diminution differ according to local circumstances.

* Report by Sanitary Commissioner, 1878, p. 21.

21. Analogous to the seasonal rest of plants in temperate zones, and in those more severe, is the torpidity and hibernation of certain animals, warm as well as cold-blooded. Similar and equally well-marked analogy presents itself in other seasonal phenomena exhibited by them. As the process of metamorphosis* in the development of the young plant is accelerated or retarded by certain conditions of climate and season, so is the corresponding process, properly so called, in relation to particular forms of animal life effected by similar states.

22. Here I would beg to express a personal view. It is, that inasmuch as the process of metamorphosis is a condition of *life* leading towards ultimate perfection of organs and performance of their functions, so are the processes which constitute disease, retrocession of life towards physical death, preparatory to reconstruction of elements by which successive generations of organised beings rise up, each in turn to disappear, and be no more seen in its former identity. All such processes, alike of advance and retrogression, are inherent in living things. Whence their ultimate cause pure science tells us not, but philosophy, when unfettered by the finite, points to that great Power beyond.

23. Is the remark made, These phenomena are so many of a series all due to "Evolution"? I quote from two recent writers in reference to the principle to which that expression is applied after this manner: "What is 'evolution' but another expression for the effect of natural causation? By strictly defining the limits and potencies of what we call Nature, evolution forces upon us the existence of the supernatural."† "Throughout nature there is a continual passing from movement to repose, which is not rest—a ceaseless oscillation from life to death, from death to life. The order of physical phenomena, like the order of mental phenomena, is inscrutable, flowing from a past eternity to a future eternity."‡ What, with reference to this subject, concerns our present purpose, is the circumstance that the phenomena indicated have more or less defined relation to season, as well as to periods. Here we touch alike the borders of pure science, and of the abstract, because intangible—the unthinkable.§

* *Structural and Physiological Botany*. Thomé, p. 220.

† *Nineteenth Century*, September, 1881, pp. 383 and 390.

‡ *The Supernatural in Nature*. J. W. Reynolds, p. 94.

§ What other power than that here indicated as "natural causation" produces the phenomena to one set of which the expression "evolution" is applied, to another "natural selection"? The reply to this query has yet to be given, at least in the phraseology of the scientist. To the philosopher the

24. Several of the phenomena of animal life present a distinct relation to meteorological conditions, and seasonal changes. This relation is, for the most part, more apparent as regards what are called the lower forms of life, than what are designated the higher. What, for example, are the ultimate causes which determine the abnormal profusion of insect, or even yet lower forms of life, in particular years and seasons, as compared with similar periods separated by intervals more or less long? Except that the recurrence of such phenomena takes place during the same periods of the year, little, if anything, further transpires on the subject. Ova are deposited in myriads every year; but only at intervals, sometimes of several years, is full development attained.* Equally remarkable is the destruction which, at intervals, sweeps over and destroys entire races of animals. With regard to some forms in which that destruction happens, no relation to season or special locality has been determined. With regard to others, the occurrence of widespread mortality has a distinct connexion with seasonal and climatic diseases among plants and in the human species. In Sweden, for example, the occurrence of pests among flocks and herds at the commencement of the national celebration of the midnight sun—namely, about the first of May, is looked upon as a seasonal “visitation,” only to be averted by *sorceries*. In India, the seasonal recurrence of what are called malarial diseases in man, is signalled by the prevalence of similar affections, not only among imported animals, but among those indigenous. In that country the phenomena of animal life,

mere substitution of a word by another word matters little. We require not to revert to geological periods to observe in organic beings changes and modifications according to local conditions and circumstances in which those beings occur. To obtain practical confirmation of this fact, no scientific process of inquiry is necessary. Let us, for example, proceed to India by one of the ocean bridges which span the distance between England and her greatest dependency. Let us note, while *en route*, the conditions of physical geography, of meteorology, the characters presented by animated life, whether vegetable, animal, or human, and, at the end of our voyage, let us write to our friends at home and tell them whether or not, in the course of our passage we have observed as great differences in general, as numerous and striking modifications in type, as many instances confirmatory, if we so desire them to be, of “evolution” as are to be traced by comparing the remains found in a particular geological stratum in one region with those of similar or even different state in another region. Still more so is this the case if we continue our journey eastward to Australia and New Zealand. Again more so, if we return homewards, *vid* America and the Antilles.

* Here is an example. In October, 1881, locust eggs were collected at Nicosia alone at the rate of 20,000 oke, or 55,000 lb. per week. An oke contains on an average 13,500 eggs, so that the total gives 270,000,000 locusts destroyed.

in relation to the occurrence of diseases which have a direct dependence upon season, as also those which at intervals are epidemic, have of late years attracted a little of that attention which the subject merits, and will, doubtless, hereafter receive. When, in our investigations, we, to a greater extent than has hitherto been done, look upon organic nature as constituting one great unity, the phenomena of one division as having a relation to those of other divisions of that unity, and all alike influenced by surrounding conditions, then may we expect that greater results than have heretofore followed our inquiries shall be attained.

25. Here, in our own country, the relation of aphidæ and other insect pests to season, and to particular seasons, is sufficiently and unpleasantly familiar. No reference to thermometer, or barometer, is needed to indicate what our own senses tell us is weather in which blights appear in gardens and orchards. The circumstance has recently been recorded that the appearance of the *Thrips cereale* takes place in connexion, as regards time, with the recurrence of electric disturbances of the atmosphere; hence the popular name "thunder blight" given to that creature.* Among other circumstances for which no precise and definite cause has been discovered, are the process by, and manner in, which species and genera of such "pests" as are alluded to succeed each other. Having appeared, their recurrence has reference to season. But how about their first development in myriads? There is no reply.

26. The relation of diseases in animals to season obtains confirmation by what, unfortunately for those concerned, and for their owners, has in this country come to be nearly the usual state of things. Here is a recent illustration. In Norfolk the disease among cattle, known as splenic apoplexy, first made its appearance on July 12, 1874; on the second occasion of its prevalence, the date of its first attack was June 19, 1877; that of its third appearance June 10, 1880. To what special conditions this comparative uniformity in the recurrence of anthrax refers, we have no sufficient data to show. Possibly—so runs the article† quoted from—"in this direction meteorological science, aided by topographical considerations, may sooner or later afford us a clue to the solution of the question." It is added: "As in 1874 and 1877, so in 1880, the primary source of infection cannot be urged alone as the centre from which the more general outbreak sprung."

* *Hardwick's Science Gossip*, October, 1881, p. 224.

† *Journal of the Royal Agricultural Society of England*, Vol. VII., 1881. Part I., p. 50.

27. No more than a passing allusion can be made to a few of the more striking points that bear upon the natural history of man. Examples occur in the physical characters of races, and the geographical limits within which the majority at least are confined; the tint of iris; colour and texture of skin and hair; relative proportions of parts of the body; relative height and chest measurement, and so on. As with physical, so with mental and intellectual characteristics the differences which exist among peoples and races are absolute; their occupations, their poetry, their habits, their character—each and all owe their distinctiveness to, as they are adapted to, the circumstances of locality and climate. “That certain races are constitutionally fit, and others unfit, for certain climates, is a fact which the English have but too good reason to know, when on the scorching plains of India they themselves become languid and sickly, while their children have soon to be removed to some cooler climate, that they may not pine and die.”* Here I guard myself against the assumption that climatic conditions are by themselves the determining causes of race and all the peculiarities by which it is distinguished. The general question is beyond our present scope. All I desire to express is that the characters alluded to coincide for the most part with defined conditions of climate and place.

28. As expressed by a recent writer,† “Man, like the productions of the earth, is in relation to the soil upon which he lives. From times the most remote it has been observed, with regard to inhabitants of hot countries, that their habits are those of indolence and apathy, combined with liability to sudden and temporary ‘exaltation’ of the nervous system, an absence of energy and self-reliance, which render them docile in bondage, and disposed, more than the natives of colder countries, to bear the inequalities and privileges of birth and chance. Let the natives of such countries be removed to colder regions; there they become incapable of entering into competition with the inhabitants of such regions, even as regards unskilled occupations. And not only this, but, when transported to reside in other parts of the tropics than those to which they belong, they suffer to a greater extent from disease in their new locality than do natives of colder climates who leave their country to reside in the same locality.” Thus it seems to be that, as under tropical influences development, growth, and decay in plants and lower orders of the animal kingdom are fostered, without corre-

* *Anthropology*. E. B. Tylor, D.C.L.; LL.D.; F.R.S.; p. 73.

† Ch. J. Masse. *Apropos du Railway Trans-Saharien*, 1881, p. 17.

sponding "tonicity" in their organisation, so with man; the denizen of equatorial regions is by a law of nature restricted to his geographical limits.* Are we, then, to view the prospect as a law of nature that tropical regions are destined to be for ever peopled by a human race whose physical and mental characteristics are still to be such as have been described? That in those regions, amidst dense forest, dank, luxuriant, but unwholesome vegetation, amidst swamps, marshes, and lagoons, tenanted by fierce animals, hideous and fierce creeping things, tropical man must continue as he has heretofore been. According to my own view, the laws of climate determine that such must happen.

29. The geographical distribution of disease realms is no less defined than that of other phenomena in Nature. Meteorological conditions are among the most important of the factors to be taken into account in determining growth, development, and health of man, as of other organised beings. But other concurrent circumstances also exert their influence, favourably or unfavourably as the case may be. Among them latitude, local situation, nature and elevation of the soil, the presence or otherwise of rivers, lakes, swamps, forest or other vegetation, desert tracts, and so on—in fact, *physical climate* generally, together with habits of a people, their food in relation to produce of the land, their habits, and so on—all concur to stamp diseases among communities with a special character.†

30. The tropical zone is bounded north and south by the mean annual isothermal line of 80 deg. F. The diseases which prevail in greatest constancy and frequency within

* The following particulars are from the *Army Medical Blue Book* for 1879. They refer to sickness, mortality, and invaliding among white and black troops respectively in the West Indies, viz. :—The ratios are per 1,000.

Admitted, white troops	.....	641·1	black troops	.....	1152·8
Died	”	”	”	”	17·57
Invalided	”	”	”	”	27·23
Constantly sick	”	”	”	”	54·90
The following are the averages for ten years prior to 1879 :—					
Admitted, white troops	.....	911·0	black troops	.....	1047·03
Died	”	”	”	”	19·42
Invalided	”	”	”	”	say ¹ 27·23
Constantly sick	”	”	”	”	54·90

† In the tables quoted the ratio invalided is not given; that here entered is in accordance with what took place in 1879. The same reports show that

¹ These and some of the succeeding remarks are based upon the chapter, "Medical Geography," in Dr. Aitken's *Science and Practice of Medicine*.

this realm are well known to Army and Navy medical officers as those which are most inimical to our soldiers and our sailors on foreign service. Here, season exercises a very definite influence upon their rate of prevalence and upon their severity. But throughout the whole of this zone the phenomena of diseases present variations, as do those of physical and organic nature. Certain forms of disease have within it their special limits. One form, namely, cholera, appears in this respect exceptional. Only within very recent years has it ever passed the limits within which for centuries it had been, as it were, confined; within our own day has it assumed the character of a raging pestilence, sweeping over all latitudes, its track everywhere marked by households rendered desolate.

31. The temperate zone extends from the preceding north and southward to the annual isothermal line of 50 deg. F. In the southern hemisphere, the most healthy regions in the world are comprised within this zone. In the northern, while the greatest degree of variety exists in regard to the processes and types of diseases, they are, as a rule, more manageable, less intense, and less fatal than corresponding attacks in the tropics. As, on the one hand, the arctic, on the other the tropical region is approached, so extremes and intensity of climatic conditions vary, so differences recur in the types and forms of organic nature, and so the phenomena of disease change, partaking more and more of distinctive characters, which pertain to the boundary regions. The British Isles lie within this zone. In them, as elsewhere, the death-rate of the human population is in a ratio corresponding with the extremes of temperature, between the summer maximum in July and winter minimum in January.* Inasmuch, therefore, as that range is less in Scotland, the colder, than in England, the milder country, so is the death-rate smaller in the former than in the latter. With the colder climate also came those physical characteristics by which "the children of the mist," the brave mountaineer of "Caledonia, stern and wild," was distinguished. Shall I say,

a difference exists as regards the diseases by which British and African troops in the West Indies respectively die. Thus, there died in

1879 by Fevers	3 whites	.....	no blacks.
" " Tubercle.....	1	"	4
" " Circulation.....	no	"	6
" " Nervous.....	2	"	no
" " Respiratory	1	"	2
" " Digestive	2	"	4

These besides injuries. Strength for the year, 1,070 white, 1,138 black.

* *Handy-Book of Meteorology.* A. Buchan, p. 176.

and still is? Certainly! That he is so is as much the result of climatic and other natural causes as is the hardy fir-tree, the *Pinus sylvestris*, the forests, and isolated individuals of which give to highland glens and hill faces their peculiar character.*

32. All beyond the isothermal line of 41 F. includes the polar zone of disease. There, malarial diseases such as endanger and often embitter life in the tropics are absent. Climate is absolutely different from, and as nearly as may be, the opposite in character of that near the equator. With each returning spring, and regularly as plant life becomes revived, disease in the form of influenza, asthmatic or catarrhal affections occurs among the human inhabitants. These impair the health even when life is not destroyed, and so the majority of the people are short-lived. As with particular forms of plant and animal life, so, with regard to forms of disease which affect humanity, the zones in which they are indigenous are limited in extent. But this cannot now be further adverted to.

33. In our own country the relation of climatic conditions to the state of public health is a subject to which the attention of observers is at the present time much directed. It is a matter within the cognisance of all that particular forms of illness rise and fall in numbers according to season and to meteorological conditions. This subject was lately discussed before audiences in this metropolis; † on the occasions when it was so, the remarks made by the eminent men who brought it forward were illustrated by diagrams, and by these diagrams the relation was made apparent which exists between particular forms of disease and particular seasons of the year. In fact, inasmuch as in the vegetable world phenomena of life manifest themselves in their several stages according to season, and differently in different orders and genera, so in man do vital phenomena vary under seasonal influences and climatic conditions; retrocession or decay being brought about in varying manners of the process, to each of which a name is given

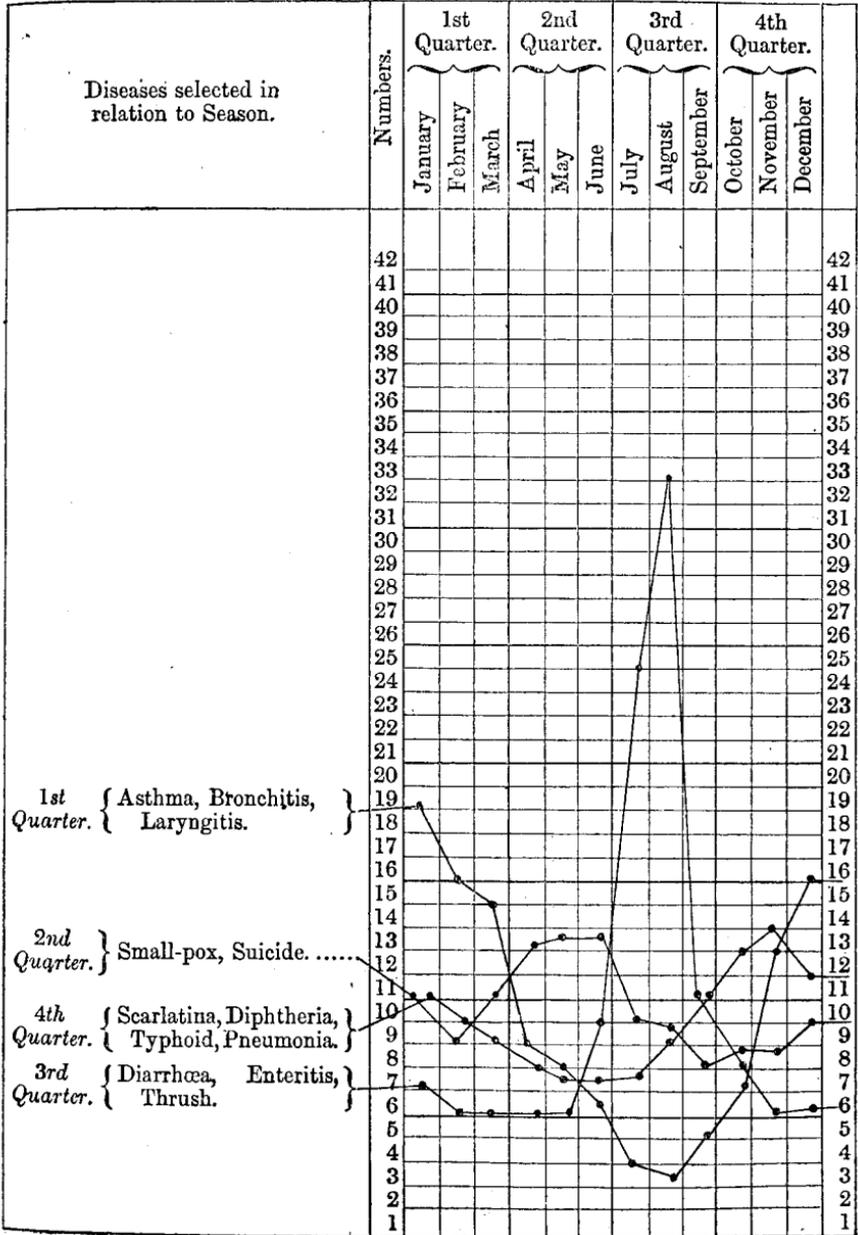
* Equally distinct and characteristic are other individuals of the organic kingdoms; among animals the red deer, the roe, the mountain hare, the grouse, the ptarmigan, and so on. Among plants the mountain ash,¹ the dwarf birch,² the *empetrum* or crowberry, the cloudberry or "averan" (*rubus chamaemorus*), the cranberry (*vaccinium oxycoccus*), the bleaberry (*vaccinium uliginosum*), and so on.

† Lecture by G. R. Langstaff. See *Transactions of the Epidemiological Society of London*, Vol. IV., Part III., 1878-80; also *Lecture on Weather and Health of London*, delivered at the Royal Institution. See *Nature*, June 23, 1881, p. 173.

¹ *Pyrus aucuparia*.

² *Betula nana*.

CHART representing the prevalence in England of particular Diseases in relation to Seasons. Mean for the year taken as 10.



signifying a particular form of disease. Inherent qualities in the individual and mass lead to these changes as regularly and surely as do others inherent in the plant itself, first to autumn tints, then shedding of the leaf, and to the varying manner in which according to their kind fruits ripen, decay, and finally drop to earth. Certain forms of disease have what may be termed double crops during the year; but the general rule is as stated. In illustration of these remarks I instance laryngitis, bronchitis, and asthma, as diseases of the first or coldest quarter; small-pox and suicide as the disease peculiar to the second quarter, for no doubt self-destruction is a disease.* Nervous affections, intestinal disorders, and, among children, thrush in the third or hottest quarter; scarlatina, pneumonia, diphtheria, and what in recent years has been designated typhoid fever, in the fourth quarter.

TABULAR VIEW OF DISEASES ACCORDING TO SEASON IN ENGLAND.
Standard taken as 10.

Months.	1st Quarter. Diseases.			2nd Quarter. Diseases.		3rd Quarter. Diseases.			4th Quarter. Diseases.			
	Asthma.	Bronchitis.	Laryngitis.	Small-pox.	Suicide.	Diarrhoea.	Enteritis.	Thrush.	Scarlatina.	Diphtheria.	Typhoid Fever.	Pneumonia.
January	23	21	12	13	9	3	10·5	8	11	10	9·8	14
February	18	18	13	12·5	6	3	7	8	7	11	11	11·5
March	16	16	14	11	11	2·5	10·5	6	6	9	9·8	14
April	7	11	9	13·5	13	3	9·8	6	6·5	9	9	10
May	5	9	10	14	13	4	6	8	6·5	8	8	8·5
June	6	7	6	12·5	14·5	10	10	10	8	9·5	7	6
July	4	6	4	8	11	40	16	19	9	9	9	5
August	4	2	4	8	11	34	13	19·5	10·5	10	12	5
September ...	4	6	5	8	8	13·3	12	8	14	10·5	12	8
October	7	9	7	8	9·5	7	10	9	16	11	14	10
November ...	15	16	9	9	8·5	4	7	8	15	13	13	16
December ...	18	18	12	11	9·5	3	9	8	10·5	11	10·8	16

* When we find that the hot, bright months of summer are those in which suicidal tendency prevails most, we seem to recognise physical, rather than psychical, influences. Suicide, also, is more common in the daytime than at night; it is particularly so at 8 a.m., at noon, and at 3 p.m. Strangely, also, it is more prevalent on Monday, Tuesday, Wednesday, and Thursday, as compared with Friday, Saturday, and Sunday (except among women, with whom this disease is most prevalent on Sunday). See the observations by Guerry in France, quoted by Dr. Henry Morselli, in his book on *Suicide*, p. 76. (Published by Kegan Paul & Co., 1881.)

34. In India the relation existing between irregularity of seasonal conditions and health and disease is well understood. It is a recognised fact in the Punjab, that an unusually wet autumn will be attended, as a rule, by a heavy fever-rate; while a dry season will be a healthy one; that, on the other hand, heavy winter and spring rains have little, if any, influence on the degree of fever sickness. At Peshawur, the British troops suffer greatly, owing to the prevalence of heat fevers during the hot months, namely, May, June, and July; from those of a so-called "malarious" nature from the month of September to that of December—that is, during the prevalence of the rains. As illustrating the association of unusual dryness with the occurrence of more than usual sickness, two instances must suffice, both having reference to Jhelum. At that station the years 1872 and 1876 were peculiarly unhealthy. In the former year, the autumnal fall of rain was below the average; in the latter, while the rainfall was 22·3 inches as compared to 1875, fever occurred among the troops in the ratio per 1,000 of 960 cases, as against 505 in 1875. Cholera also prevailed. As recently as the month of October last, accounts continued to reach us by each weekly mail that during the autumn unusually heavy rainfall occurred at Umritsur, the quantity amounting to 40 inches, instead of 18, as an average of ordinary years. Pestilence, in the form of choleraic fever, broke out as a result and consequence. In that city 242 deaths were reported as having occurred on September 28th, and on the day following 280, and so on for several days.

35. The subject of acclimatisation with reference to plants, animals, and man, can be no more than touched upon. Its importance, however, is manifest. The term itself implies adaptation to conditions of foreign climates at first injurious, and the capacity of surviving and flourishing in such conditions. It has a significance different from that of domestication; also from that of naturalisation. Thus a large number of European plants have been introduced, and flourish in America and in New Zealand, without having undergone the process of acclimatisation properly so called. In Britain the canary bird is domesticated, but not acclimatised; that is, not capable of withstanding the severity of our climate without protection. In America and in New Zealand, sparrows, rats, goats, and other British animals, including the rabbit, are naturalised without being acclimatised—the bird and the rodent multiplying to such an extent that the creatures have become nuisances. Plants in England are often naturalised without being acclimatised; hence the circumstance that

many exotics which flourish in gardens do not become wild. A few, however, do thus spread; these become both naturalised and acclimatised. Tropical plants refuse to live in a temperate climate. Certain animals have greater adaptability. The tiger ranges from the equator to the Amoor and isothermal line 32 deg. F.; the mountain sparrow (*passer montana*) inhabits Singapore, Java, and a great part of Europe. Horses, wolves, foxes, and other quadrupeds, have a similar climatic range; so among birds, particularly aquatic birds, waders and several others. Insects are adapted to a very limited range of climate.*

36. With regard to man, the subject of acclimatisation is beset by difficulties. Here are a few. The American race inhabits alike the parts around Hudson's Bay, and the hottest parts of the tropics, the equatorial valleys and lofty plateaux of the Andes. The African of the third or fourth generation in North America, who proceeds to Africa, suffers from the diseases peculiar to the latter climate as does the European. There are theorists who say that the excessive mortality of British troops and British children in India does not affect the general question. I take leave to say that it does so in a very important degree. There is, however, the indisputable fact that white Jews at Cochin have for many generations propagated their kind, and still remain pure in race as when, by their own tradition, they fled from Syria, A.D. 70.† In Southern Africa the Dutch have, during 200 years, thriven without intermixture of native blood; similarly have they flourished in the Malaccas for 250 years. In the Australian colonies, and in America, our own countrymen flourish. But in India, so far as regards the plains, experience is adverse to a similar prospect for the British race.

37. From the particulars now given—and very many more pointing in the same direction might readily be adduced—the grounds are, I trust, rendered apparent upon which I base my conviction that, inasmuch as the phenomena of organic existences, including development, growth, fructification, decay, are in relation to, and to a great degree determined by, climatic, seasonal, and other conditions incidental to particular localities,—so, in respect to man, development, health, functions, disease, death are similarly necessary results of the same conditions as they affect him. To a certain

* *Encyclopædia Britannica*, Art. "Acclimatisation."

† That is when Jerusalem was captured and sacked by Titus. According to another account the Jews of Cochin settled there in the first year of the Christian era. In 1875 their number amounted to only 1,278 persons.

extent, and within certain limits, he has in himself the power to modify in his own person the operation of those conditions; but he can do no more. Change, constant change, is part of Nature's laws. Whether looked for in respect to atmospheric, terrestrial, or organic creation, it equally manifests itself. As surely as the genial glow of returning spring leads to the recurrence of vegetable life, the summer sun to the ripening fruit, autumn to the changed tint of woodland leaves, equinoctial gales to havoc, more or less complete, among denizens of forests, fields, and gardens, winter blasts to the cessation for the time being of vegetable life—in like manner, and according to their appointed *seasons*, corresponding phenomena occur in the animal world, of which man is the highest *member*.

The CHAIRMAN (Sir J. Fayer, K.C.S.I., M.D., F.R.S.).—I am quite sure I shall have your assent in most cordially thanking Dr. Gordon for his very interesting paper. (Applause.) When I heard that Dr. Gordon was to read a paper, I knew that it would be a good one, for his great experience, long service in almost every quarter of the globe, and the peculiar interest he has always taken in the subjects he has dealt with, gave great promise of an exceedingly interesting lecture, and I think you will agree with me that my expectations have not been disappointed. (Hear, hear.) We are honoured this evening by the attendance of several distinguished visitors, and I trust that they will consider themselves, on this occasion, members of the Society, and will take part in the discussion which is about to commence. Without detaining you by any further remarks at present, I will ask you at once to open the discussion.

Sir JAMES RISDON BENNETT, V.P.R.S.—I can only express the great pleasure with which I have listened to the paper and my obligations to Dr. Gordon for having afforded me the opportunity of hearing it. There is a great deal in the paper to which we cannot but assent, and I may say, for myself, that I do very heartily assent to most of what he has put before us. The points he has dealt with are, for the most part, of a character that would only justify any expression of dissent from those who have had much more of the individual experience which Dr. Gordon possesses than I can possibly venture to claim. I think there are two or three points of very special interest in connexion with certain matters that have been touched upon, and I may refer to one in particular, with reference to the bearing of Dr. Gordon's views on the general doctrine of evolution—a matter of extreme importance, which ought not to be lost sight of in connexion with that much-discussed subject. Whatever may be our scientific views, we must all of us be more or less impressed with the fact that there is some-

thing associated with climatic and atmospheric conditions which affects us in a very special way, but which does not admit of our assigning any definite cause. For instance, with regard to different diseases which prevail in our own country, we find that at one time a particular complaint is much more malignant than at another time, without there being any other assignable cause beyond those inscrutable differences of season which, to a great extent, are, I am afraid, beyond our investigation. It is probable that varying conditions of magnetic or electric phenomena, with possibly other recondite influences, may have something to do with this; but our appreciation of these conditions must be very much a matter of guesswork. The conclusion, however, to which Dr. Gordon comes in his paper, upon one point, is of extreme importance to us as a nation. I allude to the doubt he has expressed as to the ability of the natives of India ever to attain any material difference or advance on their original physical and intellectual character beyond what they have now reached; the inference being that it is doubtful whether they will ever be competent to hold the country in the way we have hoped they might some day be able to do after the educational influences we have brought to bear upon them. I suppose also, from what Dr. Gordon has said, he equally entertains the view that there is not much probability of Europeans ever being able to stand the Indian climate better than they now do; although, no doubt, the mortality among the European population there is less now than it used to be, in consequence of improved sanitary and other conditions. But I have no views of my own on this subject that I think it would be right to venture to intrude on this meeting.

Mr. D. HOWARD, V.P.I.C.—The paper read to us by Dr. Gordon is a rather difficult one to handle, because it contains such a vast number of interesting points. It is interesting in what it tells us, though it is somewhat tantalising in regard to the important questions it raises here and there, but which it does not attempt to settle. I will not venture to touch on all the points that have interested me, because I am afraid the time at my disposal would not allow me to do so; I shall, therefore, only allude to one or two. There are several allusions in the paper to an interesting question that has frequently engaged my attention, and that is the question of changes in the characteristics of races. Two most interesting examples are given in this paper, of cases exactly opposite. One is the singular stability shown by a race of the Jewish type—the white Jews at Cochin—who for two thousand years have preserved their characteristics almost untouched by change. Yet, in the very rapid changes that have come over those natives of Africa who have been taken to America, is shown, on the other hand, a singular inability to stand the climate in which their great-grand-parents were nurtured. Then, again, we have the great change which comes over the English race in India, where it is a very rare thing for the third generation to survive without the alternation of a colder climate, which, if it be obtainable anywhere in India itself, must be among the hills of that country. The interesting remarks of the author as to the same curious diversity of experience in the case of plants and the

lower animals, that he has noticed among ourselves, open up a vast field of inquiry, and one would like, if there were time to go through the paper, to follow these out in detail. The whole question is one of great interest, because we find that the Ethiopian type is unchangeable as represented in some of the early sculptures of Nineveh and in the Egyptian frescoes, and yet we know how very rapidly a race may change and lose its characteristics. The subject is one worthy of very careful attention. There is only one other point to which I would refer, and that is the curious caprices of disease, to which reference has been made. If we take the splenic fever, mentioned in the paper as breaking out in Norfolk, we are struck with its curious recurrence on almost the same day in the year on each occasion. When we remember the experiments made by M. Pasteur, they appear so completely to cover the whole ground that we begin to think we know all about the disease, and yet, when we have read what he has to say, we still find that we are ignorant as to why all the cattle in England do not die of splenic fever, or why any cattle die of that disease. M. Pasteur has shown how difficult it is to stamp out this disease, and yet it breaks out in this most capricious way. It is the same with regard to cholera, a disease belonging to hot countries; whether it is spontaneously produced by those countries is a question I must leave to the learned to decide, but there is no doubt of its scope and extent, nor that at intervals it invades Europe. It has defied the efforts of all meteorologists and other scientific men to discover the exact causes which produce the widespread infection that again and again have decimated Europe in modern times, just as it did in the Middle Ages. Nor can any one give a reason why the Egyptian plague should have spread through England in the extraordinary manner in which it has again and again come amongst us, producing such terrible ravages. No doubt, dirt and bad habits have had a good deal to do with these things; but still, dirt and bad habits may and do exist without the appearance of cholera or the Egyptian plague; for, if these diseases be the necessary product of places as dirty and badly managed from a sanitary point of view as it is possible to be, then I think that some places I could mention ought to be constant foci of plague and malignant disorders. Here, therefore, I think we are met by an insoluble problem, and it is perhaps well for us to reflect sometimes over these insoluble problems. (Hear, hear.) We ought not to think science so simple a subject, that when we have seen the beautiful unity which runs through the demonstrations of scientific theories we have learned all it is necessary to know. There is a more difficult lesson to be learnt still, and that is, to understand the exceptions. Until we have mastered them, we have only half learned our lesson. We should be crude astronomers if we took it for granted that the planets all moved in regular ellipses, as they are represented to do in the diagrams of astronomy, without studying to attain a knowledge of the laws by which their complex motions are governed, and the reason of apparent anomalies, and, in the same way that a study of these laws is essential to a knowledge of astronomy, so ought we to endeavour

to attain a knowledge of the laws by which this world is influenced. (Hear, hear.)

Mr. PFOUNDEN.—As I have seen a very great deal of various parts of the world, I venture to offer one or two remarks. The first thing that strikes one after having travelled round the globe several times is, what an immense amount, after all, one has to learn. I am quite aghast when I return home to find that young people, who have so much leisure on their hands, should waste it in various ways, without any attempt to study the interesting subjects so ably put before us in this paper. Even when we go among specialists, we find that, after all, the human intellect is a very shallow thing, and that many of those who indulge in high-flown theories are often unable to answer very simple propositions; while in the East we frequently find people who, with all their want of science, are wonderfully intelligent on many matters about which we, at home, are still groping in the dark. There are two or three points on which I would add my mite to what has already been said. A short time ago, at the Society of Arts, I had occasion to remark on the question of meteorology in various climates, especially with reference to those in which tea and other plants of commerce can be produced. I think there is much useful work yet to be done in directing the energies we employ in the arts of cultivation; the present paper ought to have the effect of stirring one's mind somewhat in this direction. With regard to the question of forest denudation, we find, as has been pointed out, that in Afghanistan there are at the present moment great deserts where formerly there was a fertile country; and the same thing occurs in Australia, where there are arid wastes in spots through which the river beds of former periods are distinctly traceable, and this is also specially noticeable in certain parts of China. In the southern States of America there are immense tracts of land that were once under high cultivation, but which have gone back to their original wildness. I have no doubt it would be possible to bring these districts back to culture, and in this direction the teaching of forestry is a matter deserving of attention. Again, with regard to the question of races, during my residence in the East I have frequently had my attention called to the points mentioned by the lecturer. We find that the Coreans, who have gone among different alien races, have yet been able to preserve the purity of their own for four or five centuries, while there are other tribes that have been enabled to maintain their individuality for a long time. There are a number of other interesting points that must strike all specialists, especially that which relates to our soldiers and sailors abroad. On this subject I would suggest that the conditions of life under which these men are placed are of themselves very often the cause of a large proportion of the disease from which they suffer. If our English people, when they go abroad, would only throw off some of their insular customs, and try to adapt themselves a little more to the necessities of the different climates in which they have to reside, they might escape a good deal of the sickness to which they are subjected; but, if they will continue to indulge in bottled "Bass," plum-pudding, and beef-steak, it is out of all reason to

expect that they can keep their health as at home. The question of climate and horticulture is one that certainly deserves our best attention, and it would be well if we at home could only be made acquainted with the wonderful way in which, in some parts of the world, the patient labour devoted to the cultivation of fruits and flowers produces the most extraordinary results often from only a few square inches of superficial area. I may also draw attention to a very striking circumstance that may be noticed in the Fiji Islands, where, at a certain period of the year, shortly before sunrise, a peculiar slug makes its appearance and furnishes a singular confirmation of what the lecturer tells us in paragraph 24 of his paper. In conclusion I would only say, in allusion to what we are told in paragraph 28, that I hope we shall not be obliged to realise what seems to be there anticipated. I cannot but think that, in these days of increasing emigration, if people going abroad were only properly instructed as to the countries in which they are to live and the occupations they ought to follow, and the diet that is most suitable for them, we should thereby effect a great national good which would redound to the credit and wealth of the country. But at present, unfortunately, people go abroad ignorant alike of the climate they have to encounter, the food they ought to consume, and the occupations they will be compelled to pursue, actuated only by the mistaken impression that they will merely have to pick up gold from under their feet.

Rev. Principal RIGG, D.D.—I feel that the subject of this paper is one upon which no one could be expected to speak with greater authority than Dr. Gordon, looking at the groundwork on which it is based and all it includes; and yet it is one on which a good many persons might entertain some slight differences of opinion from Dr. Gordon and from each other. It is, indeed, a most interesting paper—a paper about almost everything, and one that is exceedingly suggestive and tempting, but about which one cannot say anything that is not more or less complimentary. We must beware, therefore, of the temptation to wander too far afield. I think Dr. Gordon did not touch on one point—though it is possible that I may not have caught it—that I have often thought worthy of more attention than is generally given to it, and that is the degree to which the pre-eminence of mind in any race may limit its variability. For instance, whether it is not merely physical weakness that makes a race amenable to all the influences of climate and so forth, whether the possession of superior mental force tends to preserve a race from being so entirely subject to those influences of climate, soil, and season by which it may be surrounded, as it otherwise would be. I rather think there is a good deal in this idea, and I believe that one reason for the extent to which modern European races, or, at any rate, some of them, are able to preserve their identity under the most adverse and discordant conditions of soil, climate, food, and other circumstances, is to be found in the development of mind and will in those races; that this sets up a kind of barrier against the degree of subordination to the surrounding influences which otherwise would have a depressing effect on them and their descendants in the event of their becoming settlers. I do not

quite understand what has been said with regard to the negro race, but I have thought, and I think I have met with the opinion in some books I have read, that the negro race is, perhaps, as well able to adapt itself to the climatic conditions under which it exists as most races. This may not seem to agree with what I have just said about mind being the great factor in this matter, but I think we may say of the negro race, that if the mind were more developed it would be still more able to adapt itself to all the various circumstances in which it may find itself placed than it is even at the present moment. There certainly does seem to be a singular power of adaptation to exceedingly variable conditions of climate in that race. It does not melt away from the face of the earth as many races do, and, notwithstanding the fact that the descendants of the African negro may become liable to the diseases of temperate climates, we, nevertheless, find that where they become settled they flourish. You will find magnificently grown coloured men in nearly all the northern States, and, although some places are doubtless a little too bleak, yet, speaking generally, they do well throughout the States of America. It may be that when they are sent to the West Indies they are more amenable to the baneful influences of climate there than the British soldiers; but this is possibly owing to sanitary conditions, and not merely to the question of physical adaptation. It is hard to suppose that on the ground of physical adaptation they could be less healthy at the West Indies than English soldiery; and, as a matter of fact, we find that they easily adapt themselves to altered conditions of climate extending over a very wide area in Africa and other parts of the world. So that there are some races which are peculiarly tenacious of life; and, over and above this, I think it worth while to consider whether the mere development of mind and will in various races is not of itself an element tending to keep those races alive? A great deal of rubbish has been talked about race destructibility and race decadence. You cannot go to America, and see the manifest difference of the American type from any type to which you may refer as having been the original type, without feeling that the development of continental influences exercised on the various European races is taking away the characteristics of the original type and substituting a different set. You cannot take the very striking history of the Sikhs without noticing the singular illustration furnished by that race, of national individuality, and yet they are a new nation or race created out of very heterogeneous materials. Thus you see that there is a perpetual melting down of certain characteristics and raising up of others, while our own nation differs very materially in regard to the type that now prevails from the English nation as it was one thousand years ago. All this, however, is very much matter of opinion; but I cannot help agreeing with the remark which fell from a gentleman who spoke a little while ago, and who told us it was a valuable lesson for us to learn, that we ought not to hazard strong assertions with regard to questions of this kind. There are a thousand things with regard to the influences of race, and climate, and diet, and occupation, and mental force, as to which we have no data to go upon,

and which the state of our science is not fit to grapple with at the present moment. (Hear, hear.)

Mr. PALMER.—The chief interest of Dr. Gordon's paper appears to concentrate itself on the pathological effects of climate, showing us that disease is a necessary part of our existence, whether we consider disease as exhibiting itself in the form of organic life or in molecular death. These effects appear to me to be best observed in that most typical disease, the Levantine plague—a disease well confined within geographical limits.

The CHAIRMAN.—Confined to the Continent?

Mr. PALMER.—Normally, no doubt, always so confined, and only traversing those limits under certain well-defined conditions. When we consider what those conditions are under which it spreads, we are reminded of that old Hindoo idea, that sin is the cause of disease, which Dr. Gordon dismisses in the paragraph 7 of his paper; but, if we give it another name and call it perverted moral energy, it may be regarded as a factor quite as important in the propagation of disease as climate. Every considerable outbreak of plague in the world's history has been preceded by extensive wars, and there can be no doubt that this disease is propagated under more favourable circumstances when the atmosphere is affected by the results of the decomposition of animal tissue on a large scale. Every attempt on the part of Russia to enlarge her dominion in the direction of Turkey has been followed by an outbreak of plague. Even those who do not admit war in the abstract to be immoral, or, to go back to the old phrase, sinful, must allow that there has been in its origin some fracture of the laws of morality and justice in order to render war possible. The question is still one of climate; but it is in this case one of changes in climate artificially produced by human agency, and at the present time we are undoubtedly in the infancy of our knowledge as to the possible effect of combined human action in an opposite direction. If man can by his own acts render the atmosphere so deadly as to produce the most baneful results, surely his efforts, rightly directed, might effect a proportionate change in the contrary direction. If hygiene has been in existence as a practical thing for twenty-five centuries, it must have been during a great portion of that time in a very rudimental form. We find, according to Gibbon, that this disease—the Levantine plague—spread in the third and sixth centuries to such an extent as to carry off half the population of the world; and, again, in the fourteenth century the absolute deaths by plague are said to have numbered one-fourth of the inhabitants of the known world, the mortality of some parts of England and France being estimated at nine-tenths of the population! Such a state of things we are inclined to regard as impossible with the sanitary arrangements of the nineteenth century. There is a popular idea on which I should be glad to have Dr. Gordon's opinion. He seems, if I have apprehended him rightly, to endorse the idea that seasonable weather is healthy. Now, this is a question which is still *sub judice*, and there are many who regard the common opinion as a vulgar error. Certainly,

the summer of 1880, in which the mortality approached that of cholera, was reasonable as far as the temperature was concerned. I should like also to have Dr. Gordon's opinion on another point; upon which we have had no very definite or authoritative information as yet; and that is, as to whether the *Eucalyptus globulus* really does exercise the sanitary properties that have been attributed to it?

Mr. A. E. T. LONGHURST, M.D.—The subject of the paper read to-night is one in which for some years past I have felt great interest, and we must all be deeply indebted to Dr. Gordon for having brought it before us. Atmospheric conditions must undoubtedly affect both animal and vegetable life; there can be no question upon that point, for we see the evidences before us in every walk of life. The last speaker remarked that seasonable weather is not always healthy. I think we may take it that seasonable weather is healthy, but that there may be certain local conditions in and around us, in certain seasons, which prevent those naturally healthy atmospheric states from exerting their full sanitary influence upon us—*e.g.*, the living in a crowded atmosphere in smoky cities, undue brain work, insufficient bodily exercise in the open air, &c.; causing an enfeebled state of the nervous and vascular systems, which make us unable to withstand the degree of cold which, as a rule, is no doubt beneficial to healthy people. I think the experience we had of the winter of two years ago will bear out this remark. Then, with regard to the changes that are produced by climatic and atmospheric effects upon the vegetable world these are, I think, if possible, more marked than the changes produced on ourselves. We need not go far to see this very forcibly illustrated at the present moment. If we look at our parks, we find the chestnuts are in many instances in leaf, and in one or two cases in actual flower. This is a state of things we are not accustomed to in the month of March. Certain it is that the existing atmospheric conditions may be considered to be the cause of these phenomena. But, allowing this, I think we must also allow that this weather is due to natural operations, and, I hope, as a rule, it will be found to be beneficial rather than otherwise. As it is now so late, I will not trespass long upon your patience, especially as I find the paper to contain so many points that might be discussed. There is, however, one question I should like to ask, and that is as to the assertion that cholera is localised at Murree and Simla in the Himalayas. It would appear to me, from my memory of service in that part of the world, that cholera could scarcely be said to be localised there. That it occurs there I am sorry to admit, but I am disposed to think it is not indigenous,—at any rate, I hope not. I should like to ask Dr. Gordon whether there is any positive proof of the assertion that cholera may be considered as localised at a great elevation?

The CHAIRMAN.—As the hour is getting late, and as Dr. Gordon has been asked a good many questions, I will not burden him with many more. Still, I suppose that, being in the chair, I am expected to say something. First of all, let me say how much I admire and value this paper, which

contains so many points of interest. As one of the speakers has said, it is about almost everything. There are several points on which it touches that are peculiarly interesting to me, and at any other time—even at the risk of repetition—I should like to discuss them; but, as I cannot do so now, I will merely allude to one or two. I do not consider that pathology, or therapeutics, or anything relating to disease, would have added to the interest of the paper. In fact, such subjects would have been out of place in this Society, and Dr. Gordon had too much good sense to introduce them. The paper has been written from an ethnological, physical, geographical, and climatic point of view, the latter being the gravamen of what is put before us. The question of the suitability of the Anglo-Saxon race for the position it occupies on the great continent of India is a curious and interesting one. In that peninsula, which looks so small on the map, but which really is so large, we are called on to rule two hundred and fifty millions of people, a huge portion of whom are indigenous races—not all indigenous, but importations, like ourselves, of the Aryan stock. We both set out at the same period, one wandering east and the other west. Those of the west have at last joined those of the east again; but how different are the two at the present day! The speaker to whom I have referred said he thought the supremacy of our race over the other was now maintained merely by physical attributes; but I think that this is most undoubtedly not the case, or we should not be holding India at the present time. Physically superior we are, no doubt; but it is not due to physical superiority, but rather to moral and intellectual superiority, that our hold on that country is maintained. How does it come about that Europeans, belonging to the great Aryan race, have become so intellectual and highly cultured, while our ancestors were but painted savages when the Indian people, constituting another Aryan branch, were in possession of the highest culture then existing on the face of the earth? This, no doubt, is greatly due to the effect of climate. The question that interests us now is—Can this European branch of the Aryan race, which has gone to the east, people India and colonise it? Can the race which has colonised so many countries—which has taken so firm a root in Australia and America, and in numerous islands elsewhere—do the same in India? As far as we know at the present time—irrespective of plum-pudding and bottled beer to which allusion has been made—I am afraid it cannot. But still there are great regions in that country along the great chain of mountains, 15,000 to 29,000 feet high, which is shown on the map before me—a range 150 miles in breadth and 400 miles in length, where, on a plateau of from 4,000 to 7,000 feet above the sea, there are districts which the European race may, no doubt, in time colonise. With regard, however, to the greater part of the country, there is nothing to lead us to believe that beyond the third generation the European race, unrecruited from home, could continue to exist. This is one of the great points of interest that I should have liked to have heard developed further by Dr. Gordon; but I do not know how he could have done much more, for he has told us most of what is

known about it. There is another point which has occurred to me, and that is as to the disappearance of races, or rather of large portions of the population from some of the great districts of India. In the north-west corner of India, where Rajpootana and the Punjaub are shown on the map, we have what is called the great desert of India—a region in which we find enormous plains of sand—unproductive districts, with scarcely any population in many parts, and with a rainfall in some years of only three, four, five, or six inches, while in some parts there is absolutely no rainfall at all; and yet in other districts the rainfall is as much as six hundred inches yearly, there being no great difference in the proximity of the hills, and no very great difference in the distance from the sea. One of the causes of this phenomenon has been the deforesting of large tracts of country referred to by Dr. Gordon, who has told us that rivers which once existed have greatly decreased in size; while one historic stream, the Suruswattee, flowing from the southern slope of the Himalayas, degenerates into a series of pools, until, at last, it is entirely merged and lost in the sand. A few years ago I was passing through the Suez Canal, which, as you are aware, was cut through a desert, and while walking on the quarter-deck of the steamer I remember saying to a person who accompanied me, “What is the meaning of those little runlets, those grooves or gutters which I see along the steep sides of the banks? This is a rainless country.” But the reply I received was: “No, it is not. Rain falls here now occasionally.” This rainfall and vegetation along with it had been brought there by the very fact of cutting the Canal.* We have instances of the reverse of this in India, produced by the removal of forests from districts which were the early seat of civilisation in that country. It was a populous country, but is now a desert. There are many other subjects that I should like to allude to, but must not detain you any longer, and will now call upon Dr. Gordon to reply.

Dr. GORDON.—As a remark has been made to the effect that I have not said all that I might have on the subjects upon which I have touched, I should state that my paper was restricted to one hour in length, and of course, I selected and condensed my subjects accordingly. There have been many remarks made to which, in the short time now at my disposal, I shall be unable fully to reply; but I will do the best I can. Beginning with some of the later speeches, I would refer to a current idea that, if hygiene began at the time of Chakrata, it does not seem to have advanced very much; but, according to the statement I quoted, the condition of the country in the time of the Aryans was such that there were no epidemics,—or they were of very rare occurrence,—while it is said that men lived on an average to the age of one hundred years. Making allowance for a little freedom of expression, it may be inferred that the great majority

*The rainfall at the close of 1880 was so copious, that the verdure which sprang up in the neighbouring desert gave it quite a green appearance.—Ed.

of the people lived to a very old age. Another point to be considered is the condition of the people in those days as compared with what it is now. There are many lives preserved now that would not have been preserved then ; but I take it that the race of men was much superior in those days to what it is now, and, if I have not misinterpreted the conditions that now exist, I should say that hygiene is carried to such an extent that, although mortality, as shown in statistics, is favourable to us, it gives no criterion of relative physique. I think I may express my belief that physique has not increased to the extent one might be led to suppose by reading the rates of mortality. With reference to the remark made by Dr. Longhurst as to seasonable weather and disease, every person knows perfectly well that certain diseases prevail at particular seasons, and that, if any great irregularity in the seasons takes place, disease is certain to occur. This is, perhaps, more particularly the case in India and other tropical countries, where the variations of climate are almost sure to be followed by outbreaks of disease. With regard to the localisation of cholera at Simla and Murree, I may say that some years ago that disease had not reached either place, but now it visits both those stations with unfortunate frequency. As to the applicability of the actual expression "localised," I am not quite sure how far it is justified ; but what I meant by it was, that whereas both those stations were formerly notoriously free from cholera they are now notoriously subject to it. Sir Risdon Bennett has referred to the capacity of the natives of India with regard to the future occupation of the country. I am afraid that on this point I must have made myself imperfectly understood, because the classes to whom I alluded as not being, so far as my opinion goes, capable of advance, includes those who live in the swampy parts of the tropics, the dense jungles and unhealthy tracts, as of the Gaboon for example, and not the natives of India as a whole. As to the chances of British colonisation in India, that is too large a question for me to take up further than has already been done by our worthy Chairman. It is an exceedingly interesting and at the same time an exceedingly difficult question. It is commonly said that the children at the Lawrence Asylums in the Himalayas and elsewhere are exceedingly healthy, but it is quite certain that the greatest care is taken of them ; and although, as our Chairman has remarked, we may hope that colonies of British people may become established in the hilly regions, still it very much depends on how far the experience both of these schools and of our soldiers in India will justify our being very hopeful on this point. Several allusions have been made to the mortality of our soldiers in foreign climates, and a good deal has been said about the way in which the English stick to their beef and beer. I find that the different races along the same lines of latitude and longitude live quite differently, and that their manner of life depends upon the natural conditions and productions of the earth, as well as on their habits. The soil in one part of the world will not produce the same cereals that are grown in another part, and even along the same line the natives live very differently. Take, for instance, the line of the tropics, including

America, Africa, India and China, and see how differently the people live. On the coast of Guinea, where I myself have served, the natives take as much beer, and beef, and rum as they can get, but if you go to Ceylon you will find that the people live almost entirely on grain and fish. And if you take Singapore, and so on, you will still find that the line of latitude is no criterion as to the food the people live on. And there is another thing to be remembered with regard to the British race. We must recollect that our soldiers and sailors are British. If they were Indians, of course they could live as the Indians do; but as British people they naturally retain the habits that are natural to the British race, and I think many of us will admit that, when we go to the hotels on the Continent, the change of food very soon upsets us. A remark was made as to the comparative adaptability of the native African troops and the British regiments to the climate of the West Indies. That the black troops suffer more than the British under certain circumstances is a fact not only shown in the statistics, but well known to the experience of any one who has served with them as I have. Take the note to section 28 of my paper. The averages are for the ten years previous to 1879, and the ratios are per 1,000 of the white troops admitted to the hospitals were 911; of the Africans, 1,047, showing that there is a great deal more sickness among the natives than among the whites. Then the deaths among the white troops were eleven per 1,000, and among the blacks nineteen per 1,000. Then there were invalided nineteen whites and twenty-seven blacks; constantly sick, forty-one whites and fifty-four blacks; and yet the one set of troops was in a foreign climate, and the other more or less in a climate that was natural to them, while with regard to hygiene there is as much care bestowed on the black troops, whether Asiatic or African, as there is on the British. As to the difficult and complicated question of colonisation, there is a peculiar race of comparatively new inhabitants, in what is perhaps the most unhealthy part of the Terai, at the foot of the hills—a people, called the Taroos. They have been there for about two hundred years; but, although the mortality among them was very great at first, they now seem to be absolutely proof against the prevalent malaria. They are, moreover, the most drunken and dissipated set of people to be met with in that country. Although when I read this paper it was my desire to avoid purely professional matters, nevertheless, as one speaker has made some special remarks from a rather professional point of view, I hope that I may be allowed to give my reply,—I refer to what has been said with regard to M. Pasteur's theories. I suspected, when I wrote the part of my paper referred to, that something of this kind might happen and, therefore, rather than express my own views upon the subject, I have brought with me an authority which I desire to cite. According to the report of a Commission appointed by the Hungarian Government, animals that have been inoculated according to Pasteur's method, if rendered "proof" against artificial charbon, died in increased numbers by other diseases. It is also a question how far the flesh and milk of such animals remain wholesome as articles of human food. In France,

recent inquiries render it doubtful whether this "inoculation" really is protective against epizootic charbon. They further point to the period of "protection" being restricted to eight months. Inasmuch, therefore, as the disease in question only prevails naturally during the months of April to October, any "protection" that is to be looked for appears to have reference only to that period in one year. On the subject of "germs" it is stated by an eminent authority, a copy of remarks by whom I hold in my hand, that the "germ theory" is, in itself, insufficient to account for the phenomena of diseases assigned to it, that "poisons" are secreted by the body itself in disease, that they are formed from within, not without the body. In reference to the same theory, the medical journal now in my hand raises a note of warning against its too ready acceptance. Having epitomised the arguments for and against this theory, it concludes thus:—"We are either on the threshold of a most important discovery, or we are being entangled in the meshes of a gigantic delusion." Time will not permit of my replying to other remarks that have been made upon my paper.

The meeting was then adjourned.

REMARKS UPON SURGEON-GENERAL GORDON'S PAPER.

Surgeon-Major SMITH, 1st G.E.V., writes:—

Bristol, March 17, 1882.

In the main, I agree with Surgeon-General Gordon's well-expressed views of the relation of climate to organic nature; nor can the importance of the subject-matter of his paper be over-estimated, not only as to the physical effect of climate upon man, but as to its mental and moral effects also.

As to the physical effects, we know that the Giver of all Good has fitted the back for the burden, and that "use is second nature" (after vice), and although we know well that Nature's laws cannot be violated with impunity, yet, now and then, she condones the offence and adjusts the matter by the law of accommodation; *e.g.*, the "native" inhabitant lives and thrives upon a diet, and under circumstances connected with his climate, which, to a stranger placed under the same conditions, means, in many instances, speedy and inevitable death. Yet, if the stranger survives, marries, and begets children, the children born upon the soil suffer less than the father did from climatic causes; their children, again, still less than their fathers, until, at length, succeeding generations enjoy the privileges and immunity of the children of the soil, Nature having, in fact, accommodated her offspring to altered states by a gradual process of acclimatisation.

As to the mental and moral effects of climate upon man, I believe it has passed into a truism that the passions of men and women living in hot climates are more easily excited and less readily allayed than those of the inhabitants of colder regions; that life is held at a cheaper rate; and that, often, immediate recourse—upon comparatively slight irritation—to lethal weapons in hot countries, is the rule rather than the exception, cannot be denied.

May not this be due to the cumulative influence of solar heat, producing a latent irritability of the brain and nervous system, which manifests itself on the occasions referred to with sudden, unexpected, and uncontrollable explosive force?

Finally, as a believer in the prophylactic effects of the growing *Eucalyptus globulus*, I would ask :—

May not these so-called malarial fevers, which are said now to have obtained a footing at Ootacamund, be due to water contaminated with organic impurities, or infested with living organisms, which, taken into the stomach, may escape the action of its solvent secretions, pass into the circulation, and produce symptoms analogous to those of malarial fevers ?

The presence of cholera there certainly lends colour to the assumption.

Mr. HASTINGS C. DENT writes :—

There is one sentence in Dr. Gordon's paper to be read next Monday which I think needs qualifying.

At the end of Section 35 :—"Insects are adapted to a very limited range of climate."

I will only give one instance, which tends to show that this is not in every case according to observation :—

The Butterfly *Pyrameis Cardui*, or Painted Lady, is found all over the world, with the exception of South America, where an allied species takes its place. This insect is absolutely invariable, absolutely similar wherever it occurs. I have now before me specimens from Shetland Islands, England, Cape of Good Hope, and India, all exactly similar. Near Hudson's Bay it is also unchanged.

Pyrameis Cardui and *P. Atalanta* (the Red Admiral) are generally found in company, but, while in most cases constant in form and markings, *P. Atalanta* varies more than *P. Cardui*. For instance, near Hudson's Bay, *Atalanta* varies slightly from the general type. In India, *P. Atalanta* is not found, but we discover there an allied species, *P. Indica* or *Callirrhoe*, which insect, though bearing a striking general resemblance to *P. Atalanta*, has on some portions of its wings markings similar to *P. Cardui*, in company with which butterfly it is there discovered.

P. Callirrhoe appears, therefore, an intermediate form between *P. Atalanta* and *P. Cardui*, though, as I have stated, the former is not found in India.

Dr. Gordon says very truly, on Section 24, that the occasional phenomenal abundance of insects, at other times scarce, is unaccounted for. *P. Cardui* is a case in point ; some years—for instance in 1881—it is so abundant as to be almost a plague, while frequently the next year it is almost unknown in the locality. I may also mention the beautiful *Chardeas graminis*, the Antler moth, a local insect, which last year occurred in such abundance on Pendle Hill, Lancashire, as to be a source of great alarm to the agriculturists ; millions of the larvæ were destroyed.

I consider Dr. Gordon's paper a very useful one, and it will, no doubt, give rise to an abundance of confirmatory evidence.

REPLIES BY SURGEON-GENERAL GORDON, C.B.

In reply to the remarks by Surgeon-Major Smith, I would observe that there is no evidence whatever to support the theory that "malarial" fevers at Ootacamund are due to any other causes than such as are local or climatic in their nature. I would further say that neither impurities, organisms, nor germs, although carefully sought for in India to account for fever in that country, have been definitely proved to be connected with that form of

disease, in the relation of cause to effect. Nay, more, that the tendency of recent inquiries to seek for such causes, to the relative neglect of such as were by the older medical officers acknowledged as sufficient, namely, season, climate, age, habits, and temperament, have led to very grave and important results. For example, recent statistics show a very serious increase in the rate of mortality by fevers among our troops in that great country.

In reference to the remark by Mr. Dent, I have only to observe that the smallness of the exceptions to the limited range of insects, noticed by that gentleman, shows how very general in its application is the rule alluded to in Section 24 of my paper. The remark by Mr. Dent in reference to the occasional abundance of the insects mentioned by him is valuable. It points to the importance of observations to be instituted on the subject, and it indicates how profitable a field for investigation this branch of natural science presents.

ORDINARY MEETING, DECEMBER 4, 1882.

H. CADMAN JONES, ESQ. IN THE CHAIR.

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

HON. FOREIGN CORRESPONDENT :—Professor L. Pasteur, F.R.S., Paris.

MEMBERS :—The Right Rev. H. H. Parry, D.D., Bishop of Dunedin ; T. A. M. Gennoe, Esq., India ; J. Stevenson, Esq., B.M., L.R.C.S.E., Ceylon ; J. Williams, Esq., Wales.

ASSOCIATES :—R. H. Bromby, Esq. (life), Victoria ; Rev. W. T. A. Barber, B.A., C. C. C., Richmond ; Rev. H. S. Davies, New Zealand ; Rev. M. G. Goldsmith, India ; Rev. E. Hicks, B.A., Stoke-on-Trent ; A. H. Jones, Esq., Sydenham ; Rev. J. G. Neild, New South Wales ; C. Palmer, Esq., Q.C., Canada ; Rev. T. Phillips, B.A., West Africa ; Lieut. the Hon. H. N. Shore, R.N., Greenock ; Rev. A. Thomson, A.M. D.D., Constantinople ; Rev. H. W. Taylor, New South Wales ; Ven. Archdeacon W. N. Willis, New Zealand ; Lady K. R. Barker, Gloucester.

Also the presentation of the following Works for the Library :—
 “ Transactions of the Royal Society.” 1751 to 1799. *From Rev. Sir T. H. B. Baker, Bart.*

A paper “ On the Testimony of the Cuneiform Texts to the Antediluvian period of the Mosaic History,” by the Rev. O. D. Miller, D.D. (United States) was then read. A discussion of a general character ensued, after which the meeting was adjourned. Communications were afterwards sent in by Professor Sayce, and other leading Assyriologists, and, as the ancient records just discovered by Mr. Rassam, one of the Institute’s Members, throw much light upon the question, the publication of the paper is necessarily postponed.

ORDINARY MEETING, JANUARY 1, 1883.

REV. R. THORNTON, D.D., VICE-PRESIDENT, IN THE CHAIR.

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

MEMBERS :—The Right Rev. the Bishop of Christ Church, New Zealand ; E. Bailey, Esq., London ; A. Ellis, Esq., United States ; E. W. Foster, Esq., M.R.C.S., Darlington ; T. Gorringe, Esq., Tasmania ; Surgeon-General C. A. Gordon, C.B., London ; R. J. Hammond, Esq., London ; J. Meigs, Esq., M.D., United States ; Captain J. L. Philp, Bath ; J. E. Thomas, Esq., F.G.S., Wales ; Rev. J. A. Worden, United States ; Rev. J. M. Wilson, M.A., F.R.A.S., F.G.S., Clifton ; Rev. A. J. Harrison, D.D., Waterfoot.

ASSOCIATES :—Rev. H. Ashe, A.B., Ireland ; Rev. W. S. Bean, New Zealand ; Rev. F. H. Baring, M.A. (life), India ; Rev. F. Ballard, M.A., Birkenhead ; Rev. F. B. Boyce, New South Wales ; W. G. A. Bonwill, United States ; W. D. Bosanquet, Esq., Ceylon ; Captain J. E. Broadbent, R.E., India ; The Very Rev. Dean Cowper, M.A., New South Wales ; Professor J. C. Dalton, M.D., United States ; J. Davies, Esq., Cape of Good Hope ; Rev. H. Hutchins, A.M., Ireland ; Rev. E. G. Hodgson, M.A., New South Wales ; Rev. W. Harper, M.A., New Zealand ; J. B. Johnstone, New South Wales ; Professor N. T. Lupton, M.D., LL.D., United States ; D. Larnach, Esq., London ; H. P. Malet, Esq., Italy ; Rev. H. F. Maitland, M.A., Norwich ; Venerable Archdeacon Moule, B.D., China ; J. Postlethwaite, Esq., F.G.S., Cumberland ; Rev. Canon Sheldon M.A., Ormskirk ; Rev. J. Spooner, New South Wales ; Rev. C. B. Savage, M.A., Isle of Man ; Miss E. Warrington (life), Worcester ; Miss F. W. Shepherd, California ; Rev. C. H. Waller, D.D., London.

HON. LOCAL CORRESPONDENTS :—C. Meldrum, Esq., M.D., F.R.S., Mauritius
M. A. Morrison, Esq., Tifis ; Professor Woker, Switzerland.

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

"Proceedings of the Royal Society."	<i>From the same.</i>
"Proceedings of the Royal Institution."	<i>From the same.</i>
"Proceedings of the Royal Geographical Society."	<i>From the same.</i>
"Proceedings of the Royal Colonial Institution."	<i>From the same.</i>
"Proceedings of the Geographical Society."	<i>From the same.</i>
"Proceedings of the Smithsonian Institution."	<i>From the same.</i>
"Proceedings of the Geographical Society of the Pacific."	<i>From the same.</i>
"Proceedings of the Tokio Universal Science Department."	<i>From the same.</i>
"Guesses at Purpose in Nature," by W. P. James, Esq.	<i>From the same.</i>
"Homiletics," by Professor Hoppin.	<i>From the same.</i>
"Phrenology," by Professor S. E. O'Dell.	<i>From the same.</i>

Smaller works by the Bishop of Madras, the Rev. J. M. Wilson, and J. Du Boulay, Esq.

ON THE ARGUMENT FROM DESIGN IN NATURE,
WITH SOME ILLUSTRATIONS FROM PLANTS.
By W. POWELL JAMES, M.A.

PART I.

THE argument from "Design" or from "Final Causes" has been used with such latitude, that I shall begin with stating the strict limitations under which I propose to consider it. In the first place I am concerned only with its application to the Natural World as presented to our senses, and I wish to exclude the more difficult questions which arise upon its extension into the moral and spiritual sphere. And, secondly, I may as well lay down at the outset the following proposition as expressing the doctrine in the form in which I am prepared to defend it. In the external world there are marks of Intelligence as shown by Order and Purpose, and from these marks we may infer with great probability the existence of an Intelligent Person, outside of and above Nature, who is the Source of this Order and Purpose. Even when thus limited the subject is so vast, that any attempt on the part of one man to pursue it into all its branches can only end in vague generalities and rhetorical declamation. For this reason I shall draw my illustrations almost exclusively from the Vegetable Kingdom.

2. Before, however, adducing those arrangements in Plant-life which I venture to consider as indicating Design, a few words may be devoted to some common misconceptions of the doctrine. Simple as the kernel of the argument is, both advocates and opponents have mixed it up with wider questions. Especially has it been identified with two theories about the world, with which it has no necessary connexion. I allude (1) to the old notion that all things were made for man; and (2) to the biological assumption that all species of animals and plants have been created separately and independently. Let us take these two subjects in their turn in their relation to Final Causes.

3. The assertion that all things exist for man may be considered as an exaggeration of the true doctrine of Design, which, like most exaggerations, has thrown discredit on the whole line of argument. Cicero, in the Second Book of the *De Naturâ Deorum*, expounds this view in its extreme form. Man was made the centre of the universe. Every phenomenon

was estimated with reference to his needs and convenience. Even the motions of the sun, moon, and stars were partly intended to afford him a pleasing spectacle. The sheep's wool was designed to clothe him, the dog to watch his flocks, the ox to plough his fields, the swine to feed him, wild animals to give him hunting exercise. Janet, in his masterly work on *Final Causes*, to which I acknowledge once for all my great obligations, has given some delicious instances of similar reasoning from Bernardin de St. Pierre (quoted by Biot, *Mélanges*, tom. i.): "Dogs are usually of two opposite colours, the one light and the other dark, in order that wherever they may be in the house they may be distinguished from the furniture, with the colour of which they may be confounded. Wherever fleas are, they jump on white colours. This instinct has been given them that we may the more easily catch them." It was very easy to ridicule this high-handed assumption; the following passage of Montaigne (*Essays*, ii. 12) will serve as a specimen of such criticism: "Why should not a gosling say thus: All the parts of the universe regard me; the earth serves me for walking, the sun to give me light, the stars to inspire me with their influences. I have this use of the winds, that of the waters; there is nothing which this vault so favourably regards as me, I am the darling of nature. Does not man look after, lodge, and serve me? It is for me he sows and grinds: if he eat me, so does he his fellow-men as well; and so do I the worms that kill and eat him." Now, this "exquisite fooling" of the great sceptic only assaults the exaggerated theory which sets man in the centre of the universe. It is no answer at all to the assertion that in the goose its eyes were made to see with, its lungs to breathe with, and its wings to fly with. Even now the primitive tendency to exalt man lingers in cultivated minds. People still confuse Design with our appreciation of it. Is it not possible for an animal or plant to have been planned solely with a view to its own well-being and without the slightest reference to man, as in the case of the deep-sea Fauna and Flora? The marks of Intelligence are not the least affected by not being recognised. A book is not less a book for not being read. After these deductions, we may freely admit that there is an appreciable element of truth in the human point of view when limited by good sense. To say that the sun was made to give light to the world and man is an imperfect but not a false representation of solar activities. I am now confining myself to the platform of facts and inferences, and ignoring theological speculation. From a scientific point of view it is true that

each animal and plant is best regarded as existing primarily for its own benefit. This isolation, however, is a mere act of the intellect and has no place in nature. Nature knows nothing of self-contained organisms; what she has to do with is a vast network of living things bound more or less to each other and to the inorganic world by an intricate web of mutual relations. Man has a pre-eminent place in this network. If it is false to say, "All things were made for man," it is equally false to say, "Nothing was made for man." From a purely biological point of view the advent of Man was the greatest event in the natural history of the globe. What species except man has domesticated a long list of other animals, and changed the face of the dry land by cultivation of useful plants? Any geologist would admit that the facts of his science are in accordance with the theory that preparation was made for man. So that, in a higher and general sense, the planet may reasonably be said to have been adapted for Man before Man appeared. But I hardly consider this so much the Argument from Design as a far-reaching corollary from it which requires caution in its application.

4. Let us now proceed to the other theory which is supposed to be indissolubly bound up with Design; I mean the scientific dogma, sometimes called that of special creation, but which would be better named that of the separate or independent creation of distinct species. Many opponents of Design seem to think that they are arguing against it when they are really arguing against the separate creation of species. This is a strange misconception arising from a narrow notion of Purpose in Nature. To begin with, such a line of objection does not touch the inorganic world where there are no species in the proper biological sense of the word, and where marks of Design are very evident. Again, supposing, for argument's sake, that species have originated by variation through unknown causes from pre-existent species, such variations can be conceived to have taken place according to a strictly pre-ordained scheme. In other words, there is nothing in the nature of things to prevent a Theist from combining a form of Evolution with Purpose or Ends. One thing, however, is certain, that he cannot look upon Natural Selection, acting upon the superfluous fecundity of Nature, as a key to the riddle, for, if Natural Selection can modify organs, it cannot create them. If some form of Evolution be the true account of Creation, it is not that form of it which derives its sole motive power from Natural Selection. The mode of Creation must always remain an inference, as it is removed from the sphere of observation and experiment. On

this difficult question I would only throw out as mere suggestions the following remarks :—

(I.) In the Scriptural account only one species is described as independently created; the others are brought on the stage of life in masses.

(II.) The somewhat scanty evidence in Nature seems to point to the conclusion that species have been developed from pre-existent species by means as yet undiscovered. Consider, for instance, the enormous number of allied species in the *Compositæ*. What are we to say to the Genus *Senecio*, with 900 species? It is very hard to think that such a vast series of forms insensibly passing into each other have been the objects each of a separate creative act. An Entomologist could probably give equally striking instances from his department; as, for instance, the *Noctuæ* among moths, and the countless beetles estimated at 100,000 species.

Here too comes in the development of the Parasites, both animal and vegetable. It seems impossible to believe that they were originally created as they now are, dependent for their existence on their present hosts or nurses. The parasitic habit is almost universally looked upon as an acquired one, wonderful as are the changes it has brought about. Another series of facts pointing in the same direction is found in the numerous cases of rudimentary or disused organs. To confine myself to plants, Cacti and many similar succulent plants certainly suggest to a Botanist the idea that they have lost their leaves, Broomrapes that they have lost their stems as well. Supposing, however, such a view to be established, I am at a loss to conceive how the argument for Design is thereby weakened; I should have thought, on the contrary, that the disuse of unnecessary organs, and the substitution of new adaptations in their place was a striking proof of Divine Wisdom.

But an advocate of Design may reasonably refuse to entertain the subject of creation at all. He may say, Species actually exist, or, if you prefer not to use that word, individual animals and individual plants exist. Supposing we disregard for the present any theory of their origination, and examine their present structure. If the eye, the heart, the wing of animals, the flower and leaf of plants offer evidences of contrivance, those evidences are not affected by the manner in which the species became what they are. The creation of an atom is as inconceivable as of a planet; inconceivable, but not impossible or incredible. For the laws of real existence by no means coincide with those of human thought. Many things

exist which are to us inconceivable; many processes take place which our intellects cannot grasp.

5. One other objection to Design deserves a few words, that which condemns it at the very outset as an anthropomorphic conception. It is true, the supporters of this view say, that if we come across a boat on the sea-shore we are justified in inferring that it was made for a purpose; and we know by experience that man is the only creature on this globe capable of thus making it. But it is not so with a natural object, as, for instance, a crab or a sea-weed. They were not made, but grew. They are descended from a long line of ancestors. In the course of time they have acquired their present adaptations which have only the appearance of design. In ascribing their production to a Maker acting with a definite purpose before Him, we are projecting our own personality outside of ourselves, ascribing human faculties and human aims to a Being who is not human.

To this it may be replied, that if this is justly called anthropomorphism then anthropomorphism may be claimed as being at the same time inevitable and true. But is it not an abuse of language to employ the word in this sense? There are two genuine kinds of anthropomorphic representations: (1) the frankly material conceptions of the old mythologies, as in Homer; and (2) the vivid language of poetry, as in the Psalms. Neither of these need detain us. But, when the bare ascription of Personality to God is described as anthropomorphic, it is simply an unfair way of stating a metaphysical difficulty, for it assumes it as proved that God is not a Person. All our conceptions of the Divine Being are inadequate, but they are not for that reason false. How can we transcend the limitations of our consciousness? How can we think of any thing except according to the laws of thought? But it does not thence follow that our knowledge is not knowledge because it is conditioned. So with reference to our representation of God as a Person. Personality is our highest attribute, that which makes an impassable gulf between ourselves and the rest of the animal series. The Agnostic may say you make God a Person because you are a person. May we not reply, the converse is also possible, *God has made us persons because He is a Person*. Our will, intellect, and affections are faint adumbrations of the divine attributes. The human soul, dimly conscious of its affinity to the Divine Nature, instinctively believes in a Being who possesses, in perfection, the Power, Wisdom, and Goodness which we possess in the imperfect manner of finite natures. To put it on the

lowest ground, the latter alternative is quite as probable as the former.

6. A few words more on the limits under which alone the argument from Design is tenable. Many of its opponents imagine that it ought to assign a purpose for every thing under the sun. This is a most unreasonable demand. It totally ignores the imperfection of our knowledge, the finite range of our faculties. We must be content to remain ignorant of much, especially of the higher Final Causes. What is the Purpose of Comets? We admit our ignorance. What is the Final Cause of Saturn's rings, of double stars, of the varying inclination of planetary axes to the plane of the ecliptic, of a thousand other phenomena in the visible world? A sober thinker admits at once that these questions are beyond our ken: it was such final causes as these that Bacon ought to have condemned as *misleading*. In the same way I do not know that any judicious advocate of Design asserts that an "organism is launched directly at a purpose," as Professor Huxley curiously puts it; what we assert is, that *organs* aim at a distinct end, not *organisms*,—an important distinction. Many Final Causes are thus totally beyond our range; but that is no reason why we should shut our eyes to those which lie obviously in our path. Yet Materialists argue in this way: If you can show no purpose in the desolate planets and their superfluous moons, you must not talk to me about the eye.

7. From the nature of the case the argument from Design must be denied by certain schools of thought as it is fatal to their fundamental theories. The Agnostics cannot be expected to admit it, or they would, by doing so, cease to be Agnostics. I have not myself read Herbert Spencer, so I will quote the estimate of his ultimate tendency from a critic whose impartiality and ability are universally recognised, Paul Janet: * "All Mr. H. Spencer's scientific apparatus, the whole mass of these examples accumulated to satiety, all that mechanical and dynamical terminology, can neither mask nor relieve this low and common result, the only one that can be disentangled from these diffuse amplifications; namely, that organic forms are the product of fortuitous combinations of matter. And no other hypothesis is possible: hence any internal or external directive principle is rejected. The fortuitous is the veritable artist, the seminal agent of nature." Materialists again of Haeckel's school are *ex hypothesi* incapable of fairly con-

* *Final Causes* (Eng. trans., p. 313).

sidering the argument from Design. For, simple as it sounds, if once admitted, it shatters to fragments the ever-shifting systems of the universe which recognise only Matter and Force. Great then is the bitterness with which the Materialists assail teleology. We may fairly ask why are they so envenomed on this subject, so incapable of judicial calmness? Is it because of the lurking suspicion that, do what they will, the argument is indestructible? A man reads volume after volume of wordy and hazy disputation, in which the meaning is usually in inverse proportion to the length of the words in which it is disguised; he then goes out into the fields, he picks up a butterfly, a beetle, or a flower, and all the arguments against Design seem to melt away like the mist before the sun. He thinks of Tennyson's lines about a sea-shell:—

“Frail, but a work divine,
Made so fairly well
With delicate spire and whorl,
How exquisitely minute
A miracle of design!”

In concluding these introductory remarks, I do not claim for a moment that the argument from Design amounts to demonstration. It is logically a high probability; it is an instinctive, deep-seated conviction, produced by the observation of countless particular instances, and it is, moreover, a reasonable conviction which admits of defence. But as an argument its value is that of a high degree of probability, an approach to demonstration which certainly cannot be predicated of any material explanation of the universe.

PART II.

8. Let us now advance to some of the arrangements which appear to indicate Design in the Vegetable Kingdom. First and foremost comes the great office of plants, that of supplying food to the animal world. On this planet we know by observation that animals are so constituted that they cannot feed exclusively upon inorganic materials,—upon air, water, and minerals. No instance has yet been known of an animal, an undoubted animal, which exists upon such food. Here comes in the function of the Vegetable Kingdom. Standing between the mineral and animal world, it manufactures food out of the former in order to supply the wants of the latter. As this generalisation is the most important point in my paper, I shall cite three eminent scientific men to show that there is no tendency whatever at the present day to call it

into question. Asa Gray, in his *Structural Botany*, p. 1 (6th ed., 1882), says: "We cannot distinguish the vegetable from the animal kingdom by any complete and precise definition. Although ordinary observation of their usual representatives may discern little that is common to the two, yet there are many simple forms of life which hardly rise high enough in the scale of being to rank distinctively either as plant or animal; there are undoubted plants possessing faculties which are generally deemed characteristic of animals; and some plants of the highest grade share in these endowments. But in general there is a marked contrast between animal and vegetable life, and in the part which animals and plants respectively play in nature. Plants only are nourished upon mineral matter, and upon earth and air. It is their peculiar office to appropriate mineral materials, and to organise them into a structure in which life is manifested—into a structure which is therefore called organic. So the material fitted for such structure, and of which the bodies of plants and animals are composed, is called organic matter. Animals appropriate and live upon this, but have not the power of producing it."

I will give another extract from Julius Sachs, *Text-book of Botany*, p. 120, 1st ed. (translated by Bennett and Dyer). After observing that it is an unquestionable fact that most plants which contain chlorophyll obtain the entire quantity of their carbon by decomposition of atmospheric carbon dioxide, and require for their nutrition no other compound of carbon from without, he goes on to say:—"Even the food of Fungi, which are parasitic in and on animals and plants, is derived from the products of assimilation of plants containing chlorophyll, inasmuch as the whole animal kingdom is dependent on them for its nutrition. The compound of carbon originally present on the earth is the dioxide, and the only abundantly active cause of its decomposition and of the combination of carbon with the elements of water is the cell containing chlorophyll. Hence all compounds of carbon of this kind, whether found in animals, or in plants, or in the products of their decomposition, are derived indirectly from the organs of plants which contain chlorophyll."

Let us now hear Dr. Carpenter, *The Microscope* (2nd ed., p. 433): "A more positive and easily-defined distinction (*i.e.* between Animals and Plants) lies in the *nature of the aliment* of the Protophyta and Protozoa respectively, and in the method of its introduction. For, whilst the Protophyte obtains the materials of its nutrition from the air and moisture that surround it, and possesses the power of detaching oxygen, hydrogen, carbon, and nitrogen from their previous binary com-

binations, and of uniting them into ternary and quaternary organic compounds (chlorophyll, starch, albumen, &c.) the simplest Protozoon, in common with the highest member of the animal kingdom, seems utterly destitute of any such power, and is dependent for its support upon organic substances previously elaborated by other beings. But, further, the Proto-phyte obtains its nutriment by mere absorption of liquid and gaseous molecules, which penetrate by simple imbibition; whilst the Protozoon, though destitute of any proper stomach, makes (so to speak) a stomach for itself in the substance of its body, into which it ingests the solid particles that constitute its food, and within which it subjects them to a regular process of digestion. Hence these simplest members of the two kingdoms, which can scarcely be distinguished from each other by any *structural* character, seem to be *physiologically* separable by the mode in which they perform those actions wherein their life most essentially consists."

Again, in his *Animal Physiology* (ed. 1859), p. 144, he observes:—"The nature of the food of animals is as various as the conformation of their different tribes. It always consists, however, of substances that have previously undergone organisation. . . . There are many instances in which, no obvious supplies of food being afforded, the mode of sustenance is obscure; and it has been frequently supposed that, in such cases, the animals are sustained by air and water alone. But it will always be found that, where food is taken in no other way, a supply of the microscopic forms of animal or vegetable life is introduced by ciliary action; and it is on these, indeed, that a large proportion of the lower forms of aquatic animals depend entirely for their support."

These testimonies will suffice for the fact; let us now try to set before our minds its significance. Let us try and get rid of the deadening effect of our familiarity with it. In making war one main point is admitted to be the feeding of the army. In nature the main point is obviously the same. When you have peopled a planet with varied forms of life, the most pressing question is, how are they to be fed? And this is answered not by an aggregation of dead nutritive matter, which must be exhausted sooner or later, but by the constant processes of growth, by a living laboratory incessantly engaged in manufacturing food. There is something grand and overpowering in this unceasing universal toil, carried on, if we regard the planet as a whole, without a moment's intermission, from year to year, from century to century. Not only does this activity go on in favourable places, on plains and hill-sides; but in the sea, in lakes and rivers, on the verge of eternal

snow, on the thin soil that covers ice-cliffs, on the burning sands of Africa, on the parched and rough lava-rocks, in the boiling water of mineral springs. On this function of plants the life of the whole animal world ultimately depends, and, if we rest on the uniformity of nature, has depended through all past geological ages. Do we often give its full weight to this fact as evidence of a great plan in nature? Here are the two series of animals and plants, standing, on the whole, on different planes of existence. For, however much a few microscopic animals and plants seem to approach each other, any candid reasoner will allow that the vast majority of animals,—all the vertebrates, for instance, all the insects, all the crustaceans,—occupy an altogether different sphere of being from trees, shrubs, and grasses. I repeat, then, here are the two series of organisms bound together by one general bond, which on further examination resolves itself again into myriads of particular bonds between particular plants and particular animals. And we are asked to believe that there is no prescience, no pre-established harmony, no benevolent care in all this! Supposing the world were developed according to blind unconscious forces from a fiery haze, what were the chances that plants and animals would have been developed *pari passu* with an accommodating reference to each other's welfare? The materialist assumes as a matter of course, not only that life originated accidentally on this globe, but that plants were kind enough to originate themselves, just as they were required by animals! I do not believe any materialistic thinker can have realised the monstrous, the incredible haphazard to which he intrusts the creation of the world. As matters actually are, what a spectacle of harmonious adjustment nature presents between the vegetable and animal kingdoms! Man, of course, interferes with it in civilised countries. But who ever landed on an uninhabited island without finding a perfect balance between the producing and consuming agencies of nature?

As yet I have stated the law of the manipulation of the inorganic world by plants only generally. Let us go a little more into details. If we wish to stand face to face with this every-day mystery, we can do so by observing *Algæ*. Many of them float freely in the water, and it is obvious that they must construct their cell-walls and cell-contents from the surrounding element and the gaseous and mineral elements which it contains in solution. Carbon dioxide is dissolved in all surface water, and so supplies the indispensable carbon, and the nitrogen they get from the products of decaying organic matter or the nitrates washed from the land. But

the seaweeds that are rooted to rock or timber present the phenomenon in almost the same simplicity, as their roots are little more than holdfasts, and assimilation takes place by the whole plant-body, so long as its cellular tissue is alive. How often at the seashore may we see a mass of Bladderweed (*Fucus vesiculosus* or *serratus*) floating in the tideway; on its outer divisions will be found bunches of soft brown wool (sp. of *Ectocarpus*), or the pretty red tassels of *Ceramium rubrum*; on these latter again will be found under the microscope colonies of the commoner Diatoms, *Synedra*, *Cocconeis*, or *Achnanthes*! Yet all these associated plants build up their diverse forms from the same sea water. They all agree in possessing chlorophyll, though its presence is disguised more or less by other colouring matters: by means of their chlorophyll they all agree in decomposing the carbon dioxide present in the water, and in setting free oxygen. But, in addition to this common function, the *Fuci* will select atoms of Iodine and Bromine, the Diatoms atoms of Silicon, while the *Corallina officinalis*, growing on the same rock, will accumulate atoms of Calcium. Thus is carried on in its simplest form the transmutation of lifeless matter into nutritious living substance.

It is unnecessary, and would be tedious, to follow out the process in its increasing complexity through the vegetable kingdom. Suffice it to say, that in a tree the appropriation of carbon is, in the present state of knowledge, supposed to be confined to the green chlorophyll-bearing cells of the leaves and similar parts, whilst water, with the other elements of plant-food dissolved in it, is sucked up by the roots. The higher the plant stands in the scale, the greater is the division of labour.

A few words on the actual adjustment of the animal world to its food. The plan that we see to have been in fact adopted is this; a large number of vegetable-feeders is kept in check by less numerous carnivorous creatures. So it is in the case of mammals and birds, in the enormous class of insects, in molluscs. In the class *Reptilia*, one order, that of serpents, is purely carnivorous; another, that of turtles, purely herbivorous. Other animals, again, subsist on a mixed diet. We have some difficulty in observing Fish, but there are many reasons for believing that even in their case plants are the food of some genera. Although marine *Algæ* are usually thought to extend only a mile or so from shore, Diatoms exist almost everywhere in the upper strata of the deep sea. Darwin and Sir J. D. Hooker observed them in mile-long patches on their voyages. More recently, Sir C. Wyville Thomson says that Diatoms are found abundantly on the surface, especially when

the specific gravity of the water is comparatively low. Again (*Voyage of the Challenger*, vol. ii., p. 339), "the frustules of Diatoms occur in all the deep-sea deposits in greater or less number; and in some places, as at a few of the stations in the Indian Ocean, they form the bulk of the sample brought up by the sounding machine."

The stomach of *Holothuridea* taken over this area was found to be "distended with the 'diatom-ooze' so completely that the animal looked like a thin transparent bag filled with it."

Again, it is well known that diatoms are found in the stomach of fish and crustaceans, and, moreover, of purely pelagic forms, as of *Salpæ*. Much still remains to be done in the study of marine life, but we may confidently expect that it will exhibit subordination to the same great laws of nutrition as those exemplified in terrestrial life.

Since writing the above, I have read in a daily paper a remarkable confirmation of the assertion made of the importance of Diatoms. The contributor was describing the cod-fishery. The existence of the Newfoundland shoals, he says, depends upon a great Polar current which flows that way from the Arctic regions. This current gives the fish the cold water they like, and also brings them the food they require. From the way in which he describes the food as colouring the sea green or brown, it is pretty clear that he is speaking of minute *Algæ*, probably Diatoms.

We can scarcely allude to carnivorous animals without being reminded of the sensational descriptions of the so-called cruelty of nature given under this head by Pessimists and Sceptics. May we ask, in reply, what other arrangement they can propose? If all animals fed on vegetables, they would sooner or later exhaust the supply and perish by famine. The Utilitarians set up the principle of the Happiness of the Greater Number as their guide. Is not this precisely what now results from the system of checks and counter-checks which keeps up the due balance of Animated Nature?

Closely connected with the primary function of the Vegetable Kingdom are subsidiary purposes fulfilled by it. In the first place, it purifies air and water. The gas carbon dioxide is produced in large quantities by the respiration of animals, on land and in the sea, and also by artificial combustion. This noxious compound, if not got rid of, would accumulate through its weight in the lower strata of the atmosphere, so as to be fatal to all life on the globe. But plants consume it, as I have

stated above, with perhaps wearisome reiteration. If this is not a designed result, it is a very lucky accident for Theists and Sceptics alike. In the next place, the formation of soil is obviously due to vegetables. Strip the world, in imagination, of its plant-life, and see what a waste it would become. Its present fertility is the result of the life and death of countless generations of plants which have gradually enriched the *débris* of rocks with organic materials. Another secondary end to be noticed in plants is their adaptation to be the dwelling-places as well as to supply the food of many animals. Whole genera are known which are exclusively arboreal. Even among mammals we have monkeys, sloths, fruit-bats, opossums. Vast multitudes of birds are solely at home on trees, as parrots and lorises. Above all, the insect world affords the most astounding attachment to plants. Insects are so localised, as it were, that in a great tree the bark, the wood, the leaves, the flowers give food and shelter to distinct tribes. Out of this unbounded field I will only give one fact. The Butterfly, when seeking to deposit her eggs, always chooses the plant on which the caterpillars are to feed when they emerge. Perhaps many of my hearers could not point out in a hedge the two Buckthorns, or *Rhamni*; but the Brimstone Butterfly (*Gonepteryx Rhamni*), we are told, selects them, and them alone, with unerring accuracy as the guardians of her eggs.

9. I shall now pass on to another great purpose which can be traced throughout the Vegetable Kingdom—that of Reproduction. The proofs of pre-ordained contrivances, of processes brought to bear upon one end, are here very striking. According to Hartmann, a final cause involves four stages—(1) conception of the end; (2) conception of the means; (3) realisation of the means; (4) realisation of the end. The final effect must be regarded as imaged in some way beforehand. This analysis applies admirably to reproduction in the vegetable kingdom. First, a distinct end is clearly visible,—that of continuing the species. Means are adopted for securing that end; speaking broadly, the conjugation of sperm-cells and germ-cells. In the next place, this effect is brought about in the most varied ways, and so, after much toil, the seed is finally produced, or the original end is realised. Is it possible to think otherwise than that this purpose is foreseen, predetermined, and that “this predetermination conditions and dominates the series of phenomena of which it is in appearance the result? We maintain that what occurs as an *effect* becomes an *end* by reason of the number and

complexity of the combinations which have rendered it possible." (Janet, *Final Causes*.)

Let us now look upon a flower from this point of view. I need not describe it any further than is necessary for my argument. It will be enough to remind my hearers that it is the reproductive apparatus of the plant, and that it is made up of leaves variously modified. The two most important series of transformed leaves are the stamens, which produce the sperm-cells in the form of the pollen-grains, and the carpels which develop the ovules, within which the germ-cells are stowed away. Around these are grouped the generally showy corolla and calyx, which serve partly as protective envelopes to the internal organs, and partly as sources of attraction to insects. The fundamental mark of design in a flower is the distinction between the internal organs. In these we have two series of cells,—the sperm-cells or pollen-grains and the germ-cells, which are part of the ovules, both of which advance to a certain stage independently of each other, and then perish if they are not brought into contact. The whole purpose of the flower is to secure their being brought into contact. In the vast majority of flowers, moreover, the pollen does not fall directly upon the ovules; it is arrested at a halfway-house, the stigmatic surface of the style. It then begins to grow and to emit the long slender tubes which push their way down the style and reach the micropyle of the ovules. Only microscopic observers know of the difficulty of following out any further the process of fertilisation from the excessive minuteness of the objects in question. Any good text-book will supply technical details which I can hardly give here.

In many flowers further and more complex devices are introduced to secure cross-fertilisation by insects. Whole orders are more or less adapted to insect visits. If a flower is what is called zygomorphic, *i.e.*, symmetrical only in one plane passing (to speak popularly) down through its middle, such a flower has been altered to attract insects. Such are orchids, pea-blossoms and their kin, Pelargonium, Tropæolum, and balsams. So much attention has been paid to this subject lately that I may be excused going into particulars. But for the purposes of my argument, consider the significance of all these phenomena co-existing, and co-operating for one ultimate purpose, the production of seed. We have,—

- (1.) The development of pollen and of ovules in distinct organs.
- (2.) The secretion of honey.

- (3.) The modification of a petal or sepal to hold this honey.
- (4.) The indication by bright colour and by special *streaks* where this honey lies.
- (5.) The fondness of bees, butterflies, and moths for this honey.
- (6.) The arrangement of stamens and stigma, so as to profit most by the visits of the insects thus occasioned.

How all these co-ordinate arrangements were brought about I am not bound to say; *why* they exist is obvious, namely, to secure the continuance of the species: in other words, no candid observer can deny the force of the argument for design. Even Sachs confesses (*Text-Book of Botany*, 1st ed. Eng. trans., p. 843) that the reproductive processes "have the appearance of being the result of the most careful and far-sighted calculation and deliberation." I may add that in the second edition of this valuable work, which has appeared since I wrote this paper, either the venerable author or the translator repudiates purpose in plant-life as an antiquated superstition. Such is the narrowing effect of over-specialisation; one of the crying evils to which the science of the present day is subject. The students of natural history write too often, as if there were no such branches of knowledge as metaphysics, history, or theology.

But I wish, in the next place, to call your attention to some of the complicated reproductive arrangements in Cryptogams. Speaking broadly, yet still with strict accuracy, Phanerogams are distinguished from Cryptogams by this mark: in the case of the former the sperm-cells, *i.e.* pollen-grains, are adapted to the air; in the latter the sperm-cells, *i.e.* the antherozoids, are adapted to water. The simplest Cryptogams (*Schizophytes*) are apparently reproduced only by self-division, but wherever a higher form of reproduction is found, the antherozoids invariably require water, in which they swim about until they reach the *anhegonium*. What is so amazing, however, is the variety of details, the diversity of contrivances, which are far greater than in flowering plants. I will trespass upon your patience with a description of the reproductive organs in *Chara*. Species of *Chara* are common in ponds and ditches, and are easily distinguished by their whorled branches, their gritty feel from their being encrusted with calcareous matter, and the brick-red colour of the mature *antheridia*. These last look like little pills, and are bounded by eight cortical cells, which separate at maturity. "Of these eight cortical cells,"

to quote Dr. A. W. Bennett,* “sometimes called shields, the four nearer the base are four-sided, the four nearer the apex three-sided. From the middle of the inner face of each shield, a cylindrical cell, termed a *manubrium* or handle, projects inwards, nearly to the centre of the hollow globule; and at the extremity of each *manubrium* is a roundish hyaline cell, the head or *capitulum*. The shields, *manubria* and *capitula*, form, therefore, twenty-four cells, which, together with the pedicel-cell of the globule (the older name of the *antheridium*), constitute its framework. Each *capitulum* bears six smaller cells, secondary heads or *capitula*, and from each of these grow four long whip-shaped filaments, the number of which, therefore, is about 200 ($8 \times 6 \times 4 = 192$). Each of these 200 filaments divides transversely into from 100 to 200 cells, and in each of these cells an antherozoid is produced by a peculiar transformation of its protoplasmic contents, and is provided with two cilia, by means of which it moves rapidly about when it escapes by the separation of the shields and rupture of the parent-cell. The number of antherozoids produced by a single *antheridium* may therefore be from 20,000 to 40,000. The organ known as the nucule consists of an axial row of cells, which form a kind of crown at the summit. At a certain period this crown separates and leaves open a canal leading down to the central cell, through which the antherozoids enter and effect the fertilisation.” Familiar as the motion of antherozoids has become to microscopical observers, it can never cease to be one of the standing marvels of plant life. But as an argument for design, what better contrivance could be adopted for dispersing the spores in water than this ciliary motion? If we could explain the physical causes which produce it, it would still be equally wonderful. For *efficient causes do not exclude final*; and the fundamental fallacy, the *πρῶτον ψεύδος* (Janet) of Materialism lies in the assumption that they do.

We may next take up the urn of the Urn-mosses (*Bryaceæ*) as an elegant instance of the adaptation of means to ends. In mosses there is what is called an alternation of generations; *i.e.* one stage of the plant which produces *antheridia* and *oogonia*, the organs which contain the sperm-cells and germ-cells respectively, and another which produces vegetative spores which germinate without any act of fertilisation. The very existence of this double provision for the multiplication of

* Translation of Thomé's *Botany*, p. 295. The exact words of Dr. Bennett are not given, but the substance.

plants found in all the *Muscineæ** and *Pteridophytes** is a wonderful contrivance. Now the familiar fruit of the moss is, scientifically speaking, the second generation resulting from the fertilisation of the *oogonium* by the antherozoids of the *antheridium*. Its function is to produce spores, to guard them till mature, and then to disperse them. All of us know the pretty little urn elevated on the top of a long stalk. Within it the spores are developed by free-cell formation. To protect them the following devices occur: (1) a little thatch or pent-house more or less hairy, which is the remains of the original wall of the *oogonium* carried up by the growth of the stalk. Then comes a lid which in time opens. Then comes a single or double fringe of teeth, called the peristome, which are always in number a multiple of 4, either 4, 8, 16, 32, or 64. These peristomes are well known as furnishing objects of great beauty for the low powers of the microscope. In some cases the inner fringe is not separated into teeth, but forms a beautiful lattice-work. Now, what is the object of this fringe? I will give it in the language of one of the most recent writers on the *Muscineæ*, Dr. Goebel (Schenk's *Handbuch der Botanik*, vol. ii., p. 399).

"The teeth of the peristome are very hygroscopic, their function is principally that of closing the opening of the capsule-urn in moist and wet weather, and so preventing the egress of the spores. In this way, on the one hand, moisture is not allowed to penetrate into the capsule, and so produce premature germination of the spores; and, on the other hand, the latter cannot escape from the capsule under circumstances that would be unfavourable for their wide dispersion. In dry weather, on the contrary, the teeth of the peristome bend back, and so allow the fine powdery spores to escape." The word "function" is here used, as you observe, but it is a mere *façon de parler*, an evasive equivalent for "purpose." Indeed, the learned Doctor just after uses the word "purpose" bluntly ("Der Zweck, die Sporen in der geöffneten Kapsel vor dem Zutritt von Feuchtigkeit zu schützen, wird . . . erreicht." "The purpose of protecting the spores in the opened capsule from the access of moisture . . . is reached"). But he apologises in a note for the indiscretion. ("Man gestatte der Kürze halber diese Bezeichnung!") "This designation may be excused for brevity's sake!") Science, it seems, has its

* The group of *Muscineæ*, as a sub-kingdom, includes *Hepaticæ* and *Musci*. Pteridophytes include the Vascular Cryptogams, Ferns, Horsetails, Club-mosses, &c.

pedantic fashions as well as philology. Whatever may be their own convictions, men are afraid or ashamed to admit the notion of purpose in Nature. There must be a reaction against this tyranny of authority, and I should be glad to think that it is already beginning. I will conclude with the reproduction of the *Algæ*. Low as they stand in the scale of vegetation, they in common with the fungi possess a bewildering multiplicity of reproductive processes. It is impossible to do more than select one or two cases. The common *Fuci* present us with one distinct type. In them the *antheridia* and *oogonia* are both produced in spherical cavities imbedded in the substance of the frond. These cavities communicate by a pore with the surrounding water, and through this pore the mature reproductive cells escape before fertilisation. The germ-cell, when compared with the minute antherozoids, is of enormous size, and, as it floats passively about, the latter swarm around it like bees, communicate to it a rotating motion by their ciliary action, and so fertilise it.

The beautiful *Florideæ*, or red seaweeds, deviate from this plan. Their sperm-cells have no cilia; they do not move about by lashing the water, but drift to and fro. They thus come into contact with the *trichogyne*, an organ which reminds us in function of the stigma of Phanerogams. This is the topmost of two or three cells forming a short branch, which grows into a long transparent mucilaginous hair. The floating sperm-cells adhere to this hair, and appear to form an intimate union with it by the absorption of the intervening cell-walls. As a result of this act, a kind of fruit is produced, the part generally observed by collectors, who are well aware of the elegant forms it often assumes, as in the urns of the *Polysiphoniæ*.

In addition, however, to this mode of increase, the *Florideæ* possess vegetative gemmæ, called *tetraspores*, which germinate without any act of fertilisation. They are often found in fruit-like receptacles, like little pods, or occur on transformed branchlets, or all over the frond. Hence in red seaweeds a man may pick up four different forms of the same species:—(1) a totally barren frond; (2) a frond with *antheridia*; (3) a frond with *oogonia*; (4) a frond with *tetraspores*. In some rare cases, however, both the reproductive elements occur on the same plant. Now all this is very surprising. I am at a loss to conceive how Natural Selection can account for this lavish exuberance of reproductive agencies. We seem to have variety for the sake of variety, and beauty for the sake of beauty.

10. In dealing with my subject I have entered into

abundant detail, as nothing is more unsatisfactory than the usual vague generalities employed in discussing this argument. Consequently, I have not shrunk from bringing forward actual facts which I am prepared to submit to the test of purpose. One result, however, of this method is that I can only very briefly indicate the immense field that still remains untrodden. I will only point out, then, as it is impossible for me at present to dwell upon them more fully, abundant marks of design which are found—

(1.) in the devices for the preservation of seeds till maturity, and their dispersion after maturity;

(2.) in the adaptations of the Stem, Leaf, and Root, as, for instance, in the *stomata* of the *Epidermis*;

(3.) in forms of plants fitted for special purposes, such as parasites and insect-traps;

(4.) in the production of useful plants contemporaneously with the late appearance of Man;

(5.) in the order and harmony seen in the finely-graduated adaptation of plants to every degree in the thermal scale from the Pole to the Equator;

(6.) in the Unity of plan involved in the fact that every vegetable structure can be referred to the cell as its ultimate element;

(7.) in the Unity of plan to be discovered also in the past geological history of the Vegetable Kingdom.

11. Out of this embarrassing wealth of materials I will select for my concluding illustration of Design the Pitcher-Plant. A more wonderful, complicated, and effective Insect-trap could hardly be imagined. In the first place, it attracts its victims from afar by its conspicuous colour, red, or blue, or purple, which makes it stand out boldly from the inconspicuous shrub with dioecious flowers which produces it. In the next place its jug-like shape is as good a device as can be employed for a trap in which the captured flies are to be drowned: it has a close-fitting lid which is not opened until the arrangements are complete, and when once opened never shuts again. When all is ready within, the lid opens, and we see a bait, a danger and a pool of destiny; the bait is a honeyed secretion produced by glands situated just in the neck of the pitcher; below this zone are glaucous walls of glassy smoothness, and below these again is the water poured forth by thousands of glands. The insects eat their fill of the honey, then slip helplessly down the precipitous sides, and are drowned at the bottom. In addition to these striking features, some of the pitchers have external fringes calculated to lead insects the right way to their destruction. I need hardly point out the

important anatomical differences between the two series of glands in this case, those that secrete honey and those that secrete water. Here we see remarkable and unusual arrangements all co-operating to one result. Can any reasonable man deny that the purpose, the design, of the Pitcher is to kill flies? Nay, more, is he not irresistibly led on to a further question, namely, what is the object of this singular immolation? The solution now in vogue to this latter question is that the plant requires more nitrogenous food than it can get from the swampy soil in which it lives. In pursuing researches such as these Science is really seeking for Final Causes however disguised under the latest fashionable name of function, adaptation, correlation, &c., and yet we are told that the reign of Final Causes is over! Perhaps the one-sided cultivators of Natural Science will one day awake to the great truth that Efficient Causes do not exclude Final Causes, and that Purpose and Design exist unchanged and unchangeable however much they may be ignored by Materialists.

NOTE.

The following extracts from Professor H. N. Moseley's address on Pelagic Life, delivered at the Southampton meeting of the British Association on 28th August, 1882, are interesting.

After defining *pelagic* life as those animals and plants which inhabit the surface waters of seas and oceans, the lecturer proceeds: "The existence of pelagic animals at all is directly dependent on that of pelagic plants. No animal life can exist without vegetable food as a basis, and the first living substance which came into existence must have been capable of constructing protein for itself from inorganic sources, and been physiologically a plant. Now in many regions the sea-surface teems with vegetable life. In the Polar waters diatoms swarm, sometimes occurring so abundantly that they render the water thick like soup" . . .

In temperate and warmer seas, the Professor declares, diatoms are scarcer, though present, and their place is taken by other simple minute *Algae*, namely *Oscillatoriaceæ*. In the Arafura Sea the Challenger expedition passed for days through discoloured water which smelt like a weedy pond. In the Atlantic also they had for days found the sea filled with *Trichodesmium*. Small marine animals, on which the larger exist, feed on these minute *Algae*, and also on organic *débris* from the shore, and on floating sea-weeds (in the more ordinary sense of the word). Prof. Moseley pronounces strongly for the vegetable nature of the disputed cells in Radiolarians, and even hints that *Coccospheres* and *Rhabdospheres* may turn out to be vegetables.

The Chairman (Rev. R. THORNTON, D.D.).—I am sure I may tender to Mr. James the thanks of the meeting for his very interesting paper.

Rev. Prebendary Row, M.A.—I feel some difficulty in offering any remarks upon Mr. James's paper, because it is one with which I very cordially agree. Generally speaking, one can make more effective remarks upon points with which one does not agree, than with regard to those with which one does agree. The attempts which are being made at the present time to ignore the arguments from *design*—perhaps it had better be termed adaptation, because when we speak of design we are charged with assuming the existence of a designer—are very extraordinary. I find that this charge, of assuming the existence of a designer is one which is constantly being made against us; but I do not doubt that those who make the charge understand what we mean when we use the term I have just employed. Not only is this argument of ours largely ignored by scientific men, but I am sorry to say that several persons whom I very highly esteem have to a great extent given up the argument from design,—a circumstance which always excites in my own mind unspeakable astonishment. What we want is to have the whole force of this argument stated in exceedingly simple language: and although I regard Janet's as a most valuable work, I think, at the same time, that it is one of those books which we find appealing solely to what I may term the aristocracy of intellect. What we want is a work addressed to the democracy of intellect. As it is, people generally are not able to appreciate the arguments we employ, and this is what has caused a large amount of unbelief. Therefore, the remedy we require is to have our arguments stated in plain English, so that they may be on a level with the ordinary intelligence of the million, instead of being confined to the understanding of what I call the intellectual aristocracy. It is very difficult to commend such works as we have upon this subject to an ordinary man who is busied with the affairs of life, because, the great mass of the existing books treat the question from an elevated point of view and not from such a standpoint as is comprehensible to the masses. There is in this paper one expression, and although I quite agree with it, yet I should like to see it somewhat qualified; it is the statement in which the author asserts that the argument from design amounts only to probability. I quite admit that it is an argument founded on probability; but I think that by adopting these words we may be greatly misleading the ordinary class of readers. Of course, as a matter of fact, there are only two things which are capable of strict demonstration, namely, the truths which relate to space and number. The term "demonstration" is also extensively used in modern scientific works to denote a truth capable of distinct and positive verification. Now, let us observe the real position of the question in relation to the argument from adaptation. I do not think it at all yields in force to the strongest demonstration in Euclid. I will not take the argument derived from the human eye, strong as it is, but will refer to the faculty of hearing. Let us see what are the correlations therein involved. First of all we have a wondrous musical instrument—the human mouth, the palate, and the whole of the interior structure, constituting a musical instrument of surpassing completeness and complexity,

inasmuch as it is capable of producing every variety of sound in the most perfect harmony. This is very wonderful in itself, but it is, after all, only a small portion of the wonder; for, unless every portion of that marvellously delicate sound-producing instrument was correlated to the atmospheric air, which is entirely independent of it, this organ would exist for no purpose at all, and, if the atmospheric air were largely different from what it is, it would produce a widely different result. The two, then, being perfectly correlated to each other, I would draw attention to one correlation more, and that is the auric nerve. But for this third factor the wonderful correlations which exist between the organ of speech and the atmospheric air would exist in vain. Therefore, we have here three singularly complicated correlations, each absolutely independent of the other, and yet producing a common result, viz., articulate speech and harmonious sound, which could not exist, if one factor in these correlations failed. Now, to exhibit the force of the evidence it will be necessary to multiply the chances against each individual factor coming together at the right time and place so as to perfect the combination, and the result would have to be expressed by a fraction, of which the numerator is unity and the denominator a number so large that it is impossible for our limited understandings to form a definite conception of it. But when we consider the number of complicated correlations in the universe, and estimate the chances against their concurrence at the right time and place, the denominator of the fraction representing the improbability of their concurrence cannot be distinguished by a finite understanding from infinity itself. A common fallacy of the day denies that these correlations prove intelligence, but I think that if this argument in proof of design was stated in a popular manner, the objections to it would fail to convince any unprejudiced person. It is objected that many of these adaptations and correlations seem to exist for the purpose of inflicting pain and death, Still there remains the fact that they exist, and whatever may be the results which they produce, they prove the presence of intelligence. One word on a subject which is referred to in this paper, and that is the manner in which we are charged with using an anthropomorphic idea in transferring an idea which belongs as far as direct observation goes only to man, to the being of God. This charge has been urged again and again, especially by Herbert Spencer and other unbelievers, who say that it overthrows at once the whole of our reasoning from design. I wish to ask any scientific man upon this point whether it is possible that we cannot get beyond ourselves? The fact is, because we are men, every one of our conceptions must be in terms of human thought, and so far, anthropomorphic. Even when a scientist is dealing with the objects of nature he is obliged to use anthropomorphic thoughts and conceptions, because we have no other; therefore, the objection falls to the ground. The lower and baser attributes of human nature have in pagan and uncivilised ages been applied to God. This is objectionable anthropomorphism; but when we come to ascribe to Him the higher

qualities of man, as the author has well observed, we may justly do this because we are made in the image of God, and not because we make a God in the image of man. I press this point, inasmuch as I regard all that is said by our opponents upon the subject as simply absurd; for, if we cease to think in anthropomorphic conceptions, we must cease to think at all, inasmuch as we can have nothing but anthropomorphic conceptions wherewith to think.

Mr. D. HOWARD, V.P.I.C.—I regard this as a most interesting paper upon a most interesting subject. Prebendary Row has very ably put forward an immensely important argument in favour of *design*, by combating the idea that, if you can quarrel with Paley's mode of dealing with evidence, you have done away with evidence altogether,—that if you quarrel with the enunciation of Butler's *Analogy*, you have got rid of the *Analogy* itself. The truth is, that the argument lies before our eyes, and we cannot get over it except by shutting our eyes to it. This paper, which deals only with one little corner of the subject, but which deals most distinctly and ably with what it does grasp, not only gives instances of design against which it is impossible to close our eyes, but points to a sphere in which there are countless others. With regard to any fact on which it is possible to get cumulative evidence, it is undoubtedly easy to arrive at absolute certainty. I remember soon after the siege of Strasburg, standing on the cathedral-tower with the old custodian of the edifice, and I necessarily noticed that a few bombshells had burst on the building. The custodian told me that the Germau artillery fired at the cathedral night and day. Just below, however, was the citadel, which they had really fired at night and day, and they could hardly help a chance shot or two falling on the old ecclesiastical structure; but the citadel, which is not nearly so conspicuous a building as the cathedral, was utterly annihilated. Of course, one could not have supposed that chance had guided the great mass of the bombs into the citadel, and that the same chance had preserved the cathedral. In the same way, we may regard the manifold evidences we see converging to a given point as evident proofs of design. When one looks at the materialistic fallacies of the present day, one finds that design, although rejected in specious language, comes back again; that after all, what are termed the blind forces of nature have design attributed to them; and that you are speaking in the most anthropomorphic form when you refuse to give the honour to God, and give it to the forces of nature. In point of fact the forces of nature become those of a personal God by the very language applied to them. If people find that the arguments of our opponents against design satisfy their intellect, they must be wonderfully constituted. Reasoning from analogy, we must say from the evidence of something in nature which we cannot speak of without attributing intelligent personality to the Author of it, is so strong, that it is absolutely certain that in denying an intelligent Being to govern it, they are making a blunder. It is truly said, by this paper, that the precise way of creation is not to the point. That is a question upon which there may be wide diversities of opinion; but, as I have just said, that is not the real point at issue. If we

admit, for the sake of argument, evolution as a mode of formation, we only put off the difficulty one stage, because we are bound to ask whence come the forces of nature which display the evolving power? How is the balance preserved? Chance cannot effect this—the idea is absurd. We must attribute to nature powers of discrimination which are utterly alien to anything we know of the forces of nature. Take the balance between the animal and vegetable kingdoms, and you will see that it is very easy to interfere with it. What is it that makes the streams, in any overpopulated part of England, abominable? Simply that the balance is lost. If any of that noxious fluid which now is a black stagnant abomination, be sufficiently diluted to give the forces of nature play, the vegetable kingdom will set it all right again. Instead of a horrible black mass, you would have almost a pure fluid. I might follow the same illustration through all nature, and show how impossible it is that mere chance can do what is everywhere seen, and that we are bound to conclude that the forces of nature are Divinely guided. We may boldly say this; for, after all, what does the phrase, “forces of nature,” mean but the expression of God’s will? The second part of the paper touches on the infinite richness of the reproductive arrangement of the lower plants, and also of those of some of the lower animals, which are equally wonderful, and equally worthy of study. Why is it that, when it is perfectly possible for a single cell to sprout up and divide itself off, there should be combined with so simple a process so inconceivably complex a system of reproduction? Surely, if this were due to chance alone, the chance would be immensely in favour of the simplest method. If you throw dice, the chances are that exceedingly simple combinations will turn up, and not that you will produce thousands of double sixes running. And this brings me to one point I wish to allude to before sitting down. I cannot but think that Lord Bacon is rather hardly dealt with for calling final causes a barren study. What he meant was this: that if we begin by assuming that we know how a thing was reproduced, we shall be very far from knowing how it was reproduced. The truth is that the wisdom shown in the final causes is beyond our wisdom. There is a wondrous wisdom in these final causes, which we do not understand. Why should there be a double form of reproduction, apparently for no reason? Why, for instance, when a branch, by touching the ground, can reproduce a tree, should there be a seed-vessel to accomplish that object? I would merely say to our opponents, if you admit that there are forces in nature with intelligent foresight, that is all I ask you to grant, because, if you grant that, you have granted Theism without knowing it.

Mr. J. HASSELL.—I agree with the suggestion that we want a popular exposition of “The Argument from Design,” and also that we ought not to be backward in teaching that doctrine whenever we can. It is the custom nowadays, with many scientific teachers, to take it for granted that there is no ground upon which to take our stand in teaching the great truth that God is the Creator of the Universe; would it not be well in these days of scientific dogmatism to show plainly and clearly the absurdity of the

arguments used against design? If I may be allowed to speak of myself personally, I might mention that I was able to do something in this way the other day, while conversing with two working men. I had in my hand a skeleton head of one of the parrot tribe, and the workmen, who had not made a study of such things, could hardly believe that the structure possessed so little weight. They asked me how it was that it was so light and yet so strong; and in order to satisfy them I took the skull to pieces. They then saw that the outer and the inner walls of the mandibles, which are very thin, are separated from each other, but that the two are united by an infinite number of cross-bars, each of which is wonderfully thin, thus securing great strength and durability combined with the lightest possible construction. I then said to them: "You must understand that once upon a time there was a very clever parrot who happened to have a weak bill which used to get injured when he tried to get at certain fruits. Well, this parrot said to itself: 'I will have a stronger bill in future,' and thereupon laid for itself the germs of a stronger one in the next generation." The men told me I must be joking, and one of them said: "Oh! that can't be; surely it must have been constructed for the bird?" "Precisely so," I replied; "there is no doubt but that this wonderful piece of adaptation of means to ends was planned"; and then, wishing to apply the advantage thus gained, I asked the man how he, as a carpenter, would proceed under such circumstances. The man replied that if he wanted to strengthen two outer walls which were rather thin, he would unite them by cross-bars, and if he wished to prevent its being very heavy he should make the bars numerous but very thin. "Well," I answered, "that is just how God has done it, and by so doing He has brought about the two great requisites, extreme lightness and great stability." The man saw this at once. I say, then, that teachers should not be backward in showing the working man the absurdity of any other mode of bringing about the wonderful results which God has produced by such extraordinary means. We ought to endeavour to prove that the marvellous structures found in God's works could only have been planned by a great and wise Architect, who, seeing the end from the beginning, planned all these things as being best adapted for the purposes they were to serve.

The CHAIRMAN.—Before Mr. James replies, I should like to offer a few observations, although I do not intend them as criticisms upon his admirable paper, in which there is really nothing that I can disagree with, as the paper is one that commends itself most entirely to my own views. I shall only express my confidence that the argument from *design*, for which Mr. Row and myself concocted the phrase "teleological adaptation," is, for practical use, the most important we can employ. I do not mean to say I look upon it as *the* most important, because the argument of my own consciousness is a stronger one; but for all practical purposes it is decidedly the most important; and I think, also, that the illustration given by Mr. Hassell is one of much value, as tending to show that if you put such a thing as the skull of a parrot before a working man and ask how it has been formed, he at once says it is the

product of intelligence, and that chance or the blind force of nature could never have brought about the result exhibited. I think the paper read to us by Mr. James an extremely able and important one, and we are greatly indebted to him for it. I can only express my regret that our first meeting this year has fallen on New Year's Day, as the usual family gatherings on that day may have prevented some being present.

Mr. JAMES.—It has been very gratifying to me to find that almost all the speakers have been in entire agreement with the views I have expressed. I am sorry Prebendary Row has left the room, and that consequently I cannot have the pleasure of thanking him personally for the cordial way in which he has spoken of my paper. I quite agree with him that a popular statement of the arguments I have urged would be very valuable; but I must point out that my paper has been written throughout with obvious reference to the views put forward by our opponents, and, as I have had to meet them somewhat on their own ground, my exposition has necessarily been rather dry. It is the doctrines of the materialists that I have been combating. I have been extremely pleased to be able to read the protest, contained in my paper, against the materialistic tone which has become so common in works of natural science of the present day. I do not mean to say that a work on botany ought or need contain any allusion to theology, but it certainly need not go out of its way to deny purpose and assault design. This is a fault which we can most certainly charge against Sachs's great work, which has now reached its second edition, and which is officially published by the University of Oxford. I do not think the University ought to give its sanction to a one-sided statement of this question, whereas Dr. Sachs, or his translator, goes out of his way to cast a slur on design, although he does not bring anything like arguments against it. If the idea of design is not scientific, if it be contrary to the impartiality of science to say anything in favour of Theism, why say anything contrary to Theism? It is as a protest against this course that I have been most pleased to deliver this paper, in spite of the fact, referred to by our Chairman, that this is New Year's Day. (Applause.) On any day I am glad to offer my paper as a protest against scientific prejudice. To a certain extent, perhaps, this tone in works on botany and kindred subjects is a matter of fashion; many people who, doubtless, do not hold materialistic views are, nevertheless, apt to fall into what has become the *mode*, and are led to do so possibly from want of courage. As to what Mr. Row has said about probability, I have used that word in its strict logical, and not its popular sense. The logical value of the Argument from Design is, of course, only that of high probability. Mr. Howard has been kind enough to do nothing but praise the paper. With regard to what has been said about Lord Bacon, I still think he went too far in condemnation of final causes. But Darwin, although he formally denied them, nevertheless practically used them when he started a most fertile subject in introducing the notion of the benefit to be derived from cross-fertilisation. The question which he asked was, what was the advantage to be derived by different plants from cross-fertilisation,

—that is to say, from the fact that the pollen of one individual generally fertilised the stigma of another? The following out of this principle led to so fertile a field of observation that it absolutely metamorphosed that particular branch of botany. All at once it was seen to afford an explanation of hundreds of forms of flowers which used to be called irregular, but which were really insect-adapted. If this paper had been read in the summer-time I could have brought you a garden Nasturtium (*Tropaeolum majus*) in which I could have shown you a beautiful instance of the adaptation of flowers to insect visits. When you look at that flower you cannot fail to see that its whole object is to make the most of the spur which contains the nectar sought for by the insects. Everything groups itself around that spur. First of all there are the five petals, of which the two upper and more prominent ones are the more richly coloured, their darker streaks pointing the way the butterfly has to go. The three lower petals have fringes so placed as to prevent the ants going past them to steal the nectar. Being so brilliantly coloured the flower is not adapted to moths, because they only fly by night and generally make for the white flowers; and whatever butterfly comes, the proboscis must be long enough to get to the bottom of the tube. The insect alights on the three lower petals or on the central part of the flower and inserts its proboscis, and in doing so rubs against some of the stamens, of which there are eight, which are arranged in a beautiful manner with reference to the tube. They are placed in pairs, there being one pair close to the opening of the spur, another a little further down, and then another, and another, all of them at first, declining or stooping down. Moreover, they do not all reach maturity at the same time, but rise up in turns one by one, those nearer to the mouth of the tube coming sooner, and then the rest in rotation. Whilst this pollen is being shed the device adopted to prevent its dusting the stigma of the flowers is that the stigma of the individual flower is not yet receptive. The three styles are closely applied to each other, and they do not open until all the stamens have shed their pollen. These anthers are attached to their filaments by a very small pedestal, and then when they have all been emptied, the three styles open and are capable of receiving the pollen of another plant. The same process takes place in many other flowers, and all I have to say here is that we owe all this knowledge to Darwin, who first began to observe what was going on in the orchids. Darwin was more familiar with cultivated plants than with the wild ones, and his examples were taken mainly from what he observed in hot-houses. Had he taken the wild flowers he would have found that the cross-fertilisation in their case was quite as wonderful as he found it to be among the orchids. I would only mention one—the Iris, as to which any one here will be able to make observations for himself. I have only now to thank the other speakers for their agreement with me, and also this Institute for having given me the opportunity of reading a paper which expresses my own opinions, whether they be right or wrong.

The meeting was then adjourned.

ORDINARY MEETING, FEBRUARY 5, 1883.

REV. R. THORNTON, D.D., VICE-PRESIDENT, IN THE CHAIR.

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

MEMBERS :—W. G. Ainslie, Esq., London ; Rev. A. Thursby-Pelham, M.A., Shrewsbury ; Lieut.-Col. W. Larkins Walker, Brighton.

ASSOCIATES :—The Right Rev. the Bishop of Bathurst, New South Wales ; J. Maitland Anderson, Esq., St. Andrews ; Rev. A. R. Blackett, M.A., New South Wales ; Rev. C. Ray Palmer, M.A., United States.

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

"Proceedings of the Royal Society."	<i>From the same.</i>
"Proceedings of the United Service Institution."	<i>From the same.</i>
"Proceedings of the Canadian Institute."	<i>From the same.</i>
"Proceedings of the American Bureau of Ethnology."	<i>From the same.</i>
"The American Antiquarian."	<i>From the Editor.</i>
"The Remote Antiquity of Man."	<i>From the Author.</i>

The following Paper was then read by the Author :—

IS IT POSSIBLE TO KNOW GOD? (CONSIDERATIONS ON "THE UNKNOWN AND UNKNOWNABLE" OF MODERN THOUGHT). By the Rev. J. J. LIAS, Vicar of St. Edward's, Cambridge.

IN the last paper which I had the honour of reading before the Victoria Institute I was gently censured for quoting Dean Mansel's *Bampton Lectures* as adding any strength to the Christian position, although I specially guarded myself against being supposed to agree with all that was said therein. This set me upon the task of weighing that remarkable contribution to apologetic literature, and of ascertaining how much of it was really valuable, and how much was justly liable to the criticisms so freely lavished upon the volume on its first appearance. It appeared to me then, and it appears to me now, to be hardly fair to place so learned, and, in many respects, so orthodox a divine as Dean Mansel in a kind of *Index Expurgatorius* ; to represent his works as pitch so unmixed that no one could even so much as touch them without contracting defilement. There are passages, such as I quoted in my last paper, so admirable, so clear, so convincing, that they deserve to be written in letters of gold. There are, nevertheless, principles laid down in those same lectures of so

dangerous a tendency, that, as was pointed out at the time of their appearance, they strike, not only at the foundations of religion, but of morality also.* That the first is the case is only too clear from the fact that Mr. Herbert Spencer quotes Dean Mansel with approbation in the opening chapters of his *First Principles*, in which he declares religion to have no practical bearing whatever upon life. Dean Mansel is the authority he quotes for regarding religion as the "negative pole of thought,"† as being practically valueless, because, instead of being connected with the real and the tangible, it is concerned entirely with the uncertain and the unintelligible.‡ It is on Dean Mansel's principles that Mr. Spencer tells us that religion may be dismissed from our thoughts because "the mystery it contemplates is ultimate and absolute." §

2. Mr. Goldwin Smith has pointed out the key to this extraordinary contradiction between different portions of Dean Mansel's volume, when he refers to the "happy inconsistency" || between Dean Mansel as a philosopher and Dean Mansel as a Christian. It is not the Dean's religious but his metaphysical principles that are to blame. In spite of his earnest Christianity, his great learning, his unrivalled felicity of expression, and—metaphysical speculations apart—his unquestionable orthodoxy, he has become a victim of a false system of philosophy, and, in spite of some brilliant affairs of outposts, he has really betrayed the citadel into the enemy's hands. It is the object of this present paper to investigate, as far as such brief limits permit, the grounds on which God is said to be unknowable, and the grounds on which Christians assert that they may know Him. The question is one of

* See Mr. Goldwin Smith's strictures on Dean Mansel's *Lectures*.

† *First Principles*, p. 107.

‡ "Religion and science are, therefore, necessary correlatives. . . . They stand respectively for those two antithetical modes of consciousness which cannot exist asunder. A known cannot be thought of apart from an unknown; nor can an unknown be thought of apart from a known."—*First Principles*, p. 107. [I quote from the fourth edition.]

§ *Ibid.*

|| *Rational Religion and the Rationalistic Objections to the Bampton Lectures* for 1858. Preface, p. ix. "Throughout these lectures, with the dark growth of the negative philosophy there twines in *happy contradiction*, a more wholesome plant, attesting the real geniality of the soil beneath."—*Ibid.*, p. 18. "Nor while I adhere to the doctrine opposed to that of the lecturer, in regard to his main positions, will I conclude these brief observations without paying the humble tribute of my sincere admiration to the power of statement displayed in some parts of his book. . . . It is one thing to use controversial weapons borrowed from negative philosophy; it is another thing to be yourself a negative philosopher."—*Ibid.*, p. 20.

much importance in these days : in fact, it may be said to be *the* question of the day. Just as, a few years ago, men who shrank from the responsibility of making up their minds on the great problems debated around them, betook themselves in large numbers to the only body which professed itself able to solve all these problems authoritatively, so now there are hundreds, it may be thousands, who excuse themselves the same responsibility, on the ground that on such points nothing can ever be settled at all. The object of this paper is to examine into the soundness of this conclusion : to inquire, first, whether it be true that God is absolutely and utterly unknowable ; and next, what data there are whereby anything may be known about Him. And it may here be stated that such knowledge only is referred to as may serve as a guide to conduct. There will appear, as we proceed, grounds for believing that it is impossible to form adequate abstract or metaphysical conceptions of any object whatever. This may form an admirable reason for inquiring whether there be not some inherent vice in our metaphysical systems, but it constitutes none whatever for dismissing everything whatever into the region of the inscrutable. Whatever metaphysicians say, we *do* live and we *must* act, whether we can form satisfactory metaphysical conceptions of the things with which we have to deal or not. There can be no more reason for relegating God and religion to the domain of the unknowable, and therefore the practically non-existent, than there is for placing everything else in the world around us in the same category.

3. I. It will be impossible, within the limits of this paper, to enter into a detailed examination of the statements contained in Part I. of Mr. Herbert Spencer's *First Principles* : and it will be the more so in that it is my desire, if possible, to be not merely destructive, but constructive. I hope not only to give reasons for rejecting Mr. Spencer's "First Principles" so far as they relate to religion, but to lay down some grounds, at least, for positive belief. I must, therefore, merely deal with the general principles of Mr. Spencer's system on this particular point, and leave the details alone. There is much that is worth notice in these details ; there is certainly a great deal that is open to criticism. But, interesting as a more minute examination would be, it would be too lengthy for our present purpose.

4. Mr. Herbert Spencer's main principle, which he derives from Dean Mansel, and the Dean's great authority, Sir W. Hamilton, is that the nature of the "Inscrutable Power which is manifested to us through all phenomena," "transcends intuition and is beyond imagination." "This," he informs

us, "is the certainty to which intelligence has from the first been progressing" (p. 108). He traces an ideal picture of the growth of the doctrine of God from the time when "the rudest savages imagined the causes of all things to be creatures of flesh and blood like themselves" (p. 109), through the period when persons who would "consider it impious" to "think of the creative power as in all respects anthropomorphous" do yet regard it as "in some respects anthropomorphous," (p. 110), to the time when men have become convinced of "the impiety of the pious" (p. 110), and have come finally to regard it as their "highest wisdom and their highest duty to regard that through which all things exist as The Unknowable" (p. 113).*

5. It is a question whether our progress be not altogether the other way; whether so far from confessing that we know less of God, we are not feeling that we know more of Him; whether savages ever did regard the heavenly powers as "creatures of flesh and blood like ourselves"; whether, great as is the mystery in which it has pleased God to enshroud Himself, He has not thought fit, in the course of the ages, to dispel some of the darkness which had formerly surrounded Him. But that there is a certain amount of truth in what Mr. Spencer says, cannot be denied. That there is a sense in which God transcends our conceptions, there can be no doubt. The Scriptures tell us this as plainly as Mr. Herbert Spencer.

* He goes on to say,—“An immense majority will refuse, with more or less of indignation, a belief seeming to them so shadowy and indefinite. Having always embodied the Ultimate Cause so far as was needful to its mental realisation, they must necessarily resent the substitution of an Ultimate Cause which cannot be mentally realised at all. ‘You offer us,’ they say, ‘an unthinkable abstraction in place of a being towards whom we may entertain definite feelings. Though we are told that the Absolute is real, yet since we are not allowed to conceive it, it might as well be a pure negation. Instead of a power which we can regard as having some sympathy with us, you would have us contemplate a Power to which no emotion whatever can be ascribed. And so we are to be deprived of the very substance of our faith.’ This kind of protest,” he continues, “of necessity accompanies every change from a lower creed to a higher.” Which creed is the “lower” and which the “higher” may be yet for some time a matter of debate. And it is somewhat strange to find Mr. Spencer putting in the mouth of Christians words which attribute “emotions” to God. Though such language may be loosely and inaccurately used, it is at least contradicted by the first Article of the Church of England. It would be interesting to observe, moreover, what our scientific men would say if Space, or Time, or Matter, or Motion, which Mr. Spencer has proved to be equally unthinkable with the “Ultimate Cause,” were substituted for it in Mr. Spencer’s pages. There would probably be a considerable outcry, not unmingled with expressions of scorn for philosophical pedantries. And not without reason.

“Canst thou by searching find out God?” asks Job.* “No man hath seen God at any time,” says the Apostle St. John.† St. Paul tells us that God “dwells in the light that no man can approach unto,” and adds, that “no man hath seen,” or “can see Him.”‡ Our quarrel with Mr. Spencer, and still more with those who profess to expound Mr. Spencer’s principles, and who, like disciples in general, are neither so cautious nor so reverent as their teacher, is that in consequence of this inability to comprehend God we are in effect exhorted to dismiss Him altogether from our thoughts.§

6. Now Mr. Herbert Spencer himself, as well as Dean Mansel, whom he quotes, has taught us that this incapacity for forming abstract conceptions extends, not only to what they call the “Infinite and Absolute,” but to everything else whatsoever.|| Thus, then, to be consistent, we must also dismiss from our minds as utterly inscrutable and impenetrable, and therefore as out of the sphere of all practical action, everything whatsoever that exists, including ourselves. We are as incapable of forming conceptions of space, of time, of being, of man, of self, as we are of God. And yet the proposition that we should regard all these things as practically non-existent, as “transcending intuition” and being “beyond imagination,” could not be made outside a lunatic asylum. What right, then, have we to select the idea of God out of a thousand other ideas equally unthinkable,¶ and say that while we will do our best to ascertain what can be known about all the others, we will leave that, and that only, utterly out of our calculations?

7. It will not be difficult to bring proofs from Mr. Herbert Spencer’s work of the statement we have just made. Mr. Spencer does not attempt to conceal the facts. All he does is,

* Job xi. 7; Cf. xxxvi. 26; xxvii. 23. † St. John i. 18; vi. 46.

‡ 1 Tim. vi. 16; Cf. Rom. xi. 33, 34.

§ I say “in effect,” because no sane person would ever try to think about what he believed to be “unthinkable,” to concern himself with that whose essence consisted in the fact that it was unknown (see p. 2, note 3), or to take any heed whatever of an “Ultimate Cause which cannot be mentally realised at all.” (See last page, note.)

|| See *First Principles*, ch. iii., on Ultimate Scientific Ideas; and Mansel, *Bampton Lectures*, lect. iii.

¶ Mr. Spencer (Appendix, p. 580) pours all the vials of his contempt on Professor Birks for representing him as saying that we cannot conceive ideas of these things. He says it is the realities, not the ideas, which cannot be conceived. To conceive a reality is rather a formidable affair. It is, in fact, equivalent to creating it. But what is the meaning of “unthinkable”? Surely it is equivalent to “unable to conceive ideas of.” And, if our ideas do not correspond to the reality, they are not really ideas of it at all.

curiously enough, to make use of them only when religion is in question, and to forget them when he is concerned with anything else. He begins his dealings with visible phenomena by discussing three possible hypotheses of the origin of things, each of which he dismisses as equally "unthinkable." The supposition of a First Cause is set aside in a similar manner. There can be no First cause, because the idea of a First cause involves us in metaphysical contradictions.

8. In his next chapter he discusses space and time. These, too, he finds to be equally unthinkable. They are "unthinkable as entities." We can assert "limitation or the absence of limitation" of neither of them (p. 48). We cannot form the conception of unbounded space and time. As little can we conceive of "bounds beyond which" they are not to be found. On the same principles with which Mr. Spencer deals with self-existence, with Creation, with a First Cause, we are compelled to abandon all attempts to think of space and time.*

9. The same is the case with the divisibility of matter. We can only reason about or discover natural phenomena by the assumption of indefinitely small portions of matter entitled atoms. But the supposition involves us in equal contradictions. You can only really conceive of the infinite divisibility of matter by following out the process to infinity, and this would require infinite time (pp. 50-54). Nor can you imagine material parts so small that no material power can divide them; for, as he shows, this supposition involves absurdities as great as those which are involved in the former. Consequently matter itself belongs to the unthinkable,† and everything that deals with matter, all physical science, all history, even man himself, must be unthinkable too.

10. Motion is next discussed, and the conclusion to which we come is that "all efforts to understand its essential nature do but bring us to alternative impossibilities of thought" (p. 58). Force is in the same condition. "It is impossible to form any idea of Force in itself," and "it is equally impossible to comprehend its mode of exercise" (p. 61). Of the extent of consciousness we are told that we are equally unable to believe it to be infinite, or to conceive of it as finite; its substance, that is, "the personality of which each is conscious" is a thing "knowledge of" which "is forbidden by the very laws of thought" (p. 63).

11. This process might be carried on almost to any extent. Not only the root-conceptions of the individual and of the

* They are "wholly incomprehensible," p. 50.

† "Matter, then, in its ultimate nature, is as absolutely inconceivable as space and time," p. 54.

universe, but the most ordinary phenomena of our daily existence, are capable of being thus reduced to a metaphysical absurdity. The infinite, as Mr. Spencer and Dean Mansel tell us,* is impossible to be conceived; and this, as we have seen, is as true of the infinitely little as of the infinitely great. But the infinitely little meets us every day. It is impossible for a clock to strike without the distance between the hands and the point fixed for its striking being gradually reduced to zero, *i.e.* becoming by degrees infinitely small. And the moment at which that point is reached is also an infinitely small period of time. Therefore, as the hand of the clock reaches the appointed hour, we have a non-existent portion of space between the hand and the point for a non-existent portion of time. Yet we shall hardly be persuaded by the most ingenious metaphysician to reckon the striking of a clock as "utterly unthinkable."

12. The same may be said of motion. Though the motions of a railway train and of the earth on which it moves are of course not absolute but relative, nevertheless it is a fact that a railway train traverses a certain portion of the earth's surface in a certain time. But we can only conceive of its doing so by resorting to the expedient of supposing it to describe indefinitely small portions of space in indefinitely small periods of time; that is to say, according to metaphysicians, non-existing portions of space in non-existent portions of time. Metaphysically, this is an absurdity. Practically, it is a fact, and he would be regarded as a madman who attempted to persuade us that we ought to act upon the hypothesis that it was not, or, which is perhaps more exactly a parallel case, that we ought to dismiss all considerations of motion from our minds as "unthinkable." †

13. But Mr. Spencer is not dismayed by the portentous dimensions he has assigned to "the Unknowable." He proceeds to inquire, after having proved that we can know nothing—or rather, as he prefers to put it, that "we cannot know the ultimate nature of that which is manifested to us"—he proceeds to ask, "What can we know?" (p. 127.) And he concludes: "Our postulates are—an Unknowable Power; the existence of knowable likenesses and differences among the manifestations of that Power; and a resulting segregation of the manifestations into subject and object" (p. 157).

* *First Principles*, ch. ii.; *Bampton Lectures*, lect. ii.

† It may be remarked that Newton's method of fluxions, the foundation of the methods of the differential and integral calculus, used in all modern scientific research, proceeds upon a similar metaphysical absurdity. Physical science, therefore, is clearly "unthinkable."

14. Now, what we have to ask is, on what ground does Mr. Spencer mark off what he calls "religious" ideas, and those alone, as belonging entirely to the sphere of the Unknowable? What reasons does he give (so far as we can see, he has given none) for the exclusion of the subjects which are known as "religious" from this "segregation into subject and object"? What authority is there, beyond the "unproved sayings" of so great a man, for the doctrine that religious truths cannot be included in the list of "knowable likenesses and differences among the manifestations of the Unknowable Power"? We cannot conceive metaphysically of space, or of time, or of matter, or of motion, or of self. That is to say, we cannot satisfactorily define them on metaphysical principles. And yet they exist. We know it. The ground of this knowledge is what we call, whether we can define it exactly or not, our consciousness. Why, then, should not God exist, although we cannot define satisfactorily the mode of His existence according to the laws of metaphysics? Why should not the universal consciousness of His existence be held to prove it, in spite of all metaphysical difficulty, as it is held to prove all other things? Why should we not regard the spiritual communion between the soul and God as a consequence of the "knowable likenesses and differences among the manifestations of the Unknowable Power"? For our contention with men of Mr. Herbert Spencer's school is not that we profess to know *all* about God, but that we claim to be able to know *something* about Him. All creation is involved in a robe of mystery. The origin of things, the forces of the universe, the phenomena of nature, the secret of existence,—all, as we have seen, are in some respects outside the sphere of our apprehension. Even in our own being, we recognise the presence of truths beyond our power to penetrate. And yet we venture humbly and reverently to believe that God has permitted us to know something about ourselves and the phenomena we perceive around us. Where is the absurdity of supposing that, *pari ratione*, we may know something of Him?

15. It is in the attempt to form abstract conceptions of God that philosophy has failed. We shall see **presently** that Christianity has not failed, just because she has avoided that pitfall. The attempt to form a Christian philosophy on the basis of abstract conceptions of the Divine nature has always, like Dean Mansel's, involved the person who attempted it, either in a hopeless tangle of perplexities, or in a direct contradiction of the first principles of Christianity. A brief glance at the various theories of God, from Plato downwards, will serve to convince us of the truth of this statement.

16. The Divine, according to Plato, is Abstract Existence, apart from any particular form of it. He is rather a thing than a Person; τὸ ὄν, rather than ὁ ὢν. He is not yet the "Absolute" of modern philosophy, for that is entirely without any connexion with anything else.* But he has made many strides towards it. He is not only greater than all creatures, but He is actually beyond all being whatsoever. He exceeds substance in excellence and power.† This language found its way into the Christian Church, and may have had not a little to do with the fierce controversies on the Divinity of the Son of God which convulsed the East. They meet us in that border land between heathen philosophy and Christianity, the Gnostic heresies. Basilides, as we learn from Hippolytus, regarded the ultimate source of things as pure non-existence,‡ thus anticipating Hegel's dictum, that "pure being is pure nothing." § Valentinus represented his First Cause as depth unfathomable, and, according to some accounts, as dwelling for ever with Silence as his companion.|| Christian fathers adopt Plato's language. It is found in the earliest extant apologist of the Christian Church, Justin Martyr.¶ Clement of Alexandria** and Origen †† betray the

* Mansel, *Bampton Lectures*, lect. iii. p. 50.

† It is to be observed that Plato uses this language, not of the "Absolute" or "Infinite," but of the Good. Dean Mansel has somewhat misrepresented his language in his *Bampton Lectures*, p. 224. See Plato, *Republic*, book vi. sec. 19; Archer Butler, *Lectures on Philosophy*, ii. 59; and Ueberweg, *History of Philosophy*, vol. i., "Plato." Plato's words are: οὐκ οὐσίας ὄντος τοῦ ἀγαθοῦ, ἀλλ' ἐκ ἐπέκεινα τῆς οὐσίας πρῶσβεία καὶ δύναμις ὑπερέχοντος. Knowledge, and truth, and even being itself, flow out of τὸ ἀγαθόν. Metaphysical philosophy has not advanced since Plato's time, in this respect at least.

‡ *Philosophumena*, vii. 9.

§ Hegel believed that every existing thing, by the conditions of existence, must blend two opposite ideas in itself. As pure light, without shadow, would be a medium in which it would be impossible to see, so pure being is a thing which has no actual existence, and is, therefore, identical with pure non-being.

|| The question about the eternal existence of Silence with the Ultimate Cause, is asserted by Irenæus, but left doubtful by Hippolytus, whose information was more complete. Compare Iren., *Adv. Haer.*, i. 1, with Hipp., *Philosophumena*, iv. 24.

¶ Justin cites Plato as his authority for the statement that "the eye of the mind could clearly see" the τὸ ὄν, yet that he was beyond all being (οὐσία), unspeakable, unexplainable, alone καλὸν καὶ ἀγαθόν. *Dial. c. Tryph.*, ch. iv.

** *Strom.*, ii. 2.

†† According to Origen, *De Principiis*, i. 1, God is "simplex intellectualis natura," cognisable only by means of His works. It is unfortunate that we are left here to Rufinus's Latin translation.

influence of Platonic thought, and through them it found its way into the great Trinitarian controversy of the fourth century. Athanasius himself quotes Plato as submissively as though he were one of the inspired writers.* St. Augustine, when he speaks of God, speaks quite as enigmatically.† In fact, the early fathers loved, if possible, to exaggerate the mystery of the Being of God, that they might exalt the value to humanity of the revelation which is by Jesus Christ.‡

17. Modern philosophy is just as helpless before the mystery of the Divine Existence as ancient. We find the controversy between Bishop Browne and Dr. Clarke quite as perplexing as the language of ancient philosophy. We are equally at fault whether we are told by Spinoza that "God is the being absolutely infinite—*i.e.*, the substance consisting of infinite attributes, each of which expresses an infinite and eternal essence;"§ or by Fichte, that existence implies origin, and God is beyond origin; or by Schelling, that the Absolute is neither real nor ideal, neither thought nor being.|| It is to this last conception that Sir W. Hamilton, Dean Mansel, and Mr. Herbert Spencer would bring us. God is the

* *Contra Gentes* (Paris ed., 1627), vol. i. p. 3. But though God, being good, and more than good, is said, in Plato's words, to transcend all being, we are, nevertheless, told that He gives the apprehension (*ἐννοια*) and knowledge of Himself to man. So, in his letter on the Decrees of the Nicene Synod, ch. xxi., Athanasius writes that God's Essence is incomprehensible (*ἀκατάληπτον*). And in his Epistle to the Monks he tells us that if we cannot comprehend what God is, we can at least say what He is not.

† As for instance: "Neque enim voluntas Dei creatura est, sed ante creaturam, quia non crearetur aliquid, nisi Creatoris voluntas præcederet. Ad ipsam ergo Dei substantiam pertinet voluntas ejus."—*Conf.*, xi. 10. And, again, "Præcedis omnia præterita celsitudine semper præsentis æternitatis et superas omnia futura, quia illa futura sunt, et cum venerint, præterita erunt. Tu autem idem ipse es, et anni tui non deficiunt. Anni tui nec eunt nec veniunt . . . anni hic omnes simul stant, quoniam stant, nec euntes a venientibus excluduntur . . . Anni tui dies unus, et dies tuus non quotidie, sed hodie."—*Ibid.*, xi. 13.

‡ As in Tertullian's well-known "Certum est quia impossibile."—*De Carne Christi*, ch. v.

§ *Ethics*, First Part, Definition 6.

|| See Mansel, lect. iii. note 7, p. 49. These writers give various explanations of the Infinite, the Absolute, and the Unconditioned. Fichte regards God as the moral order of the universe and nothing more. Schelling, in his *Vom Ich als Princip der Philosophie*, says that the Unconditioned can be found neither in the sphere of the subject nor the object, but only lies in the "Absolute Ich." Of this he tells us that "it is, simply because it is; and is conceived of, simply because it is conceived of" (p. 8). In like manner, in his *Letters on Dogmatism and Criticism* (Works, p. 152), he says that the existence of God is as incapable of being proved as our own.

Absolute. He is the Infinite. He is the Unconditioned. But the Absolute is "independent of all relation," Dean Mansel tells us.* The Infinite is that which is "free from all possible limitation" (p. 30). The Unconditioned is that which stands apart from all conditions of existence whatsoever.

18. In the face of these metaphysical difficulties, it is some consolation that the God in whom we are asked by Christianity to believe is neither the Infinite nor the Absolute nor the Unconditioned.† And, therefore, in whatever metaphysical difficulties we may be plunged by believing in Him, we are at least not compelled by our faith in Christ to embrace the conception that He is non-entity. Whether it be possible or right to conceive of Him metaphysically as "the sum of all reality" (p. 30), and therefore, as Hegel asserts, of necessity containing evil within Himself, or not, such is not the conception which is placed before the Christian. God is not "the Infinite," *i.e.*, the unlimited, for He cannot die, and therefore death is no part of His Being. He "cannot lie."‡ He cannot deny Himself.§ He cannot do evil, for evil is that which is contrary to His Will; and some schools of theology even conceive of Him as setting bounds to His knowledge by his own Will.|| God is not the Absolute, for the Absolute consists in the absence of all relation. But relation to other beings, accord-

* Page 51. This is the strict meaning of the word. So says Sir W. Hamilton, who derives it from *absolutum*, "what is freed or loosed," and hence it means "what is aloof from relation, comparison, limitations, condition, dependence," &c. Dean Mansel, finding this sense of the word unsuitable to his argument, modifies its meaning in Lecture III. There it means "free from *necessary* relation," and so includes *some* of the ideas ordinarily connected with the nature of God. But in addition to the confusion generally caused by using a word in two different senses, we have here the additional perplexity that the "absolute" in this sense is sometimes absolute in the proper sense of the word, and sometimes not. What is "aloof from all relation" can never, under any circumstances, be related. In entering into relation of any kind, the Absolute ceases to be Absolute. Dean Mansel speaks in pp. 136, 137, of "absolute morality." What does morality become when "independent of all relation," or even of "all necessary relation"? To the idea of infinite morality (p. 134), according to the definition above, there are equal objections. Can there be a morality without limitations?

† Even Plato had got beyond this. His idea of God was not the Infinite or the Absolute, but the Eternal Good (see above). Even Canz's doctrine, that God is to be discerned by an infinite power of action, is superior to our modern conceptions of Him as the Infinite and the Absolute.

‡ Titus i. 2.

§ 2 Tim. ii. 13.

|| The theory of Free-will can hardly be maintained except on the hypothesis that God, by the fiat of his own will, parted with His power to determine absolutely the actions of those creatures to whom He had given the gift of freedom.

ing to Revelation, is a necessary part of the Divine attributes.* It is contained in every line of Scripture. He is related to them by Creation, and hence He is their Father. He is related to them by His continual care, and therefore He is their Preserver. He is related to them by ties of a moral character, involving government on His side, obedience on theirs, and therefore He is styled their King. He is related to them by spiritual ties, for He regenerated them when they had fallen from innocence, and hence He is their Redeemer and their Saviour. The word "love" is used to express the "relation," the "conditions" under which God stands in reference to His creatures. "God so loved the world, that He gave His only begotten Son, to the end that all that believe in Him should not perish, but have everlasting life." Thus, then, so far from the God of the Christian being "the Absolute," He is essentially the direct opposite of the Absolute. Neither is He the Unconditioned,† for He subsists under certain conditions,—holiness, for instance,—which constitute His essential nature. In point of fact, unless "conditioned" in some way, God could not be properly said to have any nature whatever.

19. Whether it be right or wrong, therefore, the Bible offers us no metaphysical abstractions in its doctrine concerning God, but practical facts. And it was so from the beginning. The Hebrews conceived of God, not as the Infinite and the Absolute, but as the Power which ruled the Universe.‡ Moses presented Him to men, not as non-Being, but as Being; as having life in Himself, and imparting it to all others.§ He is continually described as the "Living God"; that is, as one Who possesses Himself all the energy which we instinctively connect with life, and Who communicates that energy to those beings which, however metaphysically inconceivable, we can see that He has made. And in the New Testament there are two other aspects in which He is presented to us. We are neither told that He is the "Infinite" nor the "Absolute." What we *are* told is that He is Spirit (*i.e.*, breath), and that He is Love; that is, that He communicates Himself, and that He wills the ultimate welfare of creation.

20. These ideas, whether they be metaphysical or not, are

* There are inter-relations, according to Revelation, in the bosom of the Trinity itself.

† The Conditioned, according to Sir William Hamilton, is the "conditionally limited," *i. e.* that which is limited by conditions.

‡ Elohim, *i. e.* Power or Strength in all its various forms.

§ Jahveh, *i. e.* the Eternally Existent.

eminently "thinkable." And if all metaphysical conceptions of all phenomena be ultimately reducible to an absurdity, it may possibly be that the true key to metaphysical science has as yet to be found.* The truth is, that one great mistake of metaphysics has been the assigning a real existence to abstract ideas. They are simply convenient formulæ of classification, "symbolic conceptions," as Mr. Herbert Spencer calls them, which assist us in the process of reasoning, but simply mislead us when we substitute these general classifications† in the place of living intelligences. It has often been humorously said that the abstract man is a practical impossibility. He is utterly "unthinkable." He has not, and never could have, any real existence. For he must be neither short nor tall, fair nor dark, fat nor thin, young nor old, good nor bad. In fact, he is quite as impossible as Dean Mansel or Mr. Spencer's "Infinite" or "Absolute." The necessity of such "symbolic conceptions" of man for the purposes of reasoning will not be denied. Yet, if we suppose these conceptions to correspond to anything having a real existence, we are speedily compelled to relegate them to the region of the unthinkable. And yet if those who are here present were to proceed, each one for himself, to conclude that every one else were "unknown and unknowable," and were to resolve to have nothing whatever to do henceforward with the rest of our fellow-creatures, because the "mystery we contemplate" in them "is ultimate and absolute," the result would be a speedy catastrophe for humanity—and for ourselves.

21. The fact is, that it is neither God nor man who is non-existent: it is the speculative conceptions we form of them. These speculative conceptions are purely subjective. That is to say, they have no real existence apart from the mind that conceives them. But real beings are essentially objective; that is to say, they exist entirely independent of any conceptions whatsoever that are formed of them. They

* As St. Augustine acutely remarks in his *Confessions*, book xi. 14, when replying to an inquiry for a definition of time, "Si nemo ex me quærat, scio; si quaerenti explicare velim, nescio." We can often understand what language is inadequate to explain.

† Or, as Kant calls them, the "form-giving faculties, or, more accurately, those which give goal or aim to our reason." Kuno Fischer; see G. H. Lewes's *History of Philosophy*, vol. ii. p. 503. It is not denied that there are conceptions which correspond to things really existing external to the mind conceiving them. What is denied is, that what are sometimes known as abstract conceptions, or, more properly speaking, generalisations of facts, have an objective existence. See Grote, *Plato and Other Companions of Sokrates*, vol. ii. p. 281.

exist whether those conceptions be adequate or inadequate; and therefore it is an utter absurdity to speak as though their existence were in the slightest degree affected by the possibility or impossibility of our forming satisfactory conceptions of them.

22. Thus, then, as we are compelled to impale ourselves upon one horn or the other of Mr. Spencer's dilemma, we unhesitatingly choose the latter. Satisfactory abstract conceptions of anything in heaven and earth we cannot form; they land us in inextricable contradictions. But "likenesses and differences among the manifestations of the Unknowable" (would it not be more correct to say *Undefinable*?) "Power" we "can know." In other words, we can form conclusions on which to base our conduct from what we see around us. That is what our reason was given us for. And though we cannot see God, though He transcends our utmost powers, yet we contend that He has given us quite sufficient manifestations of His existence for us to be able to know that He is, and within certain limits *what* He is. Mr. Spencer confesses as much, when he speaks of the "manifestations" of the "unknowable Power." It may be contended that we have here admitted the proposition, that the ideas we form of God are "regulatively true, but speculatively false." I do not admit the charge. It is quite a different thing to say, as I have in effect done, that our ideas of God are regulatively true, but speculatively insufficient. In saying this, I only say what Dean Mansel and Mr. Spencer have proved to be true concerning every object of thought whatsoever. And I have already, I trust, shown that the truth or falsehood of our beliefs is in no way affected by the possibility or impossibility of making them intelligible in an abstract form.

23. II. I proceed briefly to sketch out some of the grounds that exist for a belief in God: belief, that is, in a Living Power which governs this world, a source of the life which abounds in it, a giver of the happiness which, in the gloomiest view we take of existence, must be held to surpass the misery and pain which is to be found in it. And our method will be strictly scientific; that is to say, we shall proceed from observed facts. We shall not, like Aristotle in physical and Mr. Spencer in spiritual science, lay down abstract principles which are fatal to the progress of thought. We shall simply note phenomena, and draw conclusions from those phenomena.

24. And first, we have high authority—Mr. Spencer's own—for believing that there exist "manifestations" of that Power of which we have spoken. From these "manifestations" it can hardly be unreasonable, nay, rather it would appear to be a necessary process for the inquiring spirit of humanity, to

draw some conclusions as to the nature of that Power. The most obvious of these "manifestations" is the existence of Design in Creation. Paley's famous argument of the watch has been much derided of late, and Mr. Herbert Spencer has given us a most extraordinary version of it; but the common-sense of mankind will never be brought to deny that the phenomena of creation, as science presents them to us, most clearly point to what we understand as the workings of Mind.

25. The next point to which we would refer is the existence of Force. No satisfactory explanation of Force has been given save that which regards it as the expression of Will.* But surely it must strike every one that if Force is the expression of the Will of the Undefinable Power, we cannot escape from knowing a good deal of the character of that Power, if we only take the trouble to look at nature. In nature we see the results of that Will. As discovery advances we know more and more about the methods of that Will. With such a multiplicity of facts before us, is it quite reasonable to say, as Mr. Spencer does, that the more thought advances, the less we know of God? Is not Science a progressive Revelation of Him?

26. A similar argument may be drawn from the purpose of creation. The world literally swarms with life, and life, in the main, is enjoyment. Is it unfair to draw from hence an inference that the purpose of creation is happiness? Pessimist philosophers may endeavour to persuade the world that the miseries of life outweigh its joys; but the way in which the vast majority of men cling to life contradicts them. Nor is the argument drawn from the miseries of life a very strong one at the best. One of the most clearly established facts among visible phenomena is the existence of a malevolent Power, thwarting the beneficent Will of the Creator. And a long observation of human history is bringing us ever more clearly to the conclusion that this very existence of evil is destined in the end to augment the sum of happiness which for the time it has poisoned.

27. This consideration is strengthened when we look at

* This is Sir John Herschell's view, stated in his *Astronomy*. It is beginning to be once more accepted by men of science, even those who are not believers in Christianity. Once more the point of attack is shifting, as the assailants have been beaten back. Mr. Spencer defines Force, which he terms the "ultimate of ultimates" (p. 169), as "a certain conditioned effect of the Unconditioned Cause—the relative reality indicating to us an Absolute Reality by which it is immediately produced." In other words, it is and is not the "ultimate of ultimates." Nor is it easy to see how either that which cannot exist without relation (for force cannot be conceived of except as acting on something or other) can indicate to us a Reality whose essence consists in independence of relation, or how what is independent of all relation can possibly "produce" anything, since production involves relation.

death itself. If we are not entitled to assume that the world is designed with consummate wisdom,* we are at least, I presume, justified in saying that the wisdom and goodness, as well as the power, with which it is contrived and kept in being, is somewhat in advance of these qualities, as they are found even in the highest and best human intellect. But a very ordinary human intellect would revolt at the injustice of implanting in man a conviction, or even of permitting a conviction to be almost universally prevalent, which was to him a source of delusive happiness and comfort. This is the case with the belief in immortality, which has existed in man in all ages, and under all conditions. If, with the late Professor Clifford, we ascribe this belief to the desire to live, we merely remove the difficulty a step. The world is not only ill, but very ill ordered, if a desire for life, so deep and unquenchable that it must needs cheat itself, always and everywhere, with such a figment of the imagination, is implanted in human nature only to be denied. Grant immortality, and you at once reconcile the difficulty of death with the goodness apparent elsewhere. Deny it, and you at once assume a cruelty for which no temporary favours bestowed on humanity can compensate. Even the death of animals, one of the greatest difficulties in the way of a belief in immortality, may best be explained in accordance with the phenomena of visible existence by supposing that the gift of life is only resumed, not destroyed; and it is by no means unreasonable to suppose that it may afterwards be manifested in other forms.†

28. Another argument for the belief that God is knowable is derived from the fact of conscience. This, Professor Clifford tells us, is the "experience of the tribe." But we have to deal with the fact that the "experience of the tribe,"—that is to

* J. Stuart Mill, *Three Essays on Religion*, p. 58.

† Theodore Parker (*Theism, Atheism, and the Popular Theology*, p. 198) cannot reconcile the idea of perfect benevolence in God with the idea of the mortality of animals, and the absence for them of retribution in another life. We have certainly better reasons for believing in the beneficence of God than for erecting the mortality of animals, a point on which we know nothing, into an article of faith. But the evidences we have of the benevolence of the Creator might surely be enough to induce us to trust Him, as reasonable men certainly would trust a fellow-creature who had given similar evidences of benevolence, in a case which is beyond our criteria of judging. Mr. Parker's words are worth notice: "I do not pretend to know how this is brought about" (*i. e.*, the disciplinary effect of pain leading to ultimate welfare); "I know not the middle terms which intermediate between the misery I see and the blessedness I imagine. I only know that the ultimate welfare must come to the mutilated beast overtaken by some brutal man."

say, the public opinion of the hour,—is always in the rear of the ultimate truths of morality. There has ever been a reserve of men who have not derived their conceptions of right and wrong from their fellow-men, but from some higher source. These have been the great teachers of morality, the salt of the earth, which has kept mankind from corruption, the pioneers of progress, and of the elevation of mankind. Whence were their ideas derived? What is the nature of that higher source from which those ideas have evidently been drawn? Is it entirely unphilosophical to suppose that here again we have a “manifestation” of the unseen Power, presenting “knowable likenesses and differences” to us, which we may “segregate into subject and object”? For conscience is apparently antecedent to experience. We can hardly imagine the first murderer to have been ignorant that he had committed a great wrong. And we may observe that the Scripture account of the first murder is psychologically accurate. The murderer is represented not merely as feeling remorse for an act, but as feeling responsibility to some “object,” and that object what we call a Person. This sense of personal responsibility to a higher Power is intimately connected with the workings of conscience. It is from this source that its influence over mankind is derived. There are “knowable likenesses and differences” in ourselves to the moral “manifestations” of the “Unknowable Power” in the world around us, and conscience points them out. And therefore it were more philosophical to investigate its origin, and trace the laws of its working to their cause, than to adopt the eminently unscientific course of assuring us, upon no grounds whatsoever but the fancy of the speaker, that conscience, regarded as a sense of responsibility to a higher Power, is all a mistake.

29. Again, we see that in the visible universe there are an enormous number of laws and contrivances designed to secure the happiness of living creatures, and none, except such as may fairly come under the head of violations of those laws, calculated to destroy that happiness. With the origin of evil we do not now concern ourselves, save so far as to say that it has been almost universally regarded as the result of a violation of law. On the other hand, we have a sense of justice implanted in us which nothing but evil training can eradicate. These two considerations combined lead us irresistibly to the conviction, first, that justice is violated in human society as it at present exists, and next, that the Being who created the world must be able and willing to harmonise all inconsistencies and right all wrongs in the end. Here, again, comes in the idea of immortality. As Bishop Butler reminds us, we see

tendencies at work in human life calculated to produce certain results; but the life of the individual is too short to enable them to reach the end to which they were evidently tending. Our sense of something amiss, our moral disapprobation of the government of the world, can only be appeased by the conviction that here we see only a part of God's dealings with men, and that a part—possibly a very large part—of those dealings is carried on beyond the grave. Here, again, we are fairly within the limits of scientific research. We are reasoning on the “manifestations,” the “knowable likenesses and differences” in the action of the Unseen Power. There is only one thing in which we differ from some scientific reasoners, and that is that we take in the case in all its bearings. We do not exclude the moral aspect of the question, either as it affects the individual man, or our ideas of Him from whom all morality proceeds. The fact that the world is in a state of probation appears to be written ineffaceably upon the history of man. By whom designed, and for what purposes, is a question which it cannot be scientific to ignore.

30. Nor can it be safe to put down all the spiritual experiences of the individual as so much fanaticism. This, too, would seem to be eminently unscientific, considering the vast part religion has played, and still plays, in the history of mankind. I have already ventured to express my disagreement with Mr. Spencer when he asserts that what are called “religious” ideas have gradually grown feebler as man has progressed in intelligence. I would venture to assert that the fundamental principles of religion, involving responsibility to a Higher Power; confidence in the love and protection of that Higher Power; the firm conviction that this Higher Power has our happiness and moral elevation as much in view as if no other being existed than ourselves,* were never more powerful factors in human thought than they are at present. As regards Christianity in particular, the sense of our need of some satisfaction for sin, other than what we ourselves can offer, though it has been quite needlessly exposed to a multitude of objections by a method of stating it not found in Scripture, continues to present itself to men as a moral necessity. I remarked here on a previous occasion that it would be hardly

* This feeling finds beautiful expression in Keble's *Christian Year* :—

“Thou art as much His care as if beside
 Nor man nor angel lived in heaven or earth;
 Thus sunbeams pour alike their glorious tide
 To light up worlds, or wake an insect's mirth.”

Monday before Easter.

consistent with the wisdom manifested in the present order of things, to suppose that the sense of awe, reverence, helplessness, dependence, which produce worship and incite to prayer, had been implanted in man without an object to which to direct themselves. A universal belief involves a universal need for that belief; a universal consciousness involves an object of that consciousness. Not more deeply seated in our nature, in spite of the attempts of some metaphysicians to overthrow that also, is the persuasion of our own existence, than is the universal conviction of the existence of God.

31. Nor is this all. We may appeal to the experience of the individual. This *may* be ill-grounded, but it is quite as possible on the whole that it is not. We do not, in these days of enlightenment at least, turn a deaf ear to the traveller who comes from foreign lands and relates the wonders he has seen there. Perhaps, when enlightenment has advanced a little further, those who have had no acquaintance with spiritual things may think it not unreasonable to listen to the experience of those who have. It is the usual character of a delusion to wear itself out, except among persons of great obstinacy and small intellectual power. How comes it, then, that so many men of the clearest intellect and highest character have reached the close of life with their convictions not shaken, but confirmed. We have heard of many sceptics who, late in life, have become Christians; but of how many Christians have we heard who have sacrificed their Christianity after many years' practical experience of its value? Comfort in trouble, strange and unexpected answers to prayer, the sense of a tender and loving guidance through life, the power to resist temptation, support on which we can rest in days of difficulty, a growing and deepening sense of the reality of the Unseen, these are some of the blessings which religion has to bestow. How real and deep these blessings are, this is not the place to declare. But is there a single genuine Christian who would fail to tell us that nothing on earth could compensate for their withdrawal? Is there one who would not tell you that he had the best of all proof,—*practical* proof, that they were the offspring of no delusion, but plain, literal, sober truth?

32. There is nothing which sceptical writers are so apt, I might say so anxious, to ignore, as the fact that these convictions are by no means those of the ignorant vulgar, nor are they riveted on the minds of the weak by the influences of priestcraft. Men of the highest intelligence in every walk of life, men of mind too independent and temperaments too calm to be impressed by imaginary terrors, are profound

believers in the existence of a moral governor of the world. This belief is partly founded on their own individual experience. They see that a higher wisdom than their own has been overruling their life, and find abundant reason for gratitude to that superintending providence for its fostering care. Many things which they had ignorantly desired have been withheld, and it is only after the lapse of years that they have discerned the reason. And thus the doctrine which they accepted upon trust in their earlier years has become the conviction of their matured experience. They call the Being in whose existence they believe a Personal God, not because they fully understand in every respect the way in which what we call Personality can be predicated of God, but because it is inferred from "manifestations" of the Unseen, which are "knowably like" to what we call "personality" in man.* There are certain phenomena in the visible world from which it appears reasonable to infer the existence of a Being Who exercises a kindly supervision over,— Who keeps up a friendly connexion with,—human beings. The word "personality" is used to express this "knowable relation." If it be metaphysically inadequate to express it, that need not trouble us. For every word we use is, as we have seen, metaphysically inadequate to express the idea it seeks to convey. And yet we do not cease to think, nor yet to speak, in matters of ordinary life. There is no more reason why we should cease to speak or think of God.

33. So far we have confined ourselves to Natural Religion. Now we have one word to say for Christianity. If there be one passion more intense than another with which humanity is endowed, it is the desire to know. And this passion is at its highest in reference to the problems of the future. The early Christian writers tell us how intense this craving was. The author of the Clementines depicts his hero as wasting away with his passionate desire to know something definite concerning the life beyond. Justin Martyr tells us how he rushed from teacher to teacher, but found that none but Christ could satisfy his longings. Can we suppose that the Creator of all has implanted this craving for no purpose but

* Dean Mansel tells us that "personality implies limitation," and that God is the unlimited. But we have seen that Revelation represents God as essentially limited in certain directions. Infinitely wise and good of course He is. But these very attributes limit His power to become other than wise and good. Therefore, even if personality does imply limitations, it is not on that account inconsistent with the idea of God. And so disappears an argument which has been freely employed of late.

to be denied? Or if we say that there is no Creator (which is more than we can prove), can we explain the existence of this craving in a world in which every other desire has a sphere for its fulfilment? Is man likely to be satisfied by the reply, "God is beyond your understanding, therefore don't try to think about Him"? We need not fear for Christianity. It is not likely to be in real danger so long as men who are asking for the bread of life are put off with the stone of Agnosticism. If men seek for information,—and they do still seek, nay, even yearn, for information,—concerning the world unseen, there is none for them, save in the Gospel of Jesus Christ.

34. And that revelation comes before us on evidence which, however warmly it be contested, is absolutely alone in its immense strength. The "threefold cord" of miracles, prophecy, and power to touch and satisfy the human heart, "cannot be broken." The evidence for the two former is misrepresented or evaded, but it is never fairly grappled with. No one has been able to tell us how it is that we are to reject evidence for these alleged historic facts, which is far stronger and more express than for any other historic facts whatsoever.* The way in which Christianity has resisted the incessant, continual, passionate attacks of its assailants must be evidence enough of the immense strength of its foundation. No other religion has ever resisted such attacks. And the secret of its strength is the way in which it brings the Divine to the level of our human comprehension. The author of *Natural Religion* has lately remarked that no religion could have any permanent hold on mankind which did not identify itself with humanity. Christianity has revealed God by displaying Him in a human form, that is, as the Scriptures tell us, in the image of God; in one of the "knowable likenesses" in which the "Unknowable" has "manifested" Himself. From the perfection of the human we may gain as complete a knowledge as to our limited intellects is possible of the perfection of the Divine. God becomes man, as the necessary step in the way of bringing man back to God.

35. There could be no greater confirmation of the truth of what has been said than an admission which Mr. Spencer very candidly makes towards the close of his argument. Christianity is rationally untenable, because the mystery which it professes to expound is "ultimate and absolute." But *we*

* No other historical facts are commemorated by such remarkable memorials as the Passover and the Eucharist, the latter of which has subsisted for above eighteen hundred, the former for more than three thousand years.

*cannot do without it.** It is necessary, for the present, as a factor in the moral education of the world. That is to say, that the false is necessary for the elucidation of the true. You cannot get men to act as they should without deceiving them. We have heard a great deal about the unworthy tricks of divines in dressing up phantoms in order to frighten mankind, and keep them under priestly influence. But now one of the most eminent philosophers of the day, himself no friend to Revelation, informs us that it is the only way to deal with men whose mental development is imperfect.† May we not, in all humility, venture to believe that it is the only way, because it is the true one? Can we be fairly condemned for holding that under no circumstances can falsehood lead to truth? An imperfect belief may lead to a more perfect one; but a belief fundamentally unphilosophical, ungrounded, and absurd, must be utterly renounced before one step is taken towards the truth. From Mr. Herbert Spencer's own admissions, therefore, we may find some reason for the belief that it is vain to preach "righteousness and temperance" without a reference to "judgment to come," and vain to try to influence men by the terrors of that judgment, without pointing them to One Who can save them, not only from its penalties, but from their cause.

36. We have now given some reasons for the belief that, though we cannot know all about God, we may know something about Him. Partial knowledge is not the same thing as no knowledge at all. Our ideas are not "speculatively false" because they are speculatively inadequate. All knowledge consists of successive approximations to the truth. We are all of us familiar with calculations based on the ratio of the diameter of a circle to its circumference, and on the extraction of roots of numbers which are not complete squares. Carried on to as many places of decimals as the nicety of the operation requires, the most valuable practical results are attained from premises which are speculatively defective. Similarly, in infinite series, we take as many terms as are

* *First Principles*, p. 122. "We cannot avoid the inference that they are needful accompaniments of human life . . . elements in that great evolution of which the beginning and the end are beyond our knowledge and conception." But it is remarkable that many who take upon themselves to expound Mr. Spencer's doctrines have nothing but contempt for that to which he esteems it a duty to extend "the widest possible toleration."

† "As certainly as a barbarous race needs a harsh terrestrial rule, and habitually shows attachment to a despotism capable of the necessary rigour, so certainly does such a race need a belief that is similarly harsh, and habitually shows attachment to such a belief."—*First Principles*, p. 119.

needed for our purpose, and neglect the remainder as practically of no importance. Space, again, is infinite; or rather, we seem incapable of conceiving it as otherwise. Yet we know a great deal about the distance of the heavenly bodies, their size, the materials of which they are composed, the conditions under which they exist. Nor, because we are unable to answer all questions suggested by their existence, do we cast aside all that we do know as worthless. Once more, we do not doubt the existence of Force. Yet the doctrine of the existence of Force simply depends upon the fact that it is the only explanation satisfactory to the intellect which has been given of natural phenomena. We speak of observation as the basis of knowledge. But Force itself has never been observed. Its existence is only an induction from facts ascertained by observation. And our belief in its existence is confirmed by the circumstance that when assumed it is possible to deduce the phenomena from it.

37. The idea of God has a stronger claim on our acquiescence than this. Not only is it the conclusion to which the intellect of mankind in general is irresistibly led by the phenomena of nature in the widest sense of the word; not only is it, when assumed, a thoroughly rational and intelligible, and to most intellects a satisfactory, explanation of the phenomena; but it is witnessed to by the all but universal consciousness of mankind. That is to say, it stands upon the same basis as all phenomena whatever. If we may not assume the existence of that of which we are conscious, all existence whatsoever disappears like the "baseless fabric of a vision." Thus, the idea of God is eminently scientific. It affords an explanation of phenomena, and at the same time it is felt, or, rather rationally concluded, to be at the root of all phenomena. It rests alike upon an objective and subjective basis.* And like scientific truth, moreover, it is capable of verification. But such verification must consist first of all in assuming its truth, and acting upon the assumption by applying it to facts. A man who refused to accept the first principles of science would be eternally precluded from

* Thus, it will be seen that it is not intended to assert that belief in God depends entirely on external observation. Inward intuition is by no means excluded. But in the case of those whose inward intuition is defective, outward means may be resorted to in order to restore it. If we cannot discern Him as we should by the eye of the soul, we may still see the "invisible things of Him" by "those that are made." For the intuitions of the soul, when in spiritual health, and the conclusions of the reason mutually correspond.

arriving at truth. He must take them at first on trust from other men, and then by diligent application of them to phenomena he will arrive at an independent conviction of their accuracy. Such is eminently the case with religious truth. He who scoffs at it as absurd will remain, as long as he does so, a stranger to the knowledge of the Unseen. He who accepts it on the authority of persons he can trust will find continually, as he applies it to the facts of existence, fresh reasons for acknowledging its truth. Like all other knowledge, it passes from the stage of belief on authority, through that of experimental inquiry, into that of rational conviction. If this be said to be contrary to facts, it may be replied that such contradiction is only apparent. Those who have made shipwreck of their faith have usually done so at the very moment when they were first in a condition to act independently and intelligently upon the principles they had been taught. Instead of applying those principles to practice, and thus ascertaining whether they were an adequate solution of the problems of life, they have demanded to investigate the whole question, *ab initio*, for themselves. Life is not long enough for such a process. Those who undertake it must not be surprised if life be wasted in it, if the arrogance which treats with contempt the experience of other men should need a bitter lesson to convince it that no man in this world can venture to stand alone. It is a most significant fact, the practical importance of which cannot be overrated, that no man has taken the doctrines of Christianity as a basis for conduct, and acted upon them consistently for a long series of years, and has been forced at the end to confess that they have failed. Thousands, on the other hand, have recoiled from the abyss of uncertainty which lies before them in the shape of Agnosticism. It is not logic, it is the result of experiment, which makes a man of mature age a Christian, and keeps him so. The feeling that something more than a negative conception of God as the Unknowable is necessary to support him through the perplexities and sorrows of life, may often be the means of leading him to embrace revealed religion. But experience does not lead him to surrender his new convictions as delusive. Rather do those convictions gather strength as life advances, and as fresh demonstrations of Eternal Wisdom and Love open out upon the soul. And so, as in the lapse of the ages it continues to store up within the limits of its experience new "manifestations" of the Divine, it passes gradually from the "knowledge in part" which characterises our existence here, to that "knowledge even as we are known," which constitutes the perfection of humanity.

The CHAIRMAN (Rev. R. Thornton, D.D., V.P.).—It seems unnecessary to ask the meeting to allow me to tender their thanks for the exceedingly able and interesting paper which has just been read. (Applause.) I hope we shall now have a good discussion upon the subject.*

Rev. Prebendary Row, M.A.—The difficulty I feel in dealing with the paper before us is, that I do not think it contains five lines as to which I have to express disapprobation. In fact, I cordially hail this paper as one of the best I have ever seen; and so strong is my opinion of its excellence, that I would certainly recommend the Council of the Institute, if they do this year publish a People's Edition, to take care that it shall contain this identical paper. The reason why I recommend such a course is this: I was talking last Saturday with my publisher, who is acquainted with Mr. Herbert Spencer, and he told me, to my great surprise, that among the artisan class there is a considerable circulation of Mr. Spencer's works. I was the more surprised to hear this when I remembered that Mr. Spencer's books are full of hard words and technical phrases; and I should not have thought that they were likely to be read by men of the class referred to. Of course, I cannot gainsay what I was told, but there seems to be little doubt that such works are the main cause of the unbelief which exists at the present moment in this country. There is no doubt that an unbelief founded on his system has obtained possession of the minds of large numbers of the upper classes; and the inferior minds readily accept the doctrines put before them, not so much because they are able to understand the principles on which they are based, as because they follow the example set them by their superiors. (Hear, hear.) I think I may say that there are no books now published which are doing more mischief to the cause of religion than the books of Mr. H. Spencer. (Hear, hear.) This is the more remarkable because, I think that, although the books themselves are large, they do not require a very large amount of reasoning and argument to crumble their conclusions to the dust. There are a great many books that necessarily require large books to answer them; but Mr. Spencer can be effectually answered without the necessity of writing a thick volume. I may say, with regard to what Mr. Lias has put forward relative to Dean Mansel's work, that I cordially endorse what he says. I was acquainted with Dean Mansel, yet cannot but feel that his work has been attended by most serious consequences to the cause of religious truth, although it was undoubtedly published with the intention of defending truth. This is a most remarkable fact. Dean Mansel, doubtless, thought that he could use the weapons of unbelief in order to crush unbelief, but he forgot that, in using a weapon of this kind, it could be wielded with equal effect against Revelation as against Atheism. I admit that Herbert Spencer does not deny, abstractedly, the existence of a being which

* Previously to the commencement of the discussion the Hon. Secretary read several letters from leading members expressing approval of the paper, and trusting it will be widely useful. Amongst those since received is one from Bishop Harold Browne, saying, "I think it very able and good," and adding the expression of his wish to become a supporter of the Institute.—Ed.

he calls God; but at the same time his principles are practically those of Atheism, although not theoretically so,—I mean his is practical, as distinct from theoretical, Atheism; a system of belief which teaches that I may go from one end of life to the other without any regard to the existence of God; and, further, a system which denies the moral freedom of man. But, turning to Dean Mansel's book, there is one point which I think requires a little more elaboration than Mr. Lias has given to it. Dean Mansel denied that we can obtain any really abstract idea of God, because, as God is infinite and all our conceptions finite, it is impossible that God can be conceived by the finite mind. But as he puts it, although we cannot get this conception by means of our natural faculties, we can get it by Revelation. This, I think, is a mistake that lies at the bottom of the Dean's position. Let us take an illustration. He lays down, as a fundamental truth, that because God is infinite, and we are finite, we cannot get any real conception of God; and I fully agree that all attempts to explain the ontology of God in terms of the finite intellect of man must be futile. Dean Mansel thought that he had proved through this position the necessity for Revelation; but the same reason, which renders me incapable of forming a conception of God through the finite character of my intellect, would also render me incapable of forming a conception of God by Revelation. Let me take an illustration: a pint measure merely holds a pint of liquid; and, because it is so conditioned that it is only a pint measure, it is impossible to get a gallon into it. Just in the same way, because the intellect is so conditioned that we cannot get an adequate conception of God into it, so must it be if we try to get into it the same conception by way of Revelation. Dean Mansel has also spoken of a regulative idea of God. Let us see what is meant by such a conception. The revealed conceptions of God, being inadequate representations of His actual character, are intended to be regulative of our conduct, *i.e.*, we are to act as though they were the adequate and true ones. But we do not, in the long run, require to know what duty is; but what we want in Revelation is some spiritual or moral power to make the performance of duty possible. The essence of the Christian revelation is, that it has revealed a spiritual and moral power which has rendered duty a possibility to man, and which the whole range of pagan philosophy has utterly failed to reach. Some years ago, I quoted in this room the very words used by Aristotle, who tells us he did not think that his principles of ethics would have any effect whatever, except among the higher classes of mankind. The passage will be found in the seventh book. But Christianity has come and given us, in the Revelation of Jesus Christ, a moral and spiritual power which has rendered duty possible to all. What is the use of a regulative idea of God? I cannot love a regulative idea of anything, and it is absurd to talk to me of doing so. If you tell me that God's justice is a mere regulative idea, and that the justice of God may be a very different thing from my conception of justice, then I say that no man can feel respect and reverence for a regulative idea of justice. I can only love realities, not shadows or delusions.

This seems to me to be destructive of Mansel's position. It seems never to have occurred to the author of the work referred to, that the principle he lays down denies the possibility of man being made in the image of God, and even of the Incarnation. The Scripture tells us that Jesus Christ is the moral image of God, and I wish to know how it is possible He can be the moral image of God if God as He really exists is absolutely and entirely unknowable, and all our conceptions of Him are merely regulative. Dean Mansel ought to have seen that, if all real knowledge of God is impossible, it would be wholly impossible for Jesus Christ in human nature to be a revelation of the Invisible God. His positions, therefore, raise enormous difficulties, and I cannot help candidly admitting, on reading Herbert Spencer's works, that, if the principles thus put forward are true, they lay the axe at the root of all possible religion. (Hear, hear.) When we come to look at the principles themselves, it seems to me that it cannot but be plain to the comprehension of the most ordinary person that they are without foundation. I am prepared to admit that no human faculty can penetrate into the great question of the ontology of God. So far, I believe, this discussion is showing us that there are things beyond which the human intellect cannot penetrate. These depths go beyond the powers of a finite intellect to fathom ; and probably there will never be such an intellect in the universe as will be able to deal adequately with these points. But this does not prevent us from dealing with the facts treated of in this paper. It does not follow that, because I cannot grasp in the infinity of God, therefore I am unable to attain any knowledge of him which is real. I question whether it is right to apply the term infinite to the moral attributes of God ; but, if one says God is infinitely good, it does not follow that, because we cannot penetrate into the abstract idea of infinite goodness, therefore we cannot tell what the term "good" means when applied to God. Of course, I am aware that we have to encounter the objection of anthropomorphism when we apply these ideas to God ; but there is no idea we can have of God that is not anthropomorphic, and it cannot be otherwise, because we are human beings ; and all the ideas conceived by man must necessarily be anthropomorphic, because they are simply human ideas. When we use the term anthropomorphism in a derogatory sense is when we apply the imperfections and passions of man to God. This is what was done by the pagan mythologists. No doubt, this is most objectionable, but we can only conceive of God at all under human images, and consequently it is absurd to say that, because we use human conceptions, we are degrading the Deity. This objection charges us with applying human ideas to God ; but our reply is, We are able to conceive of God under human ideas and forms of thought because God made man in His Own Image. I defy any one to show that the difficulty is not quite as great on the one side as on the other. When we are told that we cannot form a true conception of God because He is Infinite, Absolute, and Unconditioned, I reply that these are merely metaphysical conceptions that have no existence outside the human mind. The great thing is, to give up, once for all, all these cloudy metaphysics. Let us deal with facts.

We are told by Herbert Spencer that there is an inscrutable Power of which we cannot know anything, but of which the universe contains manifestations. This being so, I want to know, if the universe is a manifestation of this power, how can it be said that we know nothing of this power? (Hear, hear.) And if God is a Power operating in every manifestation of nature, or rather a force behind every operation of nature, then we clearly do get some knowledge of this unknowable Power, and it is absurd to say that it is otherwise. Consequently we may learn a great deal about God from these manifestations, and may also have a great many of our *à priori* prepossessions about Him to unlearn. It is undoubtedly true, that the created universe is a revelation of God, and the human conscience is also a revelation of God,—God speaking to man as to what constitutes right. But Jesus Christ, our Lord, is the greatest moral manifestation of God. I wish to add, that the kind of philosophy we have been criticising has conferred on us great benefit in regard to the innumerable controversies of the past. The great controversies about the Trinity in the third, fourth, fifth, sixth, and seventh centuries touched points beyond the range of human intellect to fathom. Any person may satisfy himself of the inscrutable character of such controversies if he will read the discussions of the Council of Florence on the points which, even at this day, form the ground of separation between the Oriental and Occidental Churches.

Professor S. E. O'DELL.—There is one question I should like to ask. Suppose we put this query to ourselves—Is it possible for us not to know God? Is it possible for us, even if we bring all our intellectual capabilities to our aid, to put out of our minds the knowledge we have of God? Is it possible for us to get even from an assemblage of children the answer that it is possible not to know God? Suppose we went into an assemblage of savages, who have not been taught Christianity, and put the question to them, in the most minute and forcible manner—Would it be possible for them not to know God? In each case you would find the reply you would get is—“All of us, more or less, do know God; all of us, more or less, acknowledge the existence of God.” With regard to how much we know God, that is another question. It is a matter of degree. There are many here, no doubt, who know God more than I do, and there are many outside who know Him less than I do. We are not discussing the degree of our knowledge, but rather the question of this paper reversed—Is it possible for us not to know God? I think, with the rev. gentleman who has just spoken so intelligently, that it is a matter of impossibility for us not to know God; but probably Herbert Spencer, and those of his school as it has now arisen, would, on self-examination, say: “We do know God, because we have been taught, in our infancy and youth, that there is such a Being, and the knowledge has come into our minds in that way; but, beyond what we have thus been taught, we do not acknowledge God.” Through all nationalities and people, whatever their language and tongue, there is a knowledge of God; and this is shown by the reverence and worship they pay to Him, more or less. Now there is one other question I should like to put, and

that is—Why is it that we know God? Is it because of our intelligence? If so, all intelligent men must know God; and in accordance with the development of our intelligence, so must be our knowledge of God. But then comes the question—Is Herbert Spencer a fool or an idiot? We all acknowledge that he is a man of high intelligence, an accepted reasoner and philosopher; and that, therefore, if a knowledge of God depends upon intelligence, Herbert Spencer must acknowledge God. The question is then—Is he dishonest? Certainly we cannot come to this conclusion, as we have no reason for doing so. Therefore, we must conclude that the knowledge of God does not depend upon our intelligence. Upon what, then, does it depend? The only conclusion we can come to is this—that our knowledge must depend on a faculty of the mind, which we all possess, which God has given us, and by which we are absolutely bound to acknowledge Him. If it depended on intelligence, then Herbert Spencer must acknowledge God more than the poor woman who reads her Bible in her cottage or garret. This poor woman may not be altogether void of intelligence, but she has not the intelligence of Herbert Spencer. Nevertheless, she acknowledges God because she possesses a faculty which absolutely compels her to worship Him. If we look at human nature we shall find that this knowledge is a matter of compulsion, and that we cannot get away from it. Let us leave this place, and try to put God out of our thoughts, and we shall not be able to do so. If next Sunday, or to-night, we should find, on opening our Bibles, every word obliterated, still we should have a knowledge of God; and even if all the teachings of Christianity were obliterated, we should still worship Him, because God has put into our minds a witness of Himself which is entirely independent of reason. Reason may turn so absolutely idiotic, as to worship everything and anything in animate or inanimate nature; but there is a faculty of the mind that will compel us, whether we like it or not, to worship God—and because this faculty is possessed by all men, not all the teachings of all the philosophers combined can ever eradicate the desire to worship God. As well might they try and teach us that it is foolish to eat and drink, as teach us it is foolish to worship God, because to do so seems to me, from all I know of human nature, to be a matter of absolute necessity. (Applause.)

Mr. WOODS SMITH (a Visitor).—I desire to say a word or two, because I have been afraid it might be thought the innocent were being slain with the guilty. Mr. Lias acknowledges that there are some true things in Herbert Spencer's works, and I do also, although, like Mr. Lias, I am a Christian. I learn that I cannot find out God by searching and investigating and thinking, or by any effort of my mind or heart; and that if God is to be known, He can only be known by His revealing Himself to me. If Mr. Spencer were here to-night, I believe he would say: "I agree with you there." He says, with regard to this power of which we speak, no limits must be assigned to it. If I were to say to him: "You do not, therefore, limit the possibility of that Power revealing itself to you or to me?" I think he would say: "Certainly not." Here, then, Herbert

Spencer is advancing one of the grandest truths of the Bible. Mr. Lias has quoted those passages as to how we cannot find out God by searching; how man by wisdom knows not God; and how no man knoweth the Father save through the Son, and him to whom the Son is revealed. Therefore, we are brought face to face with this fact—that science, after thousands of years of investigation, has put its foot on one of the first and foundation truths of the Bible. This is a grand thing, and not to be roughly handled or accepted. We all, as Christians, acknowledge it as a fundamental thing, that no knowledge of God is real doctrine beyond that which St. Paul speaks of in Romans, and which puts forward what Herbert Spencer says himself. We have knowledge of God's power and eternity, but not of Himself. But I think we might go far, very far, with Herbert Spencer. Mr. Lias has said there are no words in the Bible which speak of the infinity of God. He might have remembered that there is the Hebrew word to which Eusebius alluded, which expresses the infinity and eternity of God; and that, if you say that God is not infinite or unconditioned, you might go on and say He is not Almighty. But the Lord God is Almighty, and Infinite, and Eternal. These things we cannot fully understand; but we do understand that He can reveal and make Himself known to us. I was thinking just now that we sometimes meet men who tell us: "I am not going to church; I can go out into the fields and woods and meditate about God." We also find men who say: "We know nothing about God"; and if any one should say this to Spencer, Spencer would merely say: "You cannot find Him." But if he went to the pastor, and said: "How can I find Him?" the answer would be: "If you seek Him He will reveal Himself to you." The Bible says: "To know Him is eternal life"; so that if you could get a knowledge of God from the outside world, that would give eternal life. But you cannot do this, and it is this external knowledge that Mr. Spencer tries to teach.

Rev. C. L. ENGSTRÖM.—It has occurred to me that, speaking of the unknowable, it would be a good plan to dwell upon that which is akin to knowledge in a lower sphere, because we are better able to understand things beneath us than those above us. We cannot, indeed, speak of a particle of matter having knowledge of an adjoining particle; but if we bring two particles into contact, that contact is in those particles something corresponding to knowledge. Let us take the old comparison of a child filling its cup from the ocean. There can be no harm in using so trite an illustration. The cup is brought into contact with the ocean, and if you could conceive such a thing as that both were gifted with intelligence, you would say that the two things in contact knew each other. But, coming to higher things, we do not think that the knowledge of God is nothing more than that. It must be much higher; because the knowledge of God is necessarily a far greater thing than a knowledge of matter. Let us take something with life in it. Let us consider the plant as it grows up from the tiny seed which gives it birth, and we shall perceive that, as it passes through its various stages of development and evolution, it comes every moment into new contact with its varied and varying environment; then, if we could suppose it to be possessed of

intelligence, each moment of fresh contact would also give a proportionately new knowledge of its environment. Here we see that, although this is a subject beneath us and therefore easier of comprehension, it is, at the same time, one which is difficult to grasp; for even this is almost, perhaps quite, beyond the limits of our comprehension. We can understand much better the illustration of the cup and the ocean than that of the plant, for, in the latter, besides the physical, there is a chemical and vital process. Lord Bacon has suggested that there is some analogy between the trust and attachment of a dog to its master and the faith and love which exist in the case of man towards God. Suppose we take these two last illustrations together, and say that our knowledge of God is the consciousness of the fuller life given us by God as the latter grows up into contact with the Divine life around it, and that the relation between us and God is somewhat like that between the dog and its master, that is, between a dependent being and somebody above it trusted and loved. If there be any real likeness between these things, then, as we cannot with our limited faculties thoroughly understand the lower relation between the plant and its environment, we see at once, with regard to that higher relation, that it is a thing entirely beyond our comprehension—a thing which we all instinctively feel and are certain of, but of which anything like mathematical proof would be impossible. A thing may be true, and we may know it to be true, but we may at the same time see, from the nature of the case, that our knowledge is not capable of mathematical demonstration. Knowledge is, in fact such a complex and mysterious relation, that it is difficult to understand how it comes about in the simplest things; but in regard to higher spheres the relation is so much more complex, that it would be impossible to explain it in the sense in which Mr. Spencer seems to think we ought to explain our knowledge of God. Let us take another instance, for we are almost forced to use analogies to justify our acceptance of anything which we account to be reasonable. We have just heard of the poor woman in her cottage, and of how she knows God, or of how she thinks she knows Him, and seems to live by that knowledge; now, in case any one should come to her and say it is all a mistake, I have tried to show you that it would be impossible to fully analyse her faith, and that, therefore, we can only go to another analogy from which we may judge as to whether it is reasonable or not. The analogy given to us *in the Bible* is much higher than any I have mentioned. I have spoken of a plant, and an animal; but our relation to God, revealed to us by Jesus Christ, is of a far nobler character, for it is the relation of a child to its parent. Consider the condition of a newly-born child as it hangs on its mother's breast: in that case we know that the infant can have but an infinitesimal knowledge of its mother. It has but a slight and limited material contact as it hangs there; but, as the child grows, its perceptions and faculties begin to be evolved and developed, until it has the knowledge which a child eventually obtains of its parent. Now, if the Bible be true, and God is truly our Father, we, men and women, though His children, cannot expect to grow up even to such a knowledge of Him

as the child has of its mother. We learn from the Bible that men are brought by creation into the lower position in regard to God resembling the relation between the infant and its mother, very close to God, but knowing very little of Him. Then by the mysterious discipline of Providence, we may be said to be, as it were, weaned from this lower position. What then happens? In the place of that merely material knowledge which the child has at first, it comes as it begins to grow and to acquire knowledge, to know its mother's mind, and heart, and will, and it seems to me that in the process of His revelation of Himself *we* obtain the same kind of knowledge of *God*. It is with the race as it is with the individual,—through the revelation of God in Jesus Christ, that we come to know more and more of Him. But the point which I am now mainly insisting upon is this, that, if the relation between us and God be of the kind I have been describing, our knowledge of Him, whether much or little, must be in its nature so infinitely complex and mysterious a relation, that it would be impossible for any being less than God to understand how the knowledge comes about and how the relation exists. To *know* is one thing, to know *how* we know is quite another. With regard to Mr. Spencer, although I have not read much of his writings, and therefore it is not right for me to be too sure in my criticism or praise of his philosophy, I think the last speaker was greatly in the right when he said we ought not altogether to condemn him. His philosophy is of two kinds—the materialistic philosophy of “atoms” and “force,” which, we hold, are totally insufficient to account for the production of what we see around us, and then, this agnostic philosophy by which he teaches that we do not know anything about God. Is it not possible that one element in the prevalent Agnosticism of the day is a genuine humility and reverence for the mystery which surrounds us on all sides? Such humility and reverence are “*not far from the kingdom of God,*” but they need to be quickened by faith to bring men *into* it. The better Agnosticism may be likened to a child yet unborn,—it has “come to the birth, but there is not strength to bring forth,”—but, should the soul believe in Jesus Christ, the Revealer of that Being Whom it yearns to know, it would be born into the spiritual world. There humility and reverence are indispensable both to life and to knowledge, and the once agnostic would find that the things which the Eternal Wisdom has “hid from the wise and prudent” are “revealed unto babes.” (Hear, hear.)

MR. W. GRIFFITH.—It is a great gain to know from Herbert Spencer that he thinks the First Cause is unthinkable. It is on account of the ill consequences which arise from his writings that it is necessary to consider somewhat more fully his claims as a new teacher. I quite agree with Prebendary Row, that we are much indebted to Mr. Lias for his able statement of the whole question; but, while I agree with him so far, I must differ from the view he takes of metaphysics. The learned Prebendary tells us that in metaphysics we are in a mere cloudland. If this be so, we are not likely to receive any great amount of light from that region; but, on the other hand, is not logic itself a part of metaphysics? Are

there not sublimer truths than those taught directly by physics? Is there nothing which transcends the science of the chemist and the naturalist? Granting that material man belongs to physics, is there no such person as an intellectual man? no such evidence as the human soul? If there is, surely the problems connected therewith, which form part of the province of metaphysics, are of greater importance than the classification of vegetables and animals. But that there is such an existence the wise of all ages and of all countries, the common-sense of those around us, all admit. But the human soul is neither earth, air, fire, nor water, nor any element which the chemist has discovered. These elements are not susceptible of memory intelligence, or thought; they retain no knowledge of past events, they reason not on the present, nor foresee the future. These faculties may act through the brain, but they are distinct therefrom in their essence. Finite in their origin, limited in their capacity, yet uniform in their characteristics, they must have emanated from a greater, from a free and pure mind, free from mortal conviction, yet possessing an eternal principle of action. I intend not with Bishop Butler to discuss what gratitude is, or to show that veneration is a native quality of the soul; nor with other philosophers to expound its state when it is truly happy. But, as a mere matter of fact, I can but think it possible to apply Lord Bacon's system of induction to spiritual and moral phenomena around us, which are the material of metaphysics, as well as to the other works of creation. I agree with Prebendary Row in saying that we cannot fully understand the ontology of the Supreme Being, for the finite qualities and faculties of man are inferior to the infinite; but, while we cannot fully understand the nature, we may know the existence of that Supreme Being, without being able to comprehend the Infinity, the Wisdom, the Power, and the Majesty of God. Mr. Spencer tells us that the "inscrutable power which is manifested to us through all phenomena transcends intuition and is beyond imagination." In this sentence he makes another admission, which will be of great advantage to us in this controversy. He admits that there is a Power which manifests itself through all phenomena—inscrutable, it may be, but still a Power, the existence of which is acknowledged. It is true also that it may transcend intuition, and be beyond imagination, but yet the existence of this Power may still remain. I think the Rev. Prebendary Row hardly did justice to the works of Aristotle. It may be that Aristotle thought the people at large would not comprehend his notions of a Deity; but it is an undoubted fact that Aristotle himself, and the people of the great and learned world in which he lived, did adopt the notions he put forth. It may be true that Aristotle did not think the people at large would accept these views; but that arose from the feeling with which he regarded the populace and from his dislike to the vulgar mob,—

Odi profanum vulgus et arceo :
Favete linguis : carmina non prius
Audita, Musarum sacerdos

Virginibus puerisque canto.—Horace, *Odes*, iii. 1.

Then, again, with regard to the great writers among the Romans, Cicero himself, writing of the power of the gods,—while he ignored and despised the many superstitions around him,—did contend that no man of any talent or power of comprehension would deny the existence of a Supreme Being. “Cicero maintained,” his classic biographer tells us, “that there was one God or supreme Being, incorporeal, eternal, self-existent, who created the world by His power, and sustained it by His providence. This he inferred from the consent of all nations, the order and beauty of the heavenly bodies, the evident marks of counsel, wisdom, and a fitness to certain ends observable in the whole and in every part of the visible world; and declares that person unworthy of the name of man who can believe all this to have been made by chance, when with the utmost stretch of human wisdom we cannot penetrate the wisdom which contrived it.” (1 *Tusculan*, 27; *De Natura Deorum*, iii. 3; 2 *Middleton*, 340). In his beautiful Tusculan Disputations he argues, and argues forcibly, from the nature of God, from the immortality of the soul, that those who are good and well instructed ought not to fear death, but account it a blessing, as an exodus from a world of change, as an entrance into one of permanent happiness. I merely advance these topics to show that we have other arguments than those already brought forward in proof of the existence of a Supreme Creator. In fact, if we take all the languages of the present day, we find a universal assent among mankind to the belief that such a Being does exist. Take the French, the German, the English, or any other language, and ask yourselves, how are you to account for the origin of all those terms which relate to the Deity, unless there is the universal assent of all the nations speaking those languages to the idea that there is a Supreme Being? While adding these few arguments to those which others have advanced, I certainly must say that I agree in the assertion that it is also a question of history. We have received a revelation, and that revelation does confirm those ideas which have been put forward on the subject by the greatest writers of all times. Looking on the matter in this light, I think there can be but one answer given to the question propounded by Mr. Lias —“Is it possible to know God?”—namely, that, according to the universal evidence, that knowledge is possible in some degree. (Applause.)

Mr. D. HOWARD, V.P.I.C.—It appears to me that this paper is one of the very best that could have been brought before a society like this, which has to deal with the errors of Herbert Spencer's philosophy. Three hundred years ago Bacon had to protest against the misrepresentation of Aristotle's as it was then taught; and I must say that I think Dean Mansel, has suffered almost as severely at the hands of his professed followers, Herbert Spencer and others, as ever Aristotle did. It is one thing to say, “You can never have a full knowledge of God, before whom the seraphim veil their faces”; it is another thing to say, “You can know nothing about God, therefore do not worship Him.” Hence its intention surely was to teach that you can never so know God as to be able to sit in

judgment upon His revealed will, a very different thing from saying that you cannot so know God as to receive a revelation from Him. I must say that I wish Mr. Spencer and his school would be a little more consistent, and would learn how little they know of *noumena*, and how entirely our knowledge is confined to phenomena. If, with all these doctrines of the conservation of force, and the other scientific dicta that are advanced and received as absolute revelations of truth, our opponents would only see that every word they say about the difficulty of accepting religion is far more true about these would-be scientific declarations, I think a great deal of good would be effected; but even though we may not accept, but regard as misconceptions, some of the views which have been expressed about Dean Mansel's philosophy, let us not be ready to admit that we cannot know God. It is true that we cannot know Him entirely; but, after all, there is a great deal of regulative truth, which is far from being absolute truth, and it is well we should remember that our conception of God is imperfect, and that when we have to argue, not with Mr. Spencer, but with another school of unbelievers, as to this or that point being inconceivable, we shall then require this argument. It is quite another matter in dealing with the Spencer school. I think that this paper gives us a sound and wise and true method of philosophy or theology—the inductive method. It deals with the question from the experience we have and the knowledge we derive from the phenomena around us, and argues from these with irresistible force. These high flights of metaphysics are more convenient to use as arguments to defend a foregone conclusion than to persuade our own minds. There are, unfortunately, those who *will not* know God. They cast about for reasons, as we find in their metaphysical books; but I believe in the majority of cases the desire is *not* to know God, and I think in this we find a great fact to be remembered in dealing with many of the sceptics of the present day, namely, that there is not the desire to know, and, therefore, there never can be any true knowledge. (Applause.)

Mr. H. C. DENT.—A speaker who has just left the room has mentioned the word "evolution." In the sense in which that word is very often used, and in which I think it has absolutely no meaning, the doctrine is one in which we cannot believe. The doctrine of evolution is, I believe, to be interpreted as meaning that a living creature naturally makes advances, however infinitesimal, towards a higher condition than that of its predecessor. To speak of a child's perceptions and faculties being evolved, is, therefore, erroneous, because, when we speak of a child and the enlargement of his intellectual and physical powers, we do not mean that they are growing beyond those of his predecessor, but that they are simply increasing with the child's natural growth. I desired to offer this remark, because the words "evolution" and "evolved" are very frequently used in contradictory senses.

The CHAIRMAN.—I will now, as chairman, take the liberty of saying a few words on what is to me a rather delicate subject. I have heard the name of Dean Mansel very often referred to. He was my tutor and my

personal friend, and, therefore, I may claim to know something of his mind. I am quite sure that, had he been spared, he would have brought out a wonderful work of positive Christian philosophy, ethical and metaphysical, and have given us the affirmative side of that of which we now have only the negative. Therefore, I ask all those who study him and hear about him, to remember that we have only had from him one half, and that while, we can consider that half, the other half is withheld from us. As to the able paper of Mr. Lias, before I ask him to reply to the remarks made upon it, I must congratulate him on the way in which he has hit the right nail on the head. He has shown, I think, distinctly, the fallacy which lies at the root of the Agnostic theory, which is, the confusion that is made between knowledge and comprehension. We cannot comprehend God, because the finite cannot take in the Infinite; but we can know God, because we can know something of Him. To use Prebendary Row's illustration, I can get out of a gallon of water a pint very easily, and the pint may be exceedingly good water; but Herbert Spencer and the Agnostic school seem to argue that, because I cannot put the whole of the gallon into my pint pot, I cannot get any at all, and consequently cannot drink. I say I am able to know something of God, because like apprehends like, and I know I am made in the image of God—that my intellect is a representation of God's intellect, and, though inferior to it, is of the same kind and nature. But although we are able to know something about God, we must, as Christians, freely admit that we cannot comprehend God, because He who is Infinite cannot be restrained by the limits of the intellect of His own creatures. (Applause.)

The meeting was then adjourned.

REMARKS BY THE (LATE) RIGHT HON. THE LORD O'NEILL.

THE Rev. J. J. Lias's paper appears to me to contain some very valuable observations on Mr. Herbert Spencer's theories. He has well and clearly pointed out the inconsistency of that author in rejecting the doctrine of a personal Creator of the universe, on account of the apparent contradictions in which we find ourselves involved when we endeavour to frame a concept of the Absolute or the Infinite, and yet acknowledging the existence of space, time, matter, motion, and force, with respect to which he maintains that we are beset by similar difficulties. Mr. Spencer admits that there must be a first cause, to which, however, he denies personality. He even corrects Sir William Hamilton and Dean Mansel, on account of that very sceptical tendency of their reasoning of which Mr. Lias justly complains. Their mistake, according to him, consists in asserting that in such anti-nomies of thought, as relative and non-relative (or absolute), equal and

unequal, &c., the reality of one of the contradictories is *nothing else than* a negation of the other. "The negative concept," he says ("First Principles," p. 90), "contains something besides the negation of the positive one. Take, for example, the limited and the unlimited. Our notion of the limited is composed, first, of a consciousness of some kind of being, and, secondly, of a consciousness of the limits under which it is known. In the antithetical notion of the unlimited, the consciousness of limits is abolished, but not the consciousness of some kind of being. . . . The error consists in assuming that consciousness contains *nothing but* limits and conditions, to the entire neglect of that which is limited and conditioned. It is forgotten that there is something which alike forms the raw material of definite thought, and remains after the definiteness which thinking gave it has been destroyed."

Thus Mr. Spencer admits that the unlimited has some kind of existence, and so of the unconditioned, the infinite, and the absolute. In short, he holds that there is a First Cause, but maintains that it is impossible for us to have any knowledge of it whatever. But notwithstanding its being thus utterly unknowable, he professes to know one thing about it at any rate, and that is, that it is impersonal. Dean Mansel, on the other hand, considers it our duty to believe it to be personal. And his reasoning is, that as we find ourselves involved in metaphysical contradictions when we endeavour to conceive this First Cause, the matter is beyond our understanding, and it is our duty to direct our thoughts only to what we can understand. He distinguishes between *mystery* and *contradiction*, pointing out that the apparent contradictions attending a mystery (such as the question, how unextended objects can by their conjunction produce extension, or how the motions of the material particles of our bodies can result in consciousness) extend in *both directions*; that is to say, the propositions with which they are concerned are such that we are equally involved in absurdities, whether we affirm, or deny them. "Contradiction," he says (Lecture V., p. 99), "does not begin till we direct our thoughts, not to the fact itself, but to that which it suggests as beyond itself. This difference is precisely that which exists between following the laws of thought, and striving to transcend them; between leaving the mystery of knowing and being unsolved, and making unlawful attempts to solve it. Thus the highest principles of thought and action to which we can attain are *regulative*, not *speculative*—they do not serve to satisfy the reason, but to guide the conduct; they do not tell us what things are in themselves, but how we must conduct ourselves in relation to them."

There is, I conceive, no inconsistency between Dean Mansel's *speculative* and *regulative* principles of thought and action, as thus explained by him. The former being beyond our intellectual vision, it is to the latter alone that we must give our attention. And among these latter are the grounds (amply stated by the Dean, especially in his fourth lecture) for looking upon the First Cause as having the attribute of personality. It may be a question, however, how far he was judicious in dwelling so much as he has done upon

the apparent contradictions involved in our endeavours to comprehend the First Cause. And I think he has certainly laid himself open to the objection specified by Mr. Lias, and enlarged upon (though with a different object) by Mr. Spencer himself in the passage lately quoted.

But Mr. Lias boldly denies that "the Infinite" and "the Absolute" are terms properly applied to the Deity at all. And in this I believe he is right. If God were to be conceived of as "the Infinite," we could scarcely think it true that He cannot do evil, depart from truth, or deny Himself; for these are limitations to His character. And if He were to be conceived of as "the Absolute" He could not stand in the relation of Creator to the universe, since to be absolute is to be free from relation to any thing whatever. In short, these negative terms are apt to mislead. Why not speak of God as a *perfect* Being? This is a positive idea, however inadequate. We can conceive of Him as perfectly wise, by thinking of all His actions as guided by consummate wisdom; as perfectly just, by thinking of all His actions as free from the slightest taint of injustice; and so of His other attributes.

Again, Mr. Lias appears to me to be quite correct in tracing the mistakes on this head to the doctrine that abstract ideas have an objective existence. In this he agrees with Bishop Berkeley, although I do not think he would concur in the view maintained by the latter, that a denial of the objectivity of abstract ideas must lead logically to the denial of an external world. At least I profess myself unable to adopt that conclusion. Berkeley goes upon the old supposition that the idea of an external object is a representation or likeness of that object, and inasmuch as there can be no resemblance between a thought in the mind and an object outside the mind, he concludes that there is no such object. But why must the idea of an external object be a likeness of it? Can we not conceive such an object to be perceived by the mind without there being any likeness between it and the idea it excites? If an object be supposed to be presented to the senses, thereby exciting certain sensations of colour, figure, sound, &c., what impossibility can there be in such a supposition? It is quite a gratuitous assumption to say there must be a likeness between the outward object and the sensations which it excites. How such sensations are produced by it, we know not. The effect of matter on mind, as has been already observed, is admitted to be utterly incomprehensible by us. So far as we know, therefore, it is quite as possible that objects should affect our minds in one way as in another, seeing that they do affect them.

But to return to the subject of abstract ideas, with respect to which we are at one with Bishop Berkeley, though not with respect to the doctrine he considers it to lead to, we may join him in his laugh against Locke's description of such an idea. Taking as an example the general idea of a triangle, this philosopher says (Book IV., chap. 7, sec. 9): "it must be neither oblique nor rectangle, neither equilateral, equicrural, nor scalenon, but all and none of these at once." Now, I venture to think that Locke here inadvertently used the wrong conjunction. Instead of saying "*neither* equilateral, equicrural, *nor* scalenon," I think he should have said "*either* equilateral, equicrural, *or*

scalenon ;" and instead of "all and none of these at once" ("all" denoting several particulars united by the conjunction "and," and "none" denoting several particulars disjoined by the particle "nor"), he should have said "some one of these at a time, and no more." Abstract ideas, like their signs (which in ordinary language are words or names, and in algebraic language are letters or symbols), can only be presented to the mind singly. If we think of man in the abstract, we do not think of him as a human being without any features, nor, on the other hand, as possessing all the various features at once that a human being can have, but as having one set of features out of many,—those of either Peter, James, or John, for example. And if we think of any algebraic question involving numbers, we take a letter (*a*, for instance) not to represent at the same time *all* numbers or *none*, but some particular number (*either* 3, 5, 10, &c.), and it must denote the same number throughout the calculation. Thus, abstract ideas and the words or symbols which represent them are, as Locke confesses, "fictions and contrivances of the mind." They serve for convenience in reasoning or speech, but have no objective existence.

And if this is so with respect to ideas, still more is it the case with the objects they are supposed to represent. To avoid confusion, however, it should be remarked that there are two kinds of abstraction :—1. We may think of a subject without reference to certain of the qualities belonging to it. This is the kind of abstraction which leads up from individuals to species and genera. Or, 2. We may think of a certain quality without reference to the subject to which it belongs, as of whiteness, for example, which may belong to several different materials. I am disposed to think that some philosophical errors have arisen from not observing this distinction. As an example of the second kind of abstraction, existence is a quality common to all objects of thought, and may therefore be thought of in the abstract. This, however, does not mean that it can be thought of *apart from everything existing*, but as belonging to *some one* of the innumerable things that exist, no matter which ; and we may think of it at one moment as belonging to a book, at another as belonging to a man, or at a third as belonging to God. But to think of existence without anything that exists is to me impossible. Perhaps some of the philosophical errors about the Absolute, and the Unconditioned, and so forth, might have been avoided if this distinction had been more attended to. In a similar manner, motion apart from anything that moves, whiteness apart from anything that is white, &c., are, I venture to think, impossible conceptions, and resemble those abstract ideas which, as Mr. Lias justly observes, have no objective existence. The term "Absolute," denoting existence under no relations, and the term "Unconditioned," denoting existence under no conditions, seem to have much the same signification as existence without anything that exists. In short, such words, really meaningless, have a kind of philosophical ring, calculated only to bewilder and mislead.

THE AUTHOR'S REPLY.

I HAVE thought it best to substitute a written reply for that which I delivered on the evening of the discussion. This I do, partly because the lateness of the hour obliged me to curtail what I wished to say, and partly because the observations I then made were rather supplementary to my paper than in reply to the speeches delivered, which, as a rule, though dealing with the subject at the head of the paper, had very little connexion with the paper itself.

In the few observations which I did make, I put in the forefront a remark which fell from Mr. Woods Smith. That gentleman appeared to suppose that I had said that God was not infinite. What I actually said was that He was not "the Infinite" of metaphysics, which is a very different thing.* I should regret it much if any reader of my paper who might happen to have a slight acquaintance with metaphysical terminology should thus misunderstand my language. Perhaps the best way of expressing the truth about God in this respect is to adopt the language of the First Article of the Church of England, and speak of God as "of infinite power, wisdom, and goodness," and to remember that with regard to the first of these attributes it is limited by the last—God can do nothing which would not be consistent with goodness. Could He do so, He would not be good.

On one other point mentioned by Mr. Woods Smith I may make a remark. He laid great stress upon the inward revelation of God, and said that even Mr. Spencer admitted that it could take place. An inward revelation of God as the "Unknowable" would not be of much practical benefit to anybody, and therefore (1) Mr. Herbert Spencer's admission does not amount to much; and (2) Mr. Spencer's meaning in those words is certainly a very different thing from the interpretation Mr. Woods Smith would place upon them. The limits of my paper did not allow me to enlarge very much on the revelation of God to the inner man. That I did not neglect it, paragraph 30 will show. But all inner revelations need to be connected by external considerations, or there would be no means of distinguishing between religion and fanaticism; or, rather, objective truth would disappear altogether, and that would be truth which each person thought to be so. It is very easy to see to what utterly Agnostic conclusions this would lead us. The fact is, that, if what we subjectively believe to be truth be really so, it

* Mill, in his *Examination of Sir W. Hamilton's Philosophy*, p. 55, speaks with some degree of scorn of the "Infinite" and "Absolute," calling them "meaningless abstractions," and declaring that they are "notions contradictory in themselves, and to which no corresponding realities do or can exist."

must correspond with the objective revelation of God in the world around us.* In other words, faith and right reason must correspond. The scientific argument for God, which is the main subject of this paper, must answer to the internal conceptions we form of Him. This scientific argument rests upon high authority. The greatest of the schoolmen, Thomas Aquinas, writes: "It is a common sentiment of the fathers and other theologians that God can be demonstrated to exist by natural reason, though always *à posteriori*, and through that which He effects." And a greater than St. Thomas Aquinas has told us that "the invisible things of Him from the creation are clearly seen, being understood by the things that are made."†

There are only two other remarks on my paper to which I need refer. They occur in the speech of Prebendary Row. In answer to his criticism that I did not touch upon the Revelation of God through the manhood of Jesus Christ, I would refer him to paragraph 34. I would willingly have enlarged on the subject, but it is to be remembered that my task was simply to indicate the various lines of argument open to us on the subject; had I followed them out, my paper must have become, not merely a volume, but a library.

Another remark of Prebendary Row's fills a chasm in the paper, which I observed on reading it over, and which was due to my desire to keep within considerably narrower limits than on the last occasion on which I addressed the Institute. He spoke of the interminable debates on metaphysical subjects which occupied the Eastern Church in the fourth century and those which immediately succeeded it. I myself have had a little experience of this fact, through my presence at the conference held at Bonn in 1875, where many Eastern theologians were present, and where the metaphysical subtleties in their disquisitions were inexhaustible. From the time of Origen to our own, the attempt to form correct abstract conceptions of God has been the parent of controversy, and the chief point which now prevents the Churches of the East from brotherly intercommunion with their brethren in the West is one which is chiefly concerned with such abstract conceptions. The "perplexities" of which I spoke in paragraph 15, as arising from the attempt to base our theological systems on abstract ideas of God, have taken sixteen hundred years to unravel, and they are not unravelled yet.

I proceed to make a few remarks supplementary to the paper. And, first, I would point out the precise point on which I venture to join issue with Mr. Spencer, since, perhaps, the difficulty of the subject may cause some misapprehension; he appears to regard all phenomena as surrounded by a vast background of what is unknowable; man is like one bearing a lantern and surrounded by a fog; his lantern enables him clearly to discern objects a few paces around him, but beyond is a vast impenetrable background of fog;

* Objective, be it explained, refers to that which exists outside of us; subjective, to the ideas we ourselves form on any point.

† Rom. i. 20.

a few indistinct objects near at hand may be dimly discerned through the vapour ; beyond these all is invisible. It is with the few objects clearly discerned that science deals ; it may deal conjecturally or empirically with the objects dimly discerned ; all the rest is the sphere with which religion has to deal.* It is precisely here that I would wish to demur to Mr. Spencer's view, if I rightly understand his meaning. I wish to deny emphatically that, while science deals with what is within, and religion only with what is outside the sphere of our mental vision, science deals with all that is permitted to be seen, and religion only with all that is hidden by the fog. And, even if I do not rightly understand his meaning, I would still desire to combat that which is supposed to be his teaching, or represented to be so by a host of writers who call themselves Agnostics. I would say that it is *not* with the unknowable, as such, that religion professes to deal, but with what is known ; and the distinction between religion and science is not that the latter deals with the knowable and the former with the unknowable, but that the former deals with physical and metaphysical, the latter with moral and spiritual facts. And, as the man in the fog knows that he experiences sensations and goes through processes which are connected with objects other than those he can see, so religion deals with a class of experiences and of processes which are directly derived from contact with the unseen.

The *πρῶτον ψεῦδος* of Dean Mansel's treatise is supposed by many to be his view that all conceptions of God are not absolute, but relative. But the truth or falsehood of this remark depends upon the meaning we attach to those words. Two meanings of the word "absolute" will be found in § 17 of this paper, but there is a third sense in which it is constantly used which is altogether different ; it is used as equivalent to "entire."† If we suppose Dean Mansel to mean that our conceptions of God cannot possibly be true, but are simply proportionate to some unknown truth, we are bound to protest against his language ; if, on the other hand, he means that our conceptions of God do not represent Him as a being entirely unconnected with everything else, but are derived from the relation or connexion in which He stands to us, we should hardly, I suppose, feel ourselves strongly moved to contradict him. When Clement of Alexandria teaches that God is above space, and time, and name, and conception,‡ we should not reject his doctrine ; but when we come to add that He is above being and outside of all relation, or even when, like Clement in the passage above cited, we say that we know not what He is, but that we know what He is not, we feel that this is, practically at least, to represent Him as non-existent. We

* See note on p. 108.

† As in Mill, *Examination of Sir W. Hamilton's Philosophy*, p. 43, "The Absolute must be absolutely something, either absolutely this or absolutely that." But the absolute, in the strict sense of the word, cannot be "absolutely" anything, because this would involve relation.

‡ *Strom.*, book v. ch. ii. It may be observed that Athanasius (see p. 107) is only quoting his master, Clement.

do not profess to contend that we can comprehend all that God is, or that our conceptions (it is perhaps better to say this than *conception*) of Him correspond in all respects to the fulness of the reality. All that we say is, that He is not to us the "Unknowable," for we feel that much may be certainly known about Him, and that, if it be true that "our knowledge of Him be not absolute but relative," that knowledge is a knowledge, accurate so far as it goes, of His Being, so far as it is made known through those relations—a knowledge derived from consciousness, from reason, and from revelation both in its external and internal sense.

Mr. Spencer, it must be added, has in some respects modified in his appendix the statement he made in his *First Principles*. What he says in the former may be seen in § 4. In his appendix (p. 581), he says "that an Unknowable Power, known with absolute certainty" (does this mean unconnected or entire certainty?) "is the sphere for religious feeling." Whether the words I have quoted above do or do not warrant the conclusion which Mr. Spencer goes on emphatically to disavow, that he has declared "the ignorance alone to be the sphere of religious feeling," I have no desire to discuss. What I do wish to point out is, that a great many other persons than Professor Birks have drawn this conclusion, or a conclusion practically undistinguishable from it. It is not what Mr. Herbert Spencer says, but what he is popularly regarded as saying, with which, as I have said, I wish to deal. It is the general notion abroad that, as God is the Unknowable, we cannot know anything about Him, and therefore the best thing we can do is to leave off thinking and feeling about Him, that I desire to combat. That the world in general, when it is informed that it is its "highest wisdom and its highest duty to regard God as unknowable" will imagine that religion is connected, not merely with the fact of the Unknowability, but with the resulting ignorance on our part, seems at least very likely. Mr. Herbert Spencer is, of course, not concerned with popular misrepresentations of his exact and carefully-considered language. But those who care for the interests of religion are concerned with those misrepresentations, and they are thankful to be able to inform the world that Mr. Spencer does *not* mean that our ignorance of God is the sphere of religious feeling, as many people seem to imagine.

But, as the readers of the paper will have observed, the simile of the fog by no means presents the subject before us in all its bearings. The unseen, we may safely affirm, is very far from being in all respects the unknown. Physica researches have proved for us the existence of something unseen, with which the phenomena of nature are closely connected. That something we call force. Of force in itself we know nothing; it belongs to the sphere of the unknowable; but of its effects, of its methods of action, we know a good deal. Thus, though force belongs to the unseen, and as regards what, it is in itself, to the unknown, there are many "manifestations" of it which are thoroughly "knowable." So we contend that God, though unseen, and in the totality of His nature unknown to us, has also vouchsafed "manifestations" of His existence to us which are thoroughly "knowable,"

and enable us to affirm "with absolute certainty" many things about Him besides the fact of His existence.

I might have strengthened the argument in paragraphs 27 and 29 if I had referred to those pioneers of progress in past ages to whom we owe our present civil and religious liberty. Professor Harrison, in his papers on Positivism, has often spoken with the utmost enthusiasm of these men; but it never appears in the least to strike him what a monstrous injustice it is that they should have suffered, as they did suffer, wrongs so cruel, tortures so fiendish, in a cause so holy, and that they should have endured them with the noblest fortitude to the end, while we, who perhaps neither have, nor would have, raised a finger in defence of the cause, are enjoying the blessings their miseries have won for us. "Other men laboured and ye have entered into their labours," says Jesus Christ, with a complacency which would be simply intolerable were there no world where each labourer received his due. If there be no such world, then the present order of things is an iniquity so hideous, that it may fairly be pleaded in justification of any crime on the part of those who are included within it.

I have not placed Mr. Spencer's name at the head of this paper, though I have not scrupled to criticise some of his statements. For it is rather with the practical consequences of those statements than with the statements themselves that I wished chiefly to deal. I wish to speak with all respect of a thinker whose fame has spread throughout the world. Nor have I the least desire to fasten on him any conclusions which he would desire to repudiate. My object is, if possible, to correct some floating ideas of the age, derived to a great extent from the system which originated with him. Whatever be Mr. Spencer's idea of our relations to God, whether I have correctly represented his words or not, the notion is widely prevalent just now that, while science is definite, tangible, intelligible, religion is concerned only with what is phantasmal, indefinite, imaginary. As God is unknowable, he is practically—so we are told—nothing at all to us. It is just there where the interpreters of Mr. Spencer's philosophy go wrong. As He is in Himself, in the "breadth, length, depth, and height" of His Being, God is beyond our power to grasp. But what He is *to us*, that we know perfectly well. Nor is this merely subjective knowledge. In the words, "What He is to us," it is not the conceptions we subjectively form of Him, but the objective manifestations of His Nature, that are referred to. This is what the Scriptures tell us. If St. Paul, when he speaks of knowing God, corrects himself, and says "or rather are known by God," he means that, whether we can know God in all the fulness of His Being or not, there can be no mistake about the fact that we are brought into "knowable" relations to Him, and that the very fact of those relations enables us to know a good deal about the nature of Him to Whom we are thus related. If, in fine, the words, "I know God," in their strictest literal interpretation be incorrect, at least there is nothing illogical or unphilosophical in the statement, "I know Whom I have believed, and am persuaded that He is able to guard that which I have committed unto Him against that day."

ORDINARY MEETING, FEBRUARY 19, 1883.

H. CADMAN JONES, ESQ. IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

The following Paper was then read by the Author :—

ON CERTAIN THEORIES OF LIFE. By Surgeon-General C. A. GORDON, M.D., C.B., Honorary Physician to Her Majesty the Queen. In France, Officier de la Légion d'Honneur, &c.

SYLLABUS.

1. *a.* "Science" in the sixteenth century.
- b.* "Scientists" of that period.
2. Paracelsus and his theories.
3. Bishop Hall.
4. Democritus—Frasicator.
5. Chinese Philosophy.
6. Buddhistic Philosophy.
7. English thought.
8. Possibility founded on assumption.
9. The microcosm and the macrocosm.
10. A comparison and a contrast.
11. Views combated.
12. Latest theories.
13. Errors of conception.
14. Experiments and scepticism.
15. A scientific Frankenstein.
16. Descartes.
17. One animal; not many.
18. Phenomena of life.
19. Summary and conclusion.

1. (*a.*) **I**N the sixteenth century the doctrines of astrology and of alchemy held ascendancy in Germany. Abuses of every kind were rampant; superstitions reigned supreme;

men and women everywhere saw ghosts, spectres, and wehr-wolves; "demoniacal possessions" were among the recognised ills to which rich and poor alike were liable; and jugglers, friars, and fanatics wandered through the country, making easy capital out of popular credulity.* This state of things, dating from a still more distant time, prevailed also throughout Europe generally; nor was it destined yet a while to give way before the light of advancing "knowledge."

(b.) The professors of alchemy were the "scientists" of that period. Of the so-called science, we read that, "as a system or delusion, it beguiled men's minds;" that among its professors were men of the highest types, most illustrious adepts, some of them men of world wide reputation in learning as well as in science. We further learn with regard to them that "they were patient and assiduous workmen, but blind to the uniformities which exist in nature; ignorant of the laws of causation which determined the class of phenomena they were engaged in producing;" that therefore they committed all their experiments to blind chance, torturing every natural object with which they were acquainted, in the hope that something good might turn up; that occasionally they were rewarded by the discovery of some new substance with which they were not before acquainted; but that, from beginning to end, their "researches" were a work of chance.†

2. A prominent "scientist" of that time was Theophrastus Bombastus Von Hohenheim—more generally known as Paracelsus.‡ It is recorded of him that he laid hold of a notion with regard to the nature of life which easily seduces the imagination of those who do not ask for rational proof, namely, that there is a constant analogy between the macrocosm, as they call it, of external nature, and the microcosm of man; that this harmony and parallelism of all things can only be made known to us by Divine revelation;§ and that therefore all the heathen philosophy was erroneous. He thought man had a sidereal—otherwise immaterial—as well as a material body; that the former, for a time at least, survived the latter—thus explaining the apparitions of dead persons, in which he firmly believed; that this starry influence was connected with each corporeal element; that to the sidereal salt was assigned the material consistence of the body, to the sidereal sulphur its growth and animal heat, and to the sidereal mercury the

* *Biographie Universelle*, art. "Paracelse."

† Meryon's *Hist. of Med.*, vol. i. p. 158.

‡ Born near Zurich, A.D. 1493.

§ Meryon's *Hist. of Med.*, vol. i. pp. 339, 346-351.

conservation of the fluids. He maintained the animation of all things, and he peopled the world with sylphs, nymphs, gnomes, and salamanders. According to his physiology, an *archæus* or demon presided in man's stomach, whose mission it was to separate the poisonous from the nutritious part of the food, and direct each into its proper course.* Unfortunately, although Theophrastus Bombastus Von Hohenheim could so far "quote Scripture" as to speak of Divine revelation as a source of knowledge, his habits gave the lie to his assumption in this respect.† What, then, was the character and style of the man who thus for the time being became a teacher of his fellows in matters scientific? A vagrant, passing whole nights in low taverns drinking with boors as sottish as himself; who, having in open court in Bâle insulted the magistrate before whom he was brought, fled the city, to die in poverty and misery in Saltzburg. Whence came his "inspiration"? By his own account, handed down to us through his biographies, he obtained it by having, in the vestibule of *Hades*—he used a stronger term than that—got possession of the works of Galen, and in the same place held lively disputes with Avicenna. And yet, extravagant as were his theories as just expressed, they attracted many ardent (and even pious) minds at the time, and, according to the accounts from which I quote, were afterwards woven into new schemes of fanciful philosophy.

3. Bishop Hall,‡ one of the best and wisest men of the period in which he lived, was thoroughly imbued with "science" according to the interpretation just quoted. Here is the state recorded by him as concerning "the superstitious man,"—"He confessed that old wives and stars were his counsellors. His night-spell was his guard, and charms were his physician; he wore Paracelsian characters as a remedy against the toothache, and a little hallowed wax as an antidote for every ill." History records at least one prescription of a "counsellor" thus referred to; but then it was for a poor patient. Having, in the first instance, obtained a penny and a loaf of bread, she approached the patient, and in a low voice, repeated near him the lines:—

"Thy loaf in my hand, and thy penny in my purse,
Thou art never the better, and I—am never the worse."

Two hundred and fifty years ago, spells, charms, and specifics were worn outwardly; now the latter are taken inwardly; the

* Meryon; quoted from Sprengel, vol. iii. pp. 311-316, 382.

† *Id.*, pp. 342-352; also *Biographie Universelle*.

‡ Joseph Hall, Bishop of Exeter and of Norwich, born 1574, died 1656. See Brand's *Popular Antiquities*, vol. iii. pp. 269, et seq.

difference in method indicating the great importance of modern advance in this particular direction.

Thus it was that the language of "scientific" opinion at the time referred to was moulded in accordance with the prevailing tendency of thought of the period, that tendency including within it the two very powerful elements of credulity and superstition. How far the same principle applies at the present day, we shall see as we proceed with this paper.

Here, however, I would beg to interpolate an explanatory remark. It is, that in the observations about to follow, I purposely omit the names of living men whose views I quote, my sole object being to deal with opinions, not with men as individuals. In the references given in foot-notes, however, means are afforded for tracing the various authors quoted. With certain of the views to be noticed I find myself in accord; with others, however, I have the misfortune to be absolutely at variance; therefore it is that in this address I am especially desirous to avoid every appearance of personality.

4. But Theophrastus Bombastus von Hohenheim had not in reality altogether evolved from his inner consciousness, even by the aid of the ghosts of Galen and Avicenna, the theories which, coming from a man of his high intellectual and moral standing, as already shown, attained the great popularity accorded to them by the learned of that time. His theories were in fact a reproduction, but with a modification, of others not less than nineteen hundred years old, even at the date when he appropriated or imitated them. Their originals, in several respects at least, are to be found in the philosophy of Democritus, regarding whom and which a few remarks are here deemed *à propos*. His birth is variously assigned to B.C. 494 and 460; he died B.C. 361. According to his doctrine, all that exists is vacuum and atoms. The atoms are the ultimate material of all things, including spirit. They are uncaused, and have existed from eternity. They are invisible, but extended, heavy, and impenetrable. They vary in shape. They are in motion, and this motion is eternal. There is an innate necessity by which similar atoms come together. Soul and fire are of one nature; the atoms of which they consist are small, smooth, and round. It is by inhaling and exhaling such atoms that life is maintained. It follows that the soul perishes with, and in the same sense as, the body. There is, in fact, no distinction made between the principle of life and the higher mental faculties. He considered that sensation is our only source or faculty of knowledge; he admits no mental faculty apart from sensation. Tradition attributes to him such sayings as: "There is nothing true;

and if there is, we do not know it." "We know nothing, not even if there is anything to know." He denied the creation of the world as in any way due to reason. He is stated to have believed in the existence of a higher order of beings than man, although of the same form, like him composed of atoms, longer-lived, still mortal, who influence human affairs, some for good, others for evil, and who appear to men in dreams. He considered the *summum bonum* of life to consist of tranquillity of mind,—a condition, according to him, incompatible with marriage.

But he who thus wrote was a bachelor. So also was Paracelsus. How, then, could either of those scientists and philosophers comprehend in their fulness the importance, the obligations, the responsibilities, or the dignity of *humanity*? I cannot say.

In the early part of the sixteenth century Frascatorio* revived the theory of atoms of Democritus, and by representing the atoms as demons he struck out a doctrine in strict keeping with the circumstances of the period. These demons were popularly believed to be emanations from the Deity; and the belief engendered a cabalistic theosophy, to which, according to the author quoted from, the medical delusions of the day were the most fitting accompaniments. The delusions here indicated were entertained in the minds of men as affiliated subjects of contemplation, just as we may observe nowadays a combination of heterodox doctrines finding a congenial lodgment in one brain.

5. Proceed we to the farthest East. In China, some centuries before Democritus in the West announced the system now alluded to, questions similar to those to which he furnished the replies quoted were being discussed, and with a result not altogether different from what occasionally transpires at the present day, namely, absolute disaccord. We read† that during the first historical dynasty of China, B.C. 1122–250, Duke Ai propounded a theme in which occur the questions, thus expressed:—

“By which of the elements five‡ is the work of Nature done?

And of all the ten thousand things that are, say which is the wondrous one?”

Whereupon Chi Nien exclaimed: “This is but a question of

* Born 1483; died 1553. See Brand (John), *Observations on Popular Antiquities*, vol. iii. p. 269; Meryon's *Hist. of Medicine*, vol. i. pp. 381–383.

† *Historic China*. By Herbert A. Giles. De la Rue & Co. 1882. Pp. 22, 23.

‡ Viz., earth, wood, metal, water, fire.

natural philosophy ; what difficulty is there in it?" And so he seized a stylus—for the hair-pencil, as an instrument for writing, had not then come into use in the "Central Flowery Land"—and thus he wrote:—

"By all the elements five is the work of Nature done ;
And of all the ten thousand things that are, there is no particular one."

And so the promised distinction was awarded to the gallant and learned author ; for he was none other than generalissimo of the Ch'in State. But no sooner was he "invested with the golden goblet" than forward sprang Wu Yüan, who declared that Chi Nien's answer did not dispose of the theme in a proper and final manner. Now, Wu Yüan also was a military officer high in rank, generalissimo of the Ch'u State ; for in those early days promotion was by selection ; competitive examination was in force, and there were men who could wield alike the pen and sword, even as these powerful weapons are represented by a statue of our own Lord Lawrence, "Saviour of the Punjab." And so Wu Yüan wrote:—

"By *truth* * of the elements five can most good work be done ;
And of all the ten thousand things that are, *man* is the wondrous one."

And so the "golden goblet passed to him." But do not the replies thus given represent the divergence of opinion still and now existing regarding the subject of this theme? The subject the same in the examples given in this and the preceding paragraph ; the language alone different, but in each expressing its national train of thought.

6. Returning Westward, a system of philosophy arose in India in the sixth century before our era, which still retains its hold over many millions of our race, including the ignorant and the very highly educated ; and which, if my interpretation be right, supplies the originals of many among the theories which at the present day are enunciated and accepted as the outcome of our most advanced scientific investigations in regard to things organic. The chief points of the philosophy in question necessary to be quoted for our present purpose are the following, namely:—This world, like others, is periodically destroyed. The sum of the elements of its inhabitants (men, animals, angels, &c.) who lived within it each time, produces a new world. The number of these beings never varies, save on those few occasions when one of them attains Nirvāna. In every other case, as soon as an animal dies another is produced, under more or less material

* Truth is said to be a moral equivalent of *fire*.

conditions. The article quoted continues: *—While Buddhism occasionally yielded so far to popular phraseology as to make use of the word "soul," it denies altogether that the term is anything more than a convenient expression, or that it has any counterpart in fact. According to the same system of philosophy, "There is no life outside the domain of transmigration; and by the inevitable law of change, that which causes existence of any kind would itself be the cause also of decay, and bring with it, after a time, the whole train of evils from which the tired heart of man seeks relief." "Metempsychosis gives way to metamorphosis. As one generation dies and gives way to another, so each individual in the long chain of life takes up the struggle precisely where that preceding left it off. There is nothing eternal but the law of cause and effect, and change. Nothing is, everything becomes. And so organised life passes away; there only remain the accumulated results of all its actions. One lamp is lighted at another; the second flame differs from the first, to which it owes its existence. A seed grows into a tree, and produces a seed from which arises another tree, different from the first, though resulting from it." But—the sage is recorded to have said—such inquiries lead to no profit. And few among us will question the conclusion thus expressed.

In the extracts quoted, have we not the earlier, if not original edition, of views and theories of late years being served up as if they were fresh and new? Have we not also in those extracts to a great measure the precise language which the most recent phase of science has made its own? To my mind, we certainly have to a great and very suggestive extent.

7. In 1880 the state of scientific opinion in Europe generally was described as follows: †—"Positive science is a new agent in the world. The strength of positive science lies in the fact that Nature is ever present to give it proof. Nature cannot lie, and any error in science must arise from our interpretation of her oracles. Free-thinking and free-speaking were never before so rampant as they are now. Our most learned reviews appear, month after month, laden with atheism, infidelity, and neo-paganism. Man is no longer better than the fossil monster excavated from the rocks—apes, quadrupeds, reptiles, and jelly-fish; a slavish engine; a tool of flesh and blood, to be worn out, then broken and flung away. Scientific materialism preys upon the very noblest natures.

* "Buddhism," *Encyclop. Britan.*

† *The New Truth and the Old Faith—Preface.*

8. Among "scientific" explanations of life and its phenomena which at the present day have taken the place of those accepted in a "superstitious" and credulous age, are the following:—"Vital actions are reduced to molecular movements of the protoplasm of which the body is composed. The properties of living beings are—as much dependent upon the mere qualities and nature of the material aggregate which displays them, as the properties of a metal or the properties of a crystal.—Our future Shakespeares are potential in the fires of the sun." In other words, *life* is no more than a form of energy or motion; the vital forces of the organism merely correlates of the ordinary physical forces; the phenomena of the organism the result of transformations of the heat which it receives from the sun and energy stored up in its food.*

But then, and more recently, this sentence occurs:—"There is no agreement at present respecting the real heat of the sun; what is certain, if we take as our basis the labours of a distinguished 'scientist,' † lately deceased, is, that none of the chemical compounds known to us on earth can exist on the surface of the sun." An eminent professor writes:—"I do not know what to make of the corona. Its spectrum proves that a considerable portion of light comes from some exceedingly rare form of gaseous matter, which cannot be identified with anything known to terrestrial chemistry." ‡ Therefore, if the views quoted be correct, the future Shakespeares potential must, according to science, have bodies in material different from their antetype, and consist physically of compounds unknown on earth; their potentiality depend upon solar heat, regarding which nothing is certain beyond the fact that it exists. Verily we have already reached a triumph of "science."

According to a very distinguished modern author, "If we admit that all parts of the organisation and instincts offer individual differences,—that there is a struggle for existence, leading to the preservation of profitable deviations of structures or instincts, and that gradations in the state of perfection of each organ *may* have existed, each good of its kind,"—then, in that case, and on those suppositions, "the difficulty, at first sight insuperably great, cannot then be considered real;" "that the more complex organs and instincts have been perfected, not by means superior to, though

* *Life and its Physical Basis*, by H. Alleyne Nicholson. *Trans.*, vol. xiv. pp. 281 to 286.

† Henri St. Clair Deville.—See *Knowledge*, Dec. 8, 1882, p. 454.

‡ Professor Young, *Popular Astronomy*, by Newcomb, p. 278.

analogous with, human reason, but by the accumulation of innumerable slight variations, each good for the immediate possessor." The same author writes: "Why do whole groups of allied species appear, though this appearance is often false, to have come in suddenly in the successive geological stages?" And then follows this sentence:—"I can answer these questions and objections on the *supposition* that the geological record is far more imperfect than most geologists believe."* In other words, in order to support a theory confessedly founded upon an assumption, it becomes necessary further to suppose that the entire fabric of our earth is itself at fault. Surely, also, the similarity between the main point thus expressed and certain points of the Indian philosophy already alluded to is rendered self-evident.

In reference to opinions of which those quoted are examples, a very able and competent critic ironically comments thus:—"I believe that for the formation of the most complex form, it is not necessary to know how to make it. That being so, there cannot be supposed to be an All-wise Creator. I believe that Natural Selection is the Great Creator. I believe that there was no intelligence presiding over the plan of Nature. Cuvier, indeed, says that there was, but what do I care for Cuvier? I believe that the 'struggle for life' which I have fancied must have exterminated millions upon millions of luckless failures. It may be assumption on my part, but I deal in assumptions. I believe that all animals have been changed by some accidental benefits; but if you ask me to point to any existing animal, and say how it could be benefited by some change, that is quite another question, and one with which I do not consider that I have anything to do. I believe that many a one of even the lowest animals in the scale has a really wondrous and beautiful organisation, and you say that if so you do not see how it can be improved. You may add, why can't they leave well alone?" † Why, indeed, can't they leave well alone?

It has been asked: How is it, according to the theory quoted, that all organic existence does not advance together to a common elevation? The difficulties are as great for the theory in view of the large number of parts it does not attempt to include, as in the facts it strives to embrace. The most diversified types of animals and plants are everywhere found under identical circumstances. In explanation of the

* *Origin of Species*, pp. 404-408.

† See *Articles of Darwinian Faith*, by the Rev. F. O. Morris, B.A., p. 58, et. seq.

doctrine of ascent, we are told that certain orders have fallen out; but we need a scientific account of action of environment to account for this falling out,—and such an account is not forthcoming.*

9. One of the great leaders in regard to scientific thought recently expressed himself after this manner:—"The conception of the life of one of the higher animals as the summation of the lives of a cell aggregate, brought into harmonious action by a co-ordinate machinery formed by some of these cells, constitutes a permanent acquisition to physiological science. Seeing that the actions called vital, so far as we have any means of knowing, are nothing but changes of place of particles of matter, molecular physics are looked to to achieve the analysis of the living protoplasm itself into a molecular mechanism. Living matter differs from other matter in degree and not in kind; the microcosm repeats the macrocosm; and one chain of causation connects the nebulous original of suns and planetary systems with the protoplasmic foundations of life and organisation."†

And so the astrology of the sixteenth century is "science" in the latter portion of the nineteenth! Surely extremes have here met! Identical in idea and in expression is the language they severally suggest. But the idea, resuscitated, and expressed with all the force of novelty, was readily caught up, echoed and re-echoed among the spheres scientific thus, "the powers that act on the living body are the same as those which act on every portion of the globe, its *materials* and inhabitants,"‡—and so on. And, to repeat words already used, these theories attracted many ardent minds at the time.

10. In reference to the same subject an anonymous author had already written, "This large view of evolution only shifts the original plan farther back, and dates the Creator's invention from the era of the primordial nebula—or, mayhap, from all eternity; it only reveals the mystic lines of life—the secret position of all things imprinted on the flaming winds of chaos. If, then, we are told that the fervent haze of atoms composing the primitive nebula contained the promise and potency of all terrestrial life, we are still face to face with a vast design.§ It is the great task of the evolutionist of the future to trace out the development of life on the earth, and show how it

* *Science and Religion*, p. 158.

† *Transactions of the International Medical Congress*, 1881, vol. i. pp. 99, 100.

‡ See *Critique on Criticisms on the Simplicity of Life*, p. 41.

§ *The New Truth and the Old Faith*. By a Scientific Layman. 1880, p. 86.

extended its empire through water, land, and air in every clime and habitable region. At present the evidence collected is so fragmentary, uncertain, and eked out by guesses, that an attempt to do so would draw largely on the imagination,—as, indeed, the theory has done in the past. But this protest, as it were, written in advance, was unheeded. So also were many more. As in the sixteenth century, so in our own time, an eminent scientist has got hold of “a notion which seduces the imagination of those who do not ask for a rational proof.”

After all, it may be asked, are not men’s minds even now, as in the sixteenth century and times long antecedent to that date, being led astray by words and names rather than by things actual and real? What is it, as a matter of fact, that is indicated by such expressions as chemico-physical force, directive force, plastic tendency, formative force, variability, struggle for life, generative variability, morphological force, evolution, and so forth, but terms which, in their ultimate solution, refer to final causes—the operation and existence of which they are intended to obscure or ignore? These several terms, introduced by modern science, are no more to be grasped and comprehended by man than are those—grander in their significance—which it is their object to supersede. But the thing cannot be. As with the one, so with the other, “belief” on our part is demanded. I, for myself, prefer to attach my belief in the theory of causation to that which, to my mind, is dignified and elevating, rather than to a doctrine which leaves me, physically and morally, no more than a mere “evolved organism.”

11. The Victoria Institute took an early opportunity to combat the views thus alluded to. From a very able paper read before it the following remarks are quoted:—“We are told that the protoplasmic foundation of life and organisation is connected with the nebulous original of suns and planetary systems by one chain of causation. Can an individual be found who will undertake to defend or to expound these nebulous utterances? That talk of this kind should be deemed likely to enlighten the medical profession, or assist in any way to advance education, is most extraordinary. Is thought to be silenced by such utterances as this? So far from anything like a chain of causation having been shown, not two links of such supposed chain have yet been discovered. The more this metaphysical utterance is thought over, the more difficult does it seem to get any definite meaning out of it.”*

An able writer also discusses the same subject after this

* *On the Decline of Modern Thought. Trans., vol. xvi. p. 201.*

manner : *—"The phenomena presented by inorganic matter, or by organisms deprived of life, afford us no ground upon which to base the theory that *life* and *mind* can be 'evolved'—according to the phraseology of the day—from spontaneous self-action of either. It has been well remarked that in plants the act of living is carried on by 'the life force' causing the simpler chemical elements to be built up, or united into more complex ones; while in animals the 'life force' causing chemical change produces a change which is the reverse of what takes place in the plant; namely, a *pulling* apart of complex chemical substances, such, for example, as are contained in food, and reducing them to simpler forms. The life-processes of the plant are chiefly concerned in building up inorganic food; those of the animal in pulling to pieces organic food; yet plant and animal, in the performance of the functions special to each, produce anew very various chemical organic compounds, some of which the chemist can, but the majority of which he cannot, imitate. This principle of life, or occult power by which all organisms live, is not a mere combined working of the chemico-physical forces; it is something above physics and chemistry, though using and controlling them to its needs. Nor does the mere name applied at any particular date to this mysterious and inscrutable power afford us aid to the comprehension of its actual and demonstrable nature. The discoveries of science render manifest more and more of the wonderful workings of *life*; each new discovery but furnishes a starting-point whence further investigations are to proceed; but as to the thing itself—the aim and object of inquiry—farther and farther does it elude the search, farther and farther vanish into the inscrutable, so long as we bring to bear upon it only the means afforded by *science* pure and simple. And if these remarks are applicable in regard to plants, how much more manifest is their importance when referred to animals; how infinitely greater when transferred to man."

12. A further phase of our subject now in hand reaches us from Germany. It is this:—"Living protoplasm owes its property of *life* to the presence of aldehyde groups, which are characterised by intensely active atomic movement." Regarding death, we are told that "when death takes place, it is coeval with, and *caused by*, a transformation of these aldehyde groups into amyl groups, with diminished molecular motion, thus leading to cessation of action." †

* *Science a Stronghold of Belief.*

† *Medical Press and Circular*, August 16, 1882, p. 142.

Similarly we follow up the changes which, according to the most recent—shall we say advanced?—teachings of science, are coeval with and cause *death*. The transformation from life unto death—otherwise of the aldehyde groups just alluded to—is, according to the same teaching, the change into one or another, or it may be all, of those chemical products; the names alone of a few, very few, I can now enumerate, thus: amyl-alcohol, amylamine, amyl-diethyl-benzene, amyl-methyl-benzene, and so on.*

We follow up the definitions thus given, and here is what, by a recognised authority on such subjects,† we are led to. We ask, In what, precisely, do aldehyde groups consist? We learn that “they are derived from primary alcohols by elimination of one or more molecules of hydrogen, without introduction of an equivalent of oxygen, so that they hold a position intermediate between the alcohols and the acids.” Again: “Diatomic alcohols can yield by oxidation two classes of aldehydes, according as one or two molecules of hydrogen are removed.” And so on. And then this sentence occurs: “Only a few of these compounds have been obtained.”

In what manner are theories, of which those stated are examples, to be designated? It has, indeed, been said “that science is nothing but *une langue bien faite*”; or, in other words, that the one sufficient rule for discovering the nature and properties of objects is to *name* them properly.‡ But in the quotations given, have the nature and properties of the objects indicated been so named?

13. In the second quarter of the present century, a London physician of eminence thus wrote regarding “errors of conception,” and his remarks are appropriate to our present theme:—Whether their objects relate to real or imaginary things, the person “reasons very correctly; he assumes things to be true, and reasons from those false premises with precision. Instances of this prevail in the world in religion, philosophy, medicine,” &c. The author quoted from gives instances of such speculations from the works of an older writer; he states that upon such assumptions many followers of the leader alluded to act as if they were truths; that, having been taught such things, they uphold them as if they were realities; that they do this because they have not the fortitude to exercise their own thoughts. Men professing these opinions,

* Fownes's *Chemistry*, 1877, p. 244.

† *Op. et loc. cit.*

‡ Condillac; see Meryon, *Hist. of Med.*, vol. i. p. 189.

—so says the physician who writes,—can act in a body.* He further writes: †—“The doctrine of materialism, and also the doctrine of immaterialism, being investigated, it must end in the acknowledgment of our ignorance. The nature of the mind never can be ascertained by man. When a man says that mind is material, he assumes that he knows the properties of matter; and it is certain that no man possesses any such information. We see the properties of matter, and we see the operations of the mind, and as they are evidently different, we conclude that the essence of each is different; but we are not certain of this. If any man assume that the mind is material, and that it is annihilated with the body, he assumes what he has no right to do. There may be senses and capacities suited to the perception of the powers, proportions, and substance of spirits.” But such senses and capacities pertain not yet to man.

Seventy years ago, it was observed by an eminent member of the medical profession ‡ that “the wisest and best of us are apt to fall under the domination of some fixed idea—that when the mind is fixed upon some particular dogma, its capacity of judging of the doctrine in which that dogma is included in relation to others is impaired.” The remark refers to certain controversies of the fifteenth and sixteenth centuries. But is it inapplicable to those of the present time? For my part, I believe that it is not.

Another author writes:—“The vital forces are a class of agencies extremely difficult to investigate, from their acting in living bodies side by side with the forces found solely operating in dead matter, and from the impossibility of subjecting living beings to experiment without risking the destruction or derangement of the vital forces, by the unavoidable interference with their normal action which experiment necessitates.” §

“All the materials of our knowledge,” says a very eminent writer, || “we share with animals. Like them, we begin with sensuous impressions; and then, like ourselves, and like ourselves only, proceed to the *general*, the *ideal*, the *eternal*. In many things, indeed, we are like the beasts of the field; but, *like ourselves*, and like ourselves only, we can rise superior to our bestial self, and strive after what is *unselfish* and *good*.”

* *Armstrong's Lectures*. Baldwin & Cradock, London, 1834, p. 717.

† *Ibid.*, p. 724.

‡ Meryon, *Hist. of Med.*, vol. i. pp. 229, 230.

§ *Dr. George Wilson's Life of Dr. John Reid*, p. 51.

|| Max Müller. See *Evolution of the Human Race from Apes*. By T. W. Jones, F.R.S. 1874, p. 66.

An eminent divine recently said* of men of science, that they dealt with material objects outside of ourselves, and not belonging to the inner vision, to which the only realities were the things which "eye hath not seen nor ear heard, and which hath not entered into the heart of man." Repeating the idea already quoted, he says: "When men of science say they understand matter, this is exactly what they do not understand." And then he adds—shall I say prophetically, and, judging from the estimation in which what in the sixteenth century was called "science" is now held?—"Future wisdom will laugh at the unhealthy period in which we live."

14. Is it not true that the effect of all experimental science is to create a spirit of scepticism, which, if kept within proper limits, may be really useful? for we ought to prove all things, and hold fast only that which is good. If pushed beyond these limits it has this effect: that the mind becomes at last sceptical of its own scepticism; the experimenter, like the followers of Confucius, brings himself to "believe in anything, or everything, or nothing." Unhappily the train of thought thus induced is not altogether limited to things cognisable by the bodily senses. But there are exceptions to this rule. For example: one of the most accomplished of experimental philosophers is reported as expressing himself thus:—"I have noticed during years of self-observation that it is not in hours of clearness and vigour that this doctrine ('Material Atheism') commends itself to my mind; that in the presence of stronger and healthier thought it ever dissolves and disappears, as offering no solution of the mystery in which we dwell, and of which we form a part."†

But, in the meantime, the doctrines of which I have endeavoured to submit to you examples are being promulgated under the authority of names high in rank among the learned. As in the period selected by me for comparison of modern views, the system of the day, or delusion, beguiles men's minds. The manner in which it is affected by, and in its turn reacts on, current thought has been shown, and the tendency of its teaching indicated by the climax reached—that minerals, plants, animals, only differ from each other in degree; that, for purposes of "research," they are all alike to be examined exactly in accordance with one and the same method! ‡ In

* Address by Père Hyacinthe at St. James's Hall. See *Morning Post*, June 9, 1882.

† See Paper by J. E. Howard, F.R.S., *Trans*, vol. x, p. 107.

‡ See *Nineteenth Century*, Dec., 1881; also *Brit. Med. Journ.*, Dec. 17, 1881, p. 987.

fact, the doctrine of the ancient warrior and philosopher already quoted is reproduced and accepted :—"Of all the ten thousand things that are, there is no particular one."

15. Bearing in mind the character of the several types of materialistic theories I have attempted to summarise in the preceding remarks, I endeavour to picture to myself a being such as a scientific Frankenstein, operating in accordance with those theories, would produce; and this is the fancy portrait that presents itself before me :—Its body sidereal and material ; its warmth maintained by sulphur ; its blood mercury ; in its stomach a demon ; intellect, veneration, truth, affection, sense of duty, benevolence, pity, conscience, honour, nowhere ; its companions, like its own "sidereal" elements, phantoms such as dance on walls at dead of night around the beds of men delirious ; its life, changes of place of particles of matter, produced by co-ordinate machinery formed of cells, and kept in action by "aldehyde groups derived from primary alcohols ;" its death, the transformation of such groups into amyl-diethyl-benzene, amyl-methyl-benzene, et cetera. I refuse to accept such solution of the incomprehensible. If this be really what comes to us as the revelation of modern advanced science, so-called, I decline to accept it, as being by its nature as described, self-contradictory, and repugnant alike to my intellectual and to my moral sense.

16. The purport and object of my remarks require that I for a little retrace my steps to a date already alluded to. Soon after the date of Paracelsus a new theory of the phenomena of life was promulgated, namely, that by Descartes. The chief points of that philosophy are well known ; yet, inasmuch as in times quite recent they have re-acquired a measure of acceptance dangerous to true philosophy, and indeed to public ethics, it is well to recapitulate some of them, and at the same time to take into account the kind of man by whom they were promulgated. With regard, then, to Descartes and his theories, we learn that, born in 1596, he died in 1650 ; that early in life he began to distrust the authority of tradition and of his teachers. It is stated of him that he was a type of that self-reliant, harsh, and abstract spirit of science to which erudition and all the heritage of the past seem but elegant and unworthy trifling. His science was physics in all its branches, but especially as applied to physiology. His dissections of the heads of animals were conducted in order to explain imagination and memory, both of which he considered physical processes. Another object of his researches was to find out "if there is any means of getting a medical theory based on infallible demonstrations." "The sciences," said he, "in

their totality are but the intelligence of man." The mind is not for the sake of knowledge, but knowledge for the sake of the mind. He acknowledged the "idea of an infinite, perfect, and all-powerful Being, which cannot be the creation of ourselves," and our thoughts as necessarily given to us by "some Being who really possesses all that we in idea attribute to Him—the Creator of the material universe, and of all truth in the intellectual world."

According to his biographer, his theory reduced man and animals to automata, and indeed he termed them machines. In the animal the rule of absolute mechanism is as complete as in the cosmos. Reason and thought, the essential quality of the soul, do not belong to the brutes. There is an impassable gulf fixed between man and the lower animals. The only sure sign of reason is language, and language in this sense is not found save in man. The cries of animals are but the working of the "curiously-contrived machine, in which one portion is touched in a certain way; the wheels and springs concealed in the interior perform their work, and, it may be, a note *supposed* to express joy or pain is *evolved*; but there is no consciousness or feeling. The animals act naturally and by springs, like a watch. The greatest of all the prejudices we have retained from our infancy is that of believing animals think." And then this philosopher is said to have expressed himself that he would not believe that a beast thinks, until the beast tells him so itself. The sentience of the animal to the lash of its tyrant is none other than the sentience of the plant to the influences of light and heat.

The doctrines thus expressed won society and literature before they penetrated into the universities. Literary men opened their houses for readings, to which the intellectual world of Paris—its learned professors and fair sex—flocked to hear the new doctrines explained. In England these doctrines took but little hold; and in France they had passed away into neglect by the middle of the eighteenth century.

Have we not in the abstract given the original and greater part of what might appropriately at the present day be written regarding some living theorists and their theories? Strong in self-opinion, hard and uncompromising towards the views of other inquirers, materialistic to an extreme degree, yet owning to and confessing the existence of an ultimate source of causation not to be discussed or comprehended by means of physical investigations; unsympathetic towards his own kind, and, if possible, still more so towards inferior creatures; denying to the latter attributes beyond those possessed by machines. And last of all, in the extent and

rapidity to and with which such views, when first promulgated, found acceptance, does it not require some exercise on our part to bear the circumstance in mind that we *really* are now speaking of bygone times?

For myself I feel repelled by the philosophy of life thus presented, in a degree only less than by that first alluded to in these remarks. True, the later theories, like the older, are unsupported by evidence, such as, to quote a very high forensic authority, would be accepted in a court of law on a question of fact;* but they are even now being unearthed after a century's consignment to the tomb, and once again find acceptance by what is called the "intellectual world." Is it really the case that reasonable and reasoning man is expected humbly to grasp at such doctrines as are expressed above, culminating in a denial to sentient animals under the lash of a tyrant no sentience beyond that of a plant under the stimulus of light? If it be so, rather than receive them, I would commend to the notice of proselytes of the doctrine in question the sentiment expressed by a recent writer in the *Revue des Deux Mondes*, namely, that "Le plus je connais des hommes, le plus j'aime le chien."

17. In 1796 the views thus expressed were proclaimed afresh by a popular scientist of that date. The creed then taught and enthusiastically accepted was none other than that "there is but one animal, not many," a doctrine emphasised by learned professors, and, like those just now mentioned, greedily accepted by some willing votaries at the present day. In reference to this theory it has been reasoned thus,†—If the properties of organised tissues depend upon their organic structure, or, in other words, upon the nature and disposition of their component molecules; if, again, every organism differs only in degree from every other; if these organisms are all acted upon by the same natural forces, it follows that the actions of all animated beings must be similar in kind,—as similar, in truth, as in their organic structure. Mark the *if, if, if*; mark also the conclusion drawn from assumption as if it were reality. But that it is a reality remains undemonstrated.

18. According to a recognised authority on such subjects,—“Nature presents us in the different classes of animals with nearly all possible combination of organs, and in all pro-

* *Fortnightly Review*, Feb. 1, 1882.

† *Races of Man*, by R. Knox, p. 477. See also Geoffroy St. Hilaire, quoted in *Critique on the Criticism of the Simplicity of Life*, by R. Richardson, p. 13.

portions. There are none but have some description of organs by which they are made familiar to us, and it only suffices to examine closely the effects produced by these reunions, and those which must form their partial or total absence, to deduce very probable conclusions as to the nature and use of each organ and of each form of organ. Thus, in rising from the simplest to the most complicated animal form, we are made acquainted with the functions of organs." Contrast we the definite and precise statements now quoted with the conjectural terms of those immediately preceding. In the one, all is assumption; in the other, the conditions indicated are cognisable by means of our senses, and in accordance with our experience.*

A particular organ or tissue is found, in one set of instances, in what is described as a fully developed and complete condition, the nature of the functions performed by it obvious to the observer; in other instances the same organ or tissue is represented by an "analogue" so rudimentary and seemingly undeveloped, so obviously unsuited to perform similar functions, that "scientists" are led—needlessly, perhaps—to ask themselves the question: Why is it there at all? To this they find a reply satisfactory to their own minds in their favourite doctrine that the circumstance indicates the process of "evolution" to be in progress. But whether towards, or retrogressively from, or beyond the creature in which the organ or tissue is in its highest or in its lowest condition of development, is left unstated. Reasoning such as this appears to have been well answered a little more than three years ago by a writer in a very influential review.† The argument of the writer in question had as its basis the several "developments," as they might be termed, of contrivances in use at different periods, in different countries, and by members of the several social classes, not in their nature very scientific, they being simply supports whereon to sit. In our own country every conceivable kind and shape, from the three-legged "cutty-stool" in the Highland bothy to the chair of state in the palace, is to be found—and doubtless many more inconceivable to most of us could readily be "discovered," were we to ransack the strange places in Wardour-street and its vicinity. And yet, in designing the several members of this very large class of contrivances, there are indications that each particular portion of every such contrivance had some

* *Anatomie Comparée*, 2nd edit., vol. i. p. 17, quoted in Mr. Fleming's *Essay*, p. 52.

† *The Edinburgh*.

peculiarity of its own ; that the differences between individuals at what may be termed opposite ends of the chain of development were absolute, notwithstanding that one pervading *plan* was apparent through all. But in their manufacture, artisans as numerous as, it may be, or more so, than the articles of furniture themselves, were at work upon them ; in the case of animal, as indeed of all life, only one Power, namely that of the Great Architect of the universe.

The phenomena of life in man differ in degree according to the circumstances and condition of individuals. Those observable in the natives of New Guinea, for example, furnish no criterion applicable to the higher and more civilised races of Europe and America. Each of these differs from the others ; so do the life characters of the denizens of arctic regions from those of tropical ; of feeders upon oils and fats from those on mixed diet, as do the latter from those on farinaceous ; of men according to social position, training, associates and associations ; in health as distinguished from illness ; in illness as distinguished from health ; and many other conditions of an altogether individual nature. In all that concerns intellectual life, the characters of races and individuals are no less distinctly marked and demarcated than those that are more purely corporeal. This phase of our subject, however, is of too extensive a nature to be entered upon now.

As in man so in animals, predisposition and temperament affect and modify the performance of the vital functions to an important degree, not in any way to be accounted for by materialistic or "chemical" theories. Various domesticated animals have a differential predisposition to contract particular maladies. Ruminants are affected by diseases which are not seen either in the equine or carnivorous animals ; while these, again, have severally their peculiar affections. The temperament of particular animals is taken into account by veterinarians in relation to the nature, gravity, and probable complications of maladies affecting them.* And so, also, in regard to constitution, age, sex, and various other conditions familiar to observers, but not to be enumerated here. In fact, each individual creature must by itself be held to constitute a separate sphere for study by whoever would rightly comprehend its vital actions. Compare for a moment the characters and evident phenomena in the great and most important order, the vertebrates. These include cold-blooded animals, hot-blooded animals ; those that live in the water, those that live upon the earth, and in it ; those that fly, run,

* *Veterinary Sanitary Science*, by G. Fleming, vol. i. pp. 87, 88.

creep, and swim; those that are by nature nocturnal, and such as are diurnal; those that hibernate, those that do not; and some of which it is doubtful whether or not they ever sleep. Let us also allude to such phenomena as compensatory functions; the repair in some animals, the reproduction in others, of injured portions of their bodies; the development of some such portions under particular conditions, the atrophy of others. In regard to each of these, phenomena of life and functions are special, not only in species, but in individuals, and on occasions different according to period of the year, as well as in seasonal and meteorological changes. Therefore deductions drawn can have reference only to the particular individual and circumstances on and under which they are arrived at. This enumeration could easily, by its length, be made tedious, if it is not so already. But to assert that any one of those alluded to has either ascended or descended from any other, is to adduce as fact that which remains within the sphere of the conjectural.

On the present subject a well-known London physician has expressed himself after this manner* :—The changes which occur in every organic structure as years roll on are to be considered normal. They are in harmony with the dictates of nature; they are no more unnatural than the sere and yellow leaf which falls from the oak in autumn. Why one creature should live longer, or burn out sooner than another, is not clear; why tissues of the same composition should wear out in one animal after ten revolutions of the earth, when it takes a hundred revolutions to destroy similar ones in another, is by no means apparent. Why, for example, should a dog be worn out in ten or twelve years, its limbs stiff, its sight and hearing impaired, its intellect obtuse, and senile changes be discoverable in its brain and elsewhere, when a parrot may take a century for the production of the same destructive changes? To these, and to thousands of questions pertaining to the same category, notwithstanding all the investigations dictated by science, pursued throughout a score of centuries, all we can yet say in explanation is, Nature wills it so, and so it is. And the reply, precisely similar in purport, is considered to have been given centuries before our era dawned. Opinion has meantime oscillated from one extreme to another extreme; at one time obscured by a tide of credulity and superstition, at another by a flood of scepticism, doubt, and materialistic teaching; the absolute result in regard to these and many other questions relating to the nature and source of *life* that the investiga-

* See *Lancet*, August 6, 1881, p. 223.

tions of science have taught us nothing whatever beyond that which has been, and is, equally cognisable in the absence of such investigations. It is true we have numerous brilliant examples of *une langue bien faite*. But that is all.

19. Let us now briefly summarise the more important points which the rapid survey just made has brought before us. They are these :—

Two hundred and fifty years and more ago, the prevailing “cast of thought” in Europe generally was dominated by credulity and superstition.

The science of that day, conforming to the prevalent opinions, partook also of their character.

But, looking back from our present standpoint, we see that among the scientists who then lived there were some whose names are still respected, and whose authority continues to carry the very greatest weight and respect.

And also that inquirers were honest, earnest men, zealously and steadily pursuing their “researches” in quest of truth.

Yet that which by them was accepted as “truth” is now looked upon as “extravagant theories,” and as “fanciful philosophy,” with which men’s minds were beguiled.

At the present day, the prevailing cast of thought is materialistic, and disbelief in whatever cannot be immediately appreciated by man’s ordinary senses; the train of popular teaching is that all living things come from other living things quite different in kind, and that these become in their turn living things of a kind altogether different from what had previously been.

In accordance with this form of thought, scientific theories of the day in regard to *life* and its manifestations are enunciated.

And as in regard to the theories moulded by credulity and superstition, so with those on materialism and scepticism, men’s minds are again beguiled with theories no less extravagant than were those of three hundred years ago.

Belief in astrology is now relegated to the effete superstitions of long-passed and unenlightened times.

But whereas under a bygone phase of thought “philosophers” held that man had a sidereal body, so now it is held by “scientists” that future poets are “potential in the sun”; that the energy of man and heat of the sun are but different expressions for one and the same thing; that the foundations of life and organisation are directly connected with nebulous originals of suns and planetary systems.

Thus the question naturally presents itself—Wherein lies the difference between the “fanciful philosophy” based

upon astrology in the sixteenth century, and the teachings of "exact science" at the present time? The phraseology in which they are severally expressed is in several respects identical.

The latest phase of "science" teaches the doctrine that *life* and *death* are nothing more than "conditions of aldehyde groups," which groups are themselves "derived from primary alcohols; also that only a few of these compounds have been obtained." This is not stated as an allegory, but as a simple matter of what is intended to represent scientific fact, and be accepted by reasonable man.

Such, then, being a few—a very few—out of the very many phases represented by "scientific" thought, it becomes subject of congratulation that in one great division of the civilised world a periodical specially intended to form the opinion of the rising generation thus addresses young men and women, namely, in America:—

"The great leaders in science need to be modest in claiming that their propositions are absolutely true, and should be cautious in announcing that they have made a new discovery. A leading scientist* gained for a season a brilliant reputation by announcing that he had discovered protoplasm to be the source of all organic life. But, soon after,† the great English microscopist, denied the truth of the leading scientist's theory, and asserted that bioplasm must be put in the place of protoplasm.

"The eulogies over the grave of one of the foremost among observers‡ are yet fresh. They lifted him to a place among the immortals, for his wonderful discovery of progress in creation by the law of natural selection.

"But now comes a writer§ who has for years been studying with the best naturalists and biologists of Europe, and announces that life is not due to protoplasm, but to atomised charges of electricity conducted into the system by the oxygen of respiration. Variations, he says, are caused, not by natural selection, but by the action of electricity on reproductive germs. He holds to the theory of evolution, but not to the form of that doctrine which gave a world-wide reputation to its great apostle. The famous German professor, one of the highest authorities in Europe, is said to agree with the writer just quoted.||

"It may not be to the point to ask who shall decide when

* Professor Huxley.

† Mr. Darwin.

|| Professor Helmholtz.

† Dr. Lionel Beale.

§ Mr. Towne.

scientists disagree? But it is certainly pertinent to say that such disagreements should make philosophers modest and cautious.”

The results of philosophy and of scientific teaching in regard to all that concerns the mystery of life being thus unsatisfactory, what is it that we are taught by this circumstance? Is it not that the ways of that Great Power by and through which all created beings and things were brought into existence, and are maintained during their allotted span, are past finding out—by man, at least. Are we, then, to cease our investigation of Nature and Nature’s works? By no means. On the contrary, let us investigate them by every lawful and legitimate means that are now or may become available; bearing in mind the while that

“ Knowledge is as food, and needs no less
Her temperance over appetite ; ” *

and as we proceed in our investigation we shall find newer and still newer causes to admire and wonder. But, as to the Ultimate Power upon which those manifestations, and many others that are beyond our ken, depend, we may apply expression after expression in the vain hope of deceiving ourselves as to its mysterious nature save through the eye of faith,—and still that Power itself remain inscrutable.

One of the most eminent physiologists of the present day, and certainly one of the most highly respected, writes these words †:—“ To imagine, then, that everything is gained by the interposition of ‘agents,’ intelligent or non-intelligent, between the Deity and the materials upon which He operates, is either to set limits to His knowledge and power, or to give to these agents an office purely nominal.” No reflecting mind has any doubt that this earth and its inhabitants form a system, of which every part is perfectly adapted to the rest, and of which all the actions and changes, however independent, or even contrary, have one common tendency, the ultimate happiness of the creatures of Infinite Benevolence.

And finally, having regard to all that has now been said on the subject of *life*, how apt the remarks with which a living physician ‡ brings his interesting work to an end:—“ Generation after generation still sends forth new speculators—ardent, sanguine, and undiscouraged by the

* Milton, *Paradise Lost*, book vii.

† *Physiology, General and Comparative*. By Dr. W. B. Carpenter. 1857, p. 23.

‡ Fothergill, *Therapeutics*, p. 637.

failures of their predecessors—to toil at the same Sisyphean task, to be met by the same impassable bounds, to catch the same vanishing and partial glimpses, to be conscious of the same incompetency, to confess the same utter and disheartening defeat. One after another, they retire from the voyage of discovery weary and baffled, some in exasperation of mortified ambition, some having learned the rich lesson of humility; a few in faith and hope; many in bewilderment and despair; but none in knowledge," that is, of the kind they seek. But I bear in mind that in order to combat views and opinions that are abroad, working incalculable evil in the minds of many, more especially of the impressionable and the young among us, it is necessary, not only to refute those views and opinions, but to attack them resolutely. War to be successful must be aggressive.

The CHAIRMAN.—I have now to return the thanks of the meeting to Surgeon-General Gordon for his very interesting paper. I think it has one defect, and that is, I am afraid we all so thoroughly agree with it, that it will provoke very little discussion.

The HON. SECRETARY then read the following letter from Dr. W. B. CARPENTER, C.B., F.R.S. :—

"February 17, 1883.

"Dear Sir,—I am sorry that, as I have to lecture at Leicester on Monday evening, I cannot accept the invitation to the meeting. I am much obliged to Surgeon-General Gordon for his kindly mention of my scientific work; and may say that while I entirely accept 'Evolution' as an expression of the probable *order* of Creation, I am in full agreement with him as to the incapacity of any Scientific doctrine to do more than carry us back to a First Cause, whose *modus operandi* it is the province of Science to search out."

Mr. FOSTER PALMER.—I think it will be admitted that one point has been very fully brought out in the paper, namely, that "there is nothing new under the sun." There is nothing so striking to the student of history as the constant repetition of old ideas under new forms. This would appear to be due to the *inability* of the human mind to get out of the track which has been beaten for us by our predecessors. I believe it was Aristotle who first discovered, or fancied he had discovered, that the heart was the seat of the affections, and we have never been able to get out of that fallacy, even down to the present day, although we now know that the brain is the seat of all the mental operations. Hippocrates spoke of nature as a sentient being, as a person; in all his remarks about nature he referred to it as a person; and people still speak of the laws of nature in a manner only applicable to a sentient agency. Again, belief in demoniacal possession, formerly so general, is now almost universally discarded by physiologists; while the Paracelsian idea of immaterial bodies is precisely the view held by those thinkers of the present day who call themselves spiritualists. For the

purposes of his argument, Dr. Gordon has taken us back two hundred and fifty years ; but I think we may safely go much further than that. Even at the present day English people—not only the illiterate, but people of education also—have quite as much faith in sundry shams as their Saxon ancestors of early times reposed in the Royal touch of Edward the Confessor, and, perhaps, with just as much reason ; and I must admit that even now in certain quarters the tendency to materialism sometimes runs parallel with a tendency to superstition. Another point which has been brought out by the paper is the absolute worship paid in the present day to long words and difficult sentences. Some scientific men, apparently for want of appropriate ideas, deliver themselves of long-winded sentences, which they present to the world as something entirely original. There may be something in the shape of ideas underlying this elaborate phraseology, but either the authors are unable properly to express them, or no one is able to understand them when they are expressed. When Huxley tells us that certain forms of animal life possess a “remarkable bilaterally symmetrical continuous calcareous skeleton,” he has told us what each of us knew before, and raises a suspicion in the mind that this great wealth of words is somehow connected with a corresponding paucity of ideas. In paragraph sixteen, Dr. Gordon alludes to certain comparisons between a man and a dog. Professor Fleming, in his great work on “Animal Plagues,” has most clearly demonstrated that, in spite of all the dreadful accusations brought against man as a tyrant and destroyer, he is and always has been the great physician and friend of the animal creation, and that if the dog is, as has been somewhat hyperbolically stated, the friend of man, he certainly ought to be, for man is in a hundredfold degree the friend of the dog ; and animals enjoying human protection experience an amount of health, happiness, and longevity, entirely out of proportion to anything possessed by those not so favoured. I think it will be found that those who have to so exaggerated a degree compared man unfavourably with the dog and other animals, have been wrong, and that their misanthropic nature explains the reason why they have made such a comparison. Of course, I do not accuse Dr. Gordon of having done this ; but I assert that the misanthropic nature of some men has been the cause of their finding so little sympathy among their fellow men, and being thereby induced to fall back on the brute creation. As to the sensibility of the latter to pain, I think that, after all, there is a certain germ of truth in one part of Descartes’ theory,—namely, that the lower animals have not as great sensibility to pain as human beings.

AN ASSOCIATE [who desires to withdraw his speech as much as possible here referred to the benefits, perhaps indirect, which had been conferred on their time by the alchemists ; to his acquaintance with China and Japan not leading him to go with the author in some of his remarks ; to the doctrines of Buddhism, an Eastern theory of Creation, and Mr. Davis’s recent work.

DR. CADDY.—I should like to say a few words, because, whenever I have come here and gone away without saying anything, I have always regretted it. There is one point in Dr. Gordon’s paper to which I desire briefly to

allude. He says that "the changes which occur in every organic structure as years roll on, are to be considered normal." How few of us can count among our own friends those who have lived during four generations? What a valuable addition it would be to our stock of knowledge if a body of experts would tell us the structures which have most conduced to longevity, and that have given an existence of four-score years. If we were to take the "seventies,"—the parrot, for instance,—zoologists might tell us many interesting details. Again, in the course of my travels I have never seen a bald head among the South Sea Islanders. They are every day in the salt water, and their hair gets a regular coating of the customary cocoa-nut oil. Then, in Nova Scotia and the Gulf of California, if you see a grey-headed Indian he must be very old indeed; while in the Negro you not only observe very beautiful teeth, but you also say there is plenty of rooof for them. As to the Tierra del Fuegians, they are all alike, and all evidently belong to the same race; and what a splendid figure the Negro possesses, in spite of the peculiarities of his physical formation! Is that peculiar crisp and curled condition of the hair, which we admire so much when seen in the European race, associated with the general formation of the Negro type? Is it the bone structure of the Negro that is the cause of, or a contributor to it? In considering the peculiar circumstances that have conduced to longevity, there is a wide field for observation among the inhabitants of the new world, the hill tribes, and the New Zealanders; but still I think it will be the microscope and chemical analysis that will have to solve the mystery.

Surgeon-General GORDON, C.B.—I have not many remarks to offer, and would preface what I have to say by stating that the general plan of my paper has relation to the point I have taken up, namely, that the language in which science is incorporated varies from period to period according to the peculiar turn of popular thought. In this, as far as the limits to which my paper was necessarily confined would admit, I have tried to give, as it were, the antidote—showing by quotations from recognised authorities those things which, to my mind, were calculated to neutralise those which I had previously cited. Hence it is that some remarks to which reference has been made as if they were mine, are not in reality mine, as will be seen by reference to the notes at the foot of many of the pages. I certainly have drawn certain deductions from a comparison of the different and opposing statements which seemed to me to be legitimately deducible from them, but I do not know that I have done anything more. An allusion has been made by one of the speakers to the benefits which man has conferred on the inferior animals. There can be no doubt that man has conferred very great benefits on the lower animals; but, on the other hand, the lower animals have conferred very great benefits on him; therefore, it seems to me, they are quits as far as that goes. But the allusion to which I specially refer was to a quotation given by me from a well-known French paper, the *Revue des Deux Mondes*:—"Le plus je connais des hommes, le plus j'aime le chien." My object in introducing that was to commend it to the notice of those who hold the doctrine to which I have referred, namely, those

who look on animals as simply machines, as manifesting no sentience under the lash, for instance, beyond what the plant does under the stimulus of light. I merely assert that the comparison seems to me to be of two very different things. However, as the subject of the alleged non-suffering by the lower animals of pain such as is felt by man has been taken up, I may here say that, according to the testimony of veterinary surgeons, many animals,—for instance, the dog and the horse,—do suffer, to all intents and purposes, as much actual pain as any of us, the domesticated animals suffering to a greater extent than those which are undomesticated. But there is one respect in which, according to my informants, animals suffer a great deal more than man, and that is, that whereas a man who is subjected to very severe and protracted pain faints, and becomes unconscious, the inferior animals never do this : so that, in reality, they do under these circumstances suffer more than man. But there is another respect in which there is a very material difference. A great deal of the suffering which man experiences is moral or mental, as well as physical. When a man has to undergo an operation, or to be subjected to some severe physical punishment, he knows in anticipation the results that are likely to follow. He can imagine, for example, the horrors of death, and realise the responsibilities that are attached to him if he should leave his family unprovided for ; whereas, none of the lower animals have any such feelings. Consequently, in this respect the animal has the advantage over us, because, while it only suffers physically, we suffer both physical and moral pain. A reference has been made to the alchemists of old. No doubt we owe the alchemists a great deal, but in speaking of science and other matters in relation to a particular period one is bound to take typical instances, and the particular type I took was that of Paracelsus, whom I quoted in order to show that the style and doctrines of a person with whom a theory having no solid grounds has originated may, nevertheless, become so marked as to carry with them the opinions of the most learned, and become, in fact, the fashion of the day. I may add that I introduced a certain number of personalities with reference to Paracelsus which I should not have felt justified in bringing forward with regard to any living man ; but, although it is often said we should separate altogether a man's public and private character, it seems to me that this is very often a difficult thing to do. According to my idea, some of the things enunciated by Paracelsus would have had greater weight had his private character been such as to have given them that weight. For example, with regard to some of the writings of men of the present day, although we may not agree with the opinions they enunciate, still, from the high and honourable character of those individuals, we accept their opinions with the respect due to all honourable and upright men. Their theories may be wrong, but we nevertheless receive them and treat them with respect. An allusion was made by one speaker to what we owe to the East. What he has said leads me to think that perhaps he takes me for being altogether a home-bred individual. I may state, however, that I also have been a great deal in the East, in-

cluding India, Burmah, China, and Japan ; and although I gave, as one of my authorities, the *Encyclopædia Britannica*, because I thought it right to give an authority of recognised standing, still my turn of thought with reference to the ancient philosophers whom I have quoted was formed after a good deal of intercourse with the people who are followers of their several systems of philosophy, and from a good deal of study which I have gone through, for instance, in China and in India. With regard to the doctrines of Buddhism, I would commend to the notice of the gentleman who was kind enough to comment on my remarks a work by Bishop Bigandet, of Rangoon,—a work containing a good deal of what is very interesting ; and although I have not read Mr. Davis's book, I attended all the lectures he delivered on the subject at the Royal Institution. With regard to the doctrines of creation which have been referred to, there is one circumstance which occurs to me that may be regarded as curious in its way. The idea which the Fantees on the African Gold Coast have of creation is somewhat peculiar. It so happened that I served among them, and I had, what I am about to tell you, from themselves. Their doctrine of the creation of man is this :—That when the Great Fetish created man, of course upon the Gold Coast, because their idea of the Gold Coast is that it is the most blessed part of the world, he made one division of mankind black and another white. The black men, of course, according to them, are the favourites of the Great Fetish, and were by him placed in that most delightful paradise, the Gold Coast of Africa—on the Coast of Guinea. Having made the two kinds of men, the Great Fetish presented before them two packets, the black man being allowed to select first, he selected a packet containing so much gold that the fact accounts for the name given to the coast. Nothing was left for the white man but what the black man chose to leave, and that was a box containing a book which taught the white man everything. It is a long time since I was on that coast, but the circumstance comes to my mind through an allusion made by one of the speakers, and I thought it might be of interest. In the same way, with regard to the quotation I have given at the close of section 18, in which the longevity of the parrot is compared with that of the dog ; the speaker who commented on this will find at the foot of the page an allusion to a well-known periodical, and he will also see that I state in my opening remarks my desire to avoid giving the names of individuals. If, however, he refers to the copy of the *Lancet* quoted, he will see that the quotation is from a very eminent London physician, and the object is not so much to give particulars as to the longevity of all kinds of animals, as to illustrate the manner in which the changes that take place in all organic beings are in accordance with nature, just in the same way as the fall of the sere and yellow leaf.

The meeting was then adjourned.

ORDINARY MEETING, MARCH 5, 1883.

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

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

MEMBER :—T. Morris, Esq., Warrington.

ASSOCIATES :—The Right Rev. E. Harold Browne, D.D., Lord Bishop of Winchester, Winchester ; Captain E. K. Calver, R.N., F.R.S., Cannes ; J. Hague, Esq., Canada ; H. C. Lawrence, Esq., London ; Rev. J. L. Uhl, India ; Rev. J. H. Usill, Eastbourne.

HON. CORRESPONDENT MEMBER :—Rev. G. R. Badenoch, LL.D., London.

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

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| “Transactions of the Royal Dublin Society.” | <i>From the same.</i> |
| “Transactions of the American Geographical Society.” | ” |
| “Transactions of the American Numismatic and Antiquarian Society.” | ” |
| “Transactions of the American Institute of Christian Philosophy.” | ” |
| “Transactions of the Society Biblical Archæology.” | ” |
| “Australian Stalk-eyed Crustacea, Sydney Museum.” | ” |
| “On the Modification of Clouds,” by L. Howard, F.R.S. | <i>J. E. Howard, F.R.S.</i> |
| “Positivism,” by Rev. G. Blencowe. | <i>From the same.</i> |

The following Paper was then read by the Author :—

ON CERTAIN DEFINITIONS OF MATTER. By JOHN ELIOT HOWARD, F.R.S., &c.

ἀλλὰ πάντα μέτρῳ καὶ ἀριθμῷ καὶ σταθμῷ διάταξας.*

1. SIR FRANCIS BACON, in his *Novum Organum*, dwells upon the “*idols*† and false notions,” which occupy the human mind, and inhere so strongly therein that they make the access of truth difficult.

2. Whilst dwelling upon the special illusions which beset

* “Thou [Wisdom] didst dispose all things by number, and weight, and measure.”—Wisdom of Solomon xi. 20.

† Lib. i., xxxviii., “Sunt quidem idola *profundissime mentis humanæ fallaciæ*.”—See Appendix.

those who affect particular sciences and modes of contemplation he bears rather hardly on the chemists, who, "from a few experiments conducted in the furnace, construct a phantastic philosophy of little account."*

3. This was true enough in his day, but it has been well shown by our illustrious colleague, M. Wurtz, what an alteration has taken place in the science, through the discoveries of Lavoisier.† He was at once the author of a new theory and the creator of the true method in chemistry. He first established the elementary nature of the metals, and fixed in general the notions of simple bodies. He recognised as such those bodies which yield only one kind of matter, and when subjected to the action of all available forces remain constantly the same,‡ indestructible, undecomposable. Having thus impressed on a large number of primordial substances the seal of a peculiar individuality, he finally recast the ancient notions on the nature of elements, and put an end to the hope of *effecting transmutations*.

4. The elementary bodies thus defined are represented by Lavoisier as endowed with the power of uniting together, so as to form compound bodies, this union taking place without loss of substance, and in such a manner that all the ponderable matter of the constituent bodies is found in the compound. These great principles form the basis of chemistry. Now that they are universally adopted they appear to us so simple and indisputable that we feel compelled, as it were, to admit them as maxims. But they were not so at the time in question.

"And if anything could vie in importance with the discoveries of the great master, it would be his method,—that method which consists in *applying the balance to all chemical phenomena*."

5. Thus the "fantastic theory" of "*phlogiston*"§ vanished before the light of real science; just as the notion of the "transmutation of species" would disappear if we could but

* *Novum Organum*, lib. i., liv.

† *Hist. of Chem. Theory*, by A. Wurtz, Membre de l'Institut (Aca. des Sciences).

‡ So also Lucretius :—

"Sunt igitur solidâ primordia simplicitate,
Nec ratione queunt aliâ, servata per ævom,
Ex infinito jam tempore res reparare."

Lib. i., lines 549, &c,

§ "The principle of inflammability."

ascertain in what the *formative power* of a single species or of a single individual consists.*

6. We have thus advanced in our knowledge of the *properties* of matter to some presumably correct appreciation of its nature. By spectrum analysis we appear to recognise this ponderable matter as the same throughout the universe. We may have to recast our list of simple substances, or in other ways to modify our present views; but we are conscious that we are now walking in the light of truth, and consequently cast the dreams of the past to the moles and to the bats.

7. This may seem presumptuous, but will not appear so if it is considered that on every hand our present chemistry is confirmed by fact; and that the health, comfort, and well-being (in a material sense) of the whole community are connected with continual recurrence to the principles of atomic proportions and dependence upon the unchangeable atomicity of atoms.

8. The brilliant illumination of our streets, the cleanliness of the population, their succour through pharmaceutical aid, the colours of the dresses worn, and of the furniture decorating our houses, are a few out of the familiar instances in which chemical art is essential to our civilisation.

9. Such being the progress of the science it has been necessary to co-ordinate our language with the use of phrases in the past; and also to modify words, *e. g.* metals, metalloids, salts, &c., giving a certain definite meaning to that which was before unfixed. This has not been easy to effect.

I do not even think that it has been effected, for, though we have quite a right to invent new words, or even a new language to express new facts that we discover, it is a different matter when we invade the common privilege of mankind to express themselves as they will,

“Si volet usus

Quem penes arbitrium est, et jus, et norma loquendi.”†

10. Whilst it is not to be supposed that the common language

* “Nec tamen omnimodis connecti posse putandum est

Omnia : nam vulgo fieri portenta videres ;

Semiferas hominum species existere, et altos

Interdum ramos e gigni corpore vivo

Multaque connecti terrestria membra marinis,

* * * * *

Quorum nihil fieri manifestum est ; omnia quando

Seminibus certis certâ genitrice creata,

Conseruare genus crescentia posse videmus.”

Lucretius, *De Rerum Natura*, lib. ii., lines 690, &c.

† Horace, *De Arte Poetica*, l. 71.

of mankind could be affected by chemical theory ; it is otherwise with "scientists" who have learned to dress up their thoughts in chemical language ; to talk, for instance, of mind being connected with *molecular changes* * and of "*molecular force becoming structural*," in the brain, whilst at the same time disbelieving in the existence of molecules themselves, and sceptical as to the very existence of matter itself. "It seems to be the natural desire of the chemist to see with his mind's eye the atoms and molecules which can no more be seen by the microscope than by the unaided eye. While endeavouring, then, to see the constitution of matter, we are told, on the one hand, that we may relieve ourselves from the idea of matter altogether, and be content with resolving all things into Force [e.g., Sir W. G. Armstrong, British Association Address, 1863] ; and, on the other hand, we are told that Force, in all its many manifestations, may be resolved into Matter and Motion." †

11. The popular mind would not have been influenced so easily by this pseudo-philosophy were it not for this illegitimate and misleading use of chemical language ; but even now there may be an advantage in insisting that two schools of thought should not use the same words in different meanings.

12. I plead for the common-sense views of Matter, and considerate the retention of the meaning of the word as given us in the standard old-fashioned English of Johnson's *Dictionary* : "Body, substance extended."

13. This he illustrates by the following quotations :—

From Watts's *Logic*:—"Some have dimensions of length, breadth, and depth, and have also a power of resistance ; or, exclude everything of the same kind from being in the same place. This is the proper character of matter or body."

Further, from Newton :—"It seems probable to me that God in the beginning formed Matter in solid, massy, hard, impenetrable, movable particles, of such sizes and figures, and with such other properties, and in such proportion to space, as most conduced to the end for which he formed them ; and that those primitive particles, being solids, are incomparably harder than any porous bodies compounded of them ; even so very hard as never to wear or break in pieces, no ordinary power being able to divide what God himself made one in the first creation."

14. The first of these extracts is the language of common

* See *Examination of Tyndall's Belfast Address, Trans.*, vol. x. p. 115.

† Presidential Address, delivered before the Newcastle Chemical Society by B. S. Proctor.

sense; or, in other words, that of the condensed experience of mankind. The second is that of the profoundest philosophy.

15. It was reserved for another deep thinker to bring the admirable *speculations* of Newton within the domain of *facts*. It is by weight and measure that we realise our conceptions of *body*, about which sight unaided does not always give us accurate information. What we think we see is not always really seen; and much as we owe to spectrum analysis in assisting in the investigation of the properties of matter, we are yet not able to obtain the amount of certainty which attends the following research.

16. It was Dalton, then, who first gave the idea of atomic weights:—"It was by a careful mechanical juxtaposition of parts that Dalton arrived at the idea: it is eminently mechanical, and it is remarkable that all progressive views on the subject have been so. He *introduced proportional weights into the theory, and found it to agree with facts*. His is, therefore, the quantitative atomic theory."*

17. Taking advantage of the already ascertained property of a mass of matter, called the attraction of gravitation, indicated by the weights in the balance, he thus enabled us to understand correctly something more about the intimate properties of body or substance, giving a solid basis to that which was previously theory.

18. The notion of the atomic constitution of matter formed part of the philosophy of the Hindoos, Phœnicians, and Egyptians, and must, in all probability, have descended to them from a very early antiquity, when those nations could share in common ideas.

19. Amongst the Greeks it afforded the basis of the cosmogony of Democritus; and, subsequently, Epicurus and the Epicureans generally supported the atomic hypothesis; and in a most admirable poem, Lucretius discourses on the nature of things in a sense hostile to religion, or, rather, to the abominable superstition which alone was to him "Religio,"—

"Tantum Religio potuit suadere malorum."†

20. Hence, I suppose, arose the prevalent opinion of the atheistic tendency of the doctrine which he inculcated. But if any person can read the poet's description of the sacrificed Iphigenia without partaking in his indignation, he must be destitute of humanity. We must needs, in so far, sympathise

* Ure's *Dictionary*, vol. iii. p. 270.

† Lucretius, lib. i., l. 90.

with the irreligion of Lucretius, whilst we have no excuse for copying his atheism.

21. It is, however, to be most accurately noted that the refuge of Agnosticism is, at the present day, rather in the opposing doctrines of Boscovitch and of Spinoza, and in the "everlasting haze" in which they involve us.*

22. Dr. Priestley was a champion of such *mystical materialism*. Everything with him was *matter* that was not space. There was no third or different substance; consequently the soul of man is material.† But what is matter? or, rather, what is its definition? "Matter is a solid and extended substance, endowed with powers of attraction and repulsion." With this definition he enters into controversy with his friend, Dr. Price. "Can matter think?" is the grand question proposed by the latter. Matter, observes Priestley in his reply, may think, for matter is not inert; it is not impenetrable; it is not, logically speaking, solid. We can form no conception of the beginning of perfect solidity, and it is not an improbable conjecture that all the elementary matter employed in the formation of the solar system might be comprised in the capacity of a nut-shell. It is, indeed, most probable that there is no such thing as solidity in nature; and that matter, consistently with the theory of Boscovitch, is nothing more than a *compages of centres of various attractions and repulsions extending indefinitely in all possible directions* (!) Hence, then, it was replied, the only powers or properties of matter are attraction and repulsion. But powers must be the powers of *something*; yet if *matter* have nothing but these powers, and be nothing but these powers, then is it a *nonentity*, or rather becomes altogether *immaterial*. Towards the termination, therefore, of this literary contest, it seems to have been agreed that materialism and immaterialism were the same thing; and, on the part of Dr. Priestley, that, provided there were but one essence admitted in the formation of man, he was totally unconcerned about the term, and was equally ready to denominate it a *material* or an *immaterial* substance.

23. Happily there is a large (though perhaps diminishing) fund of common sense in the composition of the English character, and neither Priestley's transcendentalism nor the theories of mystical materialists vegetate freely in our

* See *An Examination of Philosophy as advanced by Prof. Tyndall in his Belfast Address*, by J. E. Howard, F.R.S., *Trans.* vol. x. p. 126.

† Dr. Good's *Lucretius*, vol. i. p. 90.

soil. Nevertheless, it is highly desirable that our common experience should be treasured up in common English words, and that we should abolish entirely the "idols" which shield themselves under the misuse of terms in so-called "philosophy."

24. Let our word *matter* be, then, agreed upon as the same as the Latin *materia*, from which it is derived. What does this express but the "*wood*"* which the carpenter employs for the erection of his building; or the created substance out of which the Creator forms and fashions the Cosmos.

25. We will not, then, confound the carpenter with the wood that he uses, nor the Creator with His handiwork. We will not for a moment admit that Matter and Mind are the same.

26. But it is to the more accurate philosophic genius of the Greeks that we must turn for a more perfect definition. So we find "Υλη to mean "wood," or, "like the Latin *materia*, the stuff or matter of which a thing is made," or "matter as a principle of being,—mostly as opposed to the intelligent principle νοῦς"; and when I turn to this word (*Nous*) in the lexicon, I find that it implies *purpose*, *will*, and *design*, and that "Anaxagoras gave this name to the *Principle* which acted on the elementary particles of matter." †

27. We have, then, in the word *Nous* brought before us a *Divine Being*, full of will, purpose, and personality, acting on the subject-matter of the universe. Well might St. Paul say, "Whom, therefore, ye agnostically (ἀγνοοῦντες) *worship*, Him *declare* I unto you,"—and reason with them on the folly of idolatry, since we are the offspring of God, and possess something of His likeness.

28. Part of this likeness consists in our possessing Personality and Will. We begin from our infancy to learn that we are ourselves "Centres of Force,"—of force not only independent of our surroundings, but in opposition to that of other individualities, whom we must either dominate, or fall under subjection to them. Hence the knowledge of personality, and of force as the expression of this personality, becomes a part of our educated nature. The idea of *all*

* See Latin Dictionary, *sub voce*. This meaning is kept up in some of the languages derived from the Latin, e.g., the Rio Madera S.A., from the number of trees brought down by the stream. Appendix A.

† Liddell and Scott's *Gr. Lex.*, *sub voce*.

force as resulting from personality is, if I mistake not, most correct, but what that Personality is, whose will alone is force, is not so easily comprehended.

29. If the man would preserve in its freshness the knowledge which he has acquired in his youth, he must continually be adding to the store. It is necessary that he should keep himself *au courant* with the age, in its continual additions to the accumulated experience of mankind. He must be ever at school and advancing, *whilst never forgetting the grounding at his entrance.*

30. When a boy is sent to school he finds that some force is needed to overcome the difficulties that bestrew the path of learning. If he has a will to learn, the force needed is found in himself; and perhaps he may find supplementary help in the force of example, that is, in mind acting upon mind; but if thoroughly idle, he must be forced to learn. But whilst he complains of the force employed to subject his will to the will of another, he is never so stupid as to *personify* force, and to call the cane that corrects him, or the hand that wields it, *force.*

31. But our so-called "thinkers" continually make this mistake, and *personify Force.* *Nature* also, and *Natural Selection* and *Law** are so many gods or goddesses, the *idola tribus* whom our wise men agnostically worship; losing sight of the *Causa causarum* in the search after the intermediate causes, as if *they* were the all-important realities.

32. It is needful, then, to be quite sure that we attach definite meanings to the terms we employ, and that we do not mistake *words* for *things*, nor yet transform nouns-substantive into substantial realities. In many metaphysical treatises there is not even so much of substance as to fill a nut-shell, but then unfortunately it is substance capable of almost infinite expansion.

33. If I were to write a work on "Harmonics"; seeking to illustrate analogous properties in sound and in light, whilst myself totally ignorant of the science of music, I should justly expose myself to the reproach of conceit. But I find continu-

* No word is more misused than "Law." "Law, in the Aristotelian system, implies a consciousness of obligation which exists whether realised or not in practice. Law, in the Baconian system, means a uniform sequence, which exists only as it is realised in practice" (Mansell's *Int. to Aldrich*). And elsewhere:—"The laws of Nature are simply general statements concerning the powers and properties which have come under our observation" (Soisset, *Modern Pantheism*, vol. i. p. 169; see also Argyll's *Reign of Law*).

ally that writers and speakers, who manifest that they have no acquaintance with the atomic theory,—as now a matter of proven science,—still *use its language* without danger of detection; because so few of their hearers are at all competent to discover their presumption, or to prick the inflated bladder of their speculation.

34. Locke, as quoted by Huxley, expressed himself as follows:—“And thus here, as in all other cases when we use words without having clear and distinct ideas, we *talk like children*, who, being questioned what such a thing is, readily give this satisfactory answer, that it is *something*, which in truth signifies no more when so used either by children or men but that they know not what, and that the thing they pretend to talk and know of is what they have no distinct idea of at all, and are so perfectly ignorant of it and in the dark. The idea, then, we have to which we give the general name *substance* being nothing but the supposed but unknown support of those qualities we find existing which we imagine cannot exist, *sine re substante*, without something to support them, we call that support *substantia*, which, according to the true import of the word is, in plain English, standing under or upholding.”

35. I generally admire the clearness of thought and the appropriateness of diction with which this learned Professor (Huxley) sets forth his views on all subjects that are within his ken, but I fail to follow him in “the metaphysics of sensation” from which I quote. He says that he cannot but believe that “the judgment of Locke is that which Philosophy will accept as her final decision.”* He concludes that “*whether either mind or matter has a substance or not* is a problem which we are incompetent to discuss, and it is just as likely that the common notions upon the subject should be correct as any others.”

36. I cannot think we *are* incompetent to discuss either, in the *light of common sense*, and taking care that our language deals with facts, and not with the mere fictions of the imagination.

37. I contend for *atoms* as being literally *realities*,—*things* not only knowable, but ponderable. So Lucretius,—

“Non ex illorum conventu conciliata
Sed magis *æternâ potentia simplicitate*
Unde neque avelli quidquam nec diminui jam
Concedit natura, reservans semina rebus.”—Lib. i., line 603, &c.

* *Critiques and Addresses*, by T. R. Huxley, LL.D., F.R.S., p. 349, &c.

38. The size of these atoms must be considered as almost inconceivably, but not immeasurably, minute. M. Gaudin, who was rather specially adapted to abstract calculations,* published in 1873 this approximation. I must premise (for though every scholar in Professor Huxley's *new* Sunday school will be familiar with the fact, I have myself to resort to books for the exact figures) that a mètre† is equal to 39·37079 inches, and we try to think in French and translate our ideas into English in order to grasp the following calculation. I have before me the mètre on one side, and the yard on the other, of a certain whalebone scale which is always on my table; but nevertheless I confess that I think in English, and cannot help an effort of thought to realise the relation which a millimètre bears to the English conception. It is 0·003280825 of a foot. I look at the scale, to which I again refer, to fix my idea; for I have next to divide the millimètre into a thousand parts, which has been perfectly done by mechanical means, and a scale formed in proportion. This being placed under the microscope, and covered with a drop of water containing infusoria, has enabled observers to compare the small infusory animalcules which dart about and sometimes rest on the surface of the scale. It has been ascertained that they are not larger than one of these divisions.

39. At this degree of enlargement no detail can be perceived. The infusoria resemble small globules, but the nature of their movements, jerking, angular, and frequently retrograde, shows that we have before us small creatures endowed with spontaneous movement, and consequently provided with means of locomotion such as muscles and cilia, or other appendages.

40. M. Gaudin imagines one of these little entities enlarged to the diameter of one mètre, and then gives us a fancy sketch of the creature, and also of a small portion of one of its cilia, enlarged to about 45 millimètres in length, in which he shows the imaginary building up of the structure by molecules of an organic nature represented as one millimètre in diameter. These molecules would be of the nature of albumen, and would bear about the same relation to the ultimate atoms as a basketful of grapes would to a single grape.‡ Chemical considerations too abstract to enter into in this paper make it probable that

* As Calculateur du Bureau des Longitudes and Lauréat de l'Académie des Sciences.

† "The ten-millionth part of the distance from the equator to the pole, as ascertained (?) by actual measurement of an arc of the meridian."

‡ Appendix B.

the number of atoms in a cube of metal the size of a pin's head would be expressed by the following (or by the cube of 20 millions), 8,000,000,000,000,000,000,000.*

41. I will not follow further the deductions of this author, whose calculations may seem to some persons fanciful; but his beautiful work *L'Architecture du Monde des Atomes* commends itself at once to those who have sufficient mental training to follow his deductions. His merit has been appreciated in the highest scientific quarters in France.

42. I may, then, safely draw my own inference, which is this: We have in the body of the small infusorial animalcule we have been considering a certain number of atoms, and these combined into molecules in conformity with certain well-known chemical affinities; but we have also the evidence of another wholly different power acting upon the whole of these molecules, and not resulting from any properties in the molecules themselves. We may call this power (for argument's sake) *life*, and see that in virtue of this we have *one* individuality, *one* will, *one* centre of action, and *one* centre of reproduction, whether fissile or otherwise. We have, doubtless, *growth*, *maturity*, and *decay*, characteristics of *organisation*, but *contrary* to all that is known of chemical combination.

43. Moreover, we must bear in mind that we have in our small animalcule a Protozoon rather than a Protophyte, and that its movements are connected with seeking its food amidst the inconceivably more minute Protophyta who, like all plants, have the power of feeding upon and decomposing the molecules of inert matter. We have then, in their movements, the exercise of a will wholly opposed to the chemical actions we have been contemplating. No atom has ever the choice whether to

* Dr. Thomson has shown that an atom of lead cannot exceed in weight the $\frac{1}{310,000,000,000}$ of a grain, and that the sulphur united with it in the form of sulphuret could be no more than $\frac{1}{2,015,000,000,000}$ of the same. It may also be proved that a square inch of gold is divisible into a million of parts visible through a common microscope: so that when the metal is reduced to the thinness of leaf of $\frac{1}{50,700,000}$ of a grain, it may be distinguished. Nor is this all, for a grain of gold of the thinness which it is on gilt silver wire will cover an area of 1,400 square miles; it follows that $\frac{1}{1,400,000,000}$ of a grain may be seen through a common glass. Yet it is probable that even such a minute quantity comprehends a considerable number of atoms.—DAUBENY, *Atomic Theory*, p. 272.

advance or to retrograde, to go to the right hand or to the left, nor what place it shall take in the compound molecule. Whence, then, comes the free will which characterises this organised matter?

44. Certainly *not* from molecular combination!

45. I do not propose to myself the task of enabling my readers to keep pace with the progress of the science; but having grown up with the atomic theory of Dalton, and from early youth followed with delight its further development, I find that I think *chemically*. I have constantly acted upon the certified details of chemical combinations with the same confidence that a traveller feels in consulting *Bradshaw*. He may complain of the bad type, or the arrangement of the contents, but the familiar book is his guide after all.

46. I thus find myself in altogether a different country, and speaking a different language from others differently circumstanced. It may seem very presumptuous to say that a writer who attempts to enlighten us in reference to "the *physical basis of life*," does not travel by the *Bradshaw* of science, and in fact proposes to lead us along the old high road. In proof of this I must refer to what I have already written, but the result of fuller study of his mind shows me that the difference between our views is much more fundamental (*substantial*) than I at first apprehended.*

47. When, according to the Professor's wish, we have "a scientific Sunday school in every parish," † I hope *the atomic theory* will hold a prominent place in the instruction. No well-educated Sunday scholar would then think of listening to disquisitions on the Origin of things, such as we find in Huxley's *Lay Sermons*, p. 128.

48. At the risk of exacting an unreasonable amount of attention, I will now recall some of the elementary lessons in this science, and seek to show that we not only imagine, but *know* "that matter has a substance"; and that Newton's views about the constitution of ultimate atoms are now as much the subject of proof as those about the falling of an apple.

49. It was from the results of an examination of two gases (olefiant gas and marsh gas) that Dalton was first led to the conception of his theory. He ascertained that both gases consist of carbon and hydrogen only; and set out the centesimal composition of each in the customary manner. But he observed

* Compare Dr. Huxley's *Lay Sermons*, p. 73, &c. Appendix C.

† *Ibid.*, p. 71.

further, that the ratio of hydrogen to carbon is exactly twice as great in the one case as in the other; that in olefiant gas, for instance, the carbon is to the hydrogen as six to one, whereas, in marsh gas it is as six to two. Or, in other words, a given quantity of carbon unites with either *one* or *two* proportions of hydrogen to form the above compounds. Dalton, whose turn of mind might be described as the expression of common sense in its mechanical aspect, explained the constitution of these two compounds by supposing that the first consisted of one *atom* of carbon united with one atom of hydrogen ● ○, while the second consisted of one *atom* of carbon united with two atoms of hydrogen ○ ● ○, the atom of carbon being considered to have six times the weight of the atom of hydrogen. He then calculated the composition of other bodies on the same plan; and found, for instance, that the quantity of hydrogen which unites with six parts of carbon to form olefiant gas unites with eight parts of oxygen to form water. Hence water was represented by the symbol ○ ○, the atom of oxygen being considered to have eight times the weight of the atom of hydrogen.* The crowning point of Dalton's theory was reached when he discovered that the numbers which expressed the respective combining proportions of carbon and oxygen with one part of hydrogen, also expressed the proportions in which they unite with each other. Thus the ratio of carbon to oxygen in carbonic oxide gas was found to be as six to eight; whereas in carbonic anhydride gas it was as six to twice eight. The former compound he considered to result from the union of one atom of carbon with one atom of oxygen ● ○, and the latter to result from the union of one atom of carbon with two atoms of oxygen ○ ● ○. Dalton extended the same views to the compounds of nitrogen.

50. Dalton thus established that general principle in chemistry known as the law of *combination in definite and multiple proportions*. He showed that a particular number might be selected for every element in such a manner that the proportions by weight in which any two or more elements combined together should be always in the ratios of their respective numbers, or of different multiples of those numbers. And he accounted for this law by supposing that the elements unite with one another, *atom to atom*, and that the proportionate number accorded to each particular demand expresses the relative weight of its atom. Hydrogen, being

* Watt's *Dictionary of Chemistry*: "Atomic Weights."
Longmans & Co.

the lightest substance in nature, was at once chosen by Dalton as the unit in his scale of atomic weights, and the weights in the atoms of other elements were established by ascertaining directly or indirectly the respective quantities of those elements which unite either with one part of hydrogen or with the quantity of some other element which unites with one part of hydrogen.

51. The founder of the doctrine which I have sought to explain might, if he had lived to this day, have boasted, with more probable truth than the Roman poet, that he had erected a monument which even the ravages of time could not destroy.* But his was the simplicity of the true philosopher, as was specially appreciated by the French *savants* when they welcomed him to their capital. I am struck, in reading over my notes of an early meeting of the British Association (in 1834), with the absence of self-assertion shown by Dalton. I do not find that he took any notice of the *half atoms* talked about by some inferior men.

52. As a disciple of Dalton, I claim (on his behalf) that his views of matter are consistent with common sense and with revealed religion. On the other hand, I have proved, beyond contradiction, that Professor Tyndall's views are consistent with neither.

53. On recurring to these notes, I find that a certain chemist of less note contended for *one-third atoms* against Dalton. This seemed to me at the time so absurd that I kept no record of the discussion, except that of "*ultimate atoms minimised*,"—the word atom being derived from two Greek words which imply that which *cannot be divided or cut asunder* (ἀ, not; τέμνω, I cut).† I do not say there are not even now some worthy successors to the individual alluded to above, who dislike the atomic theory because it interferes with their mystical notions; but to show that modern chemistry has been built up altogether in connexion with the theory of atoms,‡ I will refer to the appropriately-coined word, *Atomicity*.

54. This term is invented to express the combining capacity of an element. The atomicity of hydrogen, as exhibited in

* "Exegi monumentum ære perennius," &c.—Horace, Ode xxx.

† Ure's *Dict.*, *sub voce*.

‡ Foreshadowed by Lucretius :—

"Nam si primordia rerum
Commutari aliquâ possent ratione revicta
Incertum quoque jam constet, quid possit oriri
Quid nequeat."

the single compound which it forms with chlorine, is assumed as the standard of this *force* (I was about to say). I do not like the term "force," however, as it scarcely seems to describe accurately a power acting *ab intra* and not *ab extra*; but this former power is what very specially characterises the *properties* of matter, as seen from a chemical point of view.

55. We must, in fact, regard atoms as "substantial" *centres of force* (if this term be used), and as combining with mathematical certainty on the lines of their affinities, or separating, as the result of superior attraction on the one hand, or of force (*ab extra*) on the other.

56. I may be pardoned for explaining my meaning by reference to familiar use of words. When two young persons have a liking for each other, we do not call this *force*; and yet their caring for each other may have very important influence on their future destinies. Now we are compelled to speak of the affinities of atoms as very important indeed, and these "affinities" if "unsatisfied" may lead to the dismemberment of the molecule; or, shall we say, to the breaking up of the household. In some cases two individual atoms are quite taken up with each other, as chlorine and hydrogen; and are consequently termed monatomic, monadic, or univalent. But oxygen unites with two atoms of hydrogen, and is diatomic, dyadic, or bivalent. Nitrogen combines with three atoms of hydrogen, carbon combines with four atoms of hydrogen, and so forth.

57. It is fortunate that we are able to calculate with perfect certainty on the basis of the permanent likings or dislikings of these small bodies. Though violence may sever, they always retain the same measure of affection.* It is equally fortunate that when a molecule is established by means of these affinities, there is no *law* to render the alliance stable. Chemical change mostly depends on our being able to entice away an atom from its molecule, or to present to a molecule that has taken possession of more atoms than it can well keep a more tempting object which replaces another in the magic ring. This is called, in chemical language, *substitution*.

58. Thus chlorine and bromine may in many instances be introduced into hydrogen compounds by direct substitution;

* Of course, I use the language of *metaphor*. I have not the least approach to a conception of the *how* or the *why* of these affinities. The suggested "harmony of molecular movements" are to me like the Mediaeval explanations of the movements of the heavenly bodies,—“Cycle on cycle, orb in orb,” nor is “the impact of atoms of luminiferous ether on opposite sides” more explanatory.

one atom of hydrogen being removed and entering into combination with one atom of chlorine or bromine, while another atom of the haloid element takes the place of the hydrogen removed. Thus, when chlorine acts upon marsh gas (methylic hydride) the products are hydrochloric acid and methylic chloride.*



and by the continued action of the chlorine the latter may be converted successively into CH^2Cl^2 and CHCl^3 , the last being the compound usually called *chloroform*. Behold the transformation!

59. Now, I trust I may be pardoned, in consideration of the importance of the result, for dwelling on these technicalities. Every one knows the soothing properties of *chloroform*, which exists nowhere in nature, but is the product of the chemist's art. Its twin sister, *iodoform*, was recently the means of saving a young life threatened by the result of a dreadful accident, and now full of hope and promise.

60. The views which were attempted to be established, founded on the electrical relations of the elements, are diametrically opposed to what we now know of substitution.† Thus, atoms like chlorine, bromine, and iodine, are capable of replacing hydrogen atom for atom, and discharging functions similar to those of hydrogen in the primary compound.

61. It must be remembered that we are speaking of bodies of almost inconceivable but *not infinite* minuteness; not absolutely in contact, nor, on the other hand, capable of exercising these affinities at any distance that we can define. The action is what we call instantaneous, and frequently most marked and pleasing. I have often been delighted with beholding the production of colour from colourless liquids, and of crystallisation on the mixture of two uncrystallizable fluids.

62. *Such, then, is matter*, or, as we may say, *ponderable matter*,—subjected to destiny, acting according to implanted impulses, and that with unerring certainty,—so that when we understand the nature of these impulses we can avail ourselves of our knowledge to alter to an unknown extent the resulting combinations; producing continually things which have never existed from the beginning of time.

* *Watts's Dict. Sub.*, vol. v. pp. 450, 452.

† See further my *Exam. of Tyndall's Belfast Address*, *Trans.* vol. x. p. 121.

63. But all this knowledge of matter is, as I have shown, the result of our knowledge of another property of matter, which we call *gravitation of mass*; that which causes the apple to fall from the tree, that which has enabled mankind to construct the balance and the weights.

64. But in all this we find not the slightest approach to what we call "mind," nor to the exercise of any power of organisation or of combination to serve one common purpose.*

65. What, then, are we to say to *force*? This, at all events as an abstract conception, can neither be weighed nor measured; and the *proper* idea of force is surely destructive and not constructive. The common experience of mankind has ever looked upon the flash of lightning as the embodiment of force, and thus the thunderbolts were of old put into the hands of *Jupiter Tonans*. It is somewhat arrogantly said that the great achievement of the age is to have taken these weapons out of the hand of the Thunderer, and adapted them to our every-day purposes.

66. Moreover, we are to teach all the young scholars in the proposed new Sunday schools that we know all about the lightning now, and that it is simply a display of *electricity*. But if any junior of inquiring mind asks, What, then, *is* electricity? he will probably be told that it is "a name given to a series of phenomena," and that "it derives its name from the Greek word *electron*, amber, which, when well rubbed, has the power of attracting bodies." He might be further told about "an extremely subtle fluid"; but if the *enfant terrible* pursued his inquiries to the point whether this fluid was *matter* or *no matter*, he would surely be told that such subjects were beyond the grasp, at all events, of a Sunday scholar!

67. But if I put this inquiry to Modern Science, I shall doubtless receive a satisfactory answer, since whatever is capable of being measured, whether by *Ells* or by *Ohms*,† must certainly be ranked amongst phenomena of matter, though it be not ponderable.

68. I put to myself the question Matter or *no Matter*? whilst gazing on the crimson glories of the recently observed Aurora. I looked on it *all* as a display of terrestrial magnetism. I turn to my books for an answer to the question, What *is* magnetism? and I find that it is specially an

* *Exam. of Belfast Address, Trans.* vol. x. p. 126.—See *ante*.

† The unit of resistance of electricity is thus called after Ohm, a German electrician.—See Prescott, *The Speaking Telephone* p. 103.

attractive *power* residing in the magnet. But then what is that extraordinary white beam which I saw traversing the heavens at the same time? Was that material?*

69. So that I must tell the boys that, in the lightning we behold embodied *force*, in the Aurora embodied *power*; but if I ask after embodied *mind* in man, I shall, like the troublesome boy, be driven on to the question of embodied *not mind* in the birds which, before my eyes, are feasting on provision hung up for them during the frost. I watch their ways with much amusement, and, if I were a Greek, should say they display much *nous* (*vous*), though I grant no *mind* (*mens*).

70. My object in this paper is to show that, contrary to Professor Huxley's theory, the constitution of *matter* is a *legitimate subject of inquiry*; and that, pursuing the research on the lines of common sense, we arrive at some certain knowledge of its properties, and attain to a strong presumption of accuracy as to our conception of its constitution. The resulting knowledge that we obtain shows us matter as subordinated in all things to the disposal of an Infinite Mind,—in its orderly arrangement affording scope for devout admiration; but as regards any possibility of deducing the properties of mind from those of matter, everything shows that the attempt must fail. Instead of Will and Choice we encounter Destiny; instead of power of combination and organisation, we meet with an all but infinite individuality,—every atom acts on its neighbours according to fixed properties and laws.

71. Ponderable matter, then, stands in the same relation to us that it does to its Creator,—the subject *materia* which we (as formed in the image of God) may, in proportion to our knowledge of its properties, mould at our will.

72. I assert nothing, because we know nothing distinctly, about *imponderable matter*. In this direction there lies a whole world open to our inquiry, concerning which our present acquaintance is like that of children, deriving their knowledge of the ocean by wading fearfully amongst its tiny waves.† On

* I suppose so, though the discussion in the pages of *Nature* has not led to a very definite result; but I find a definition in Ganot's *Eléments des Physiques*, translated by Dr. Atkinson, 1879, which would, at all events, apply. It is this:—"That which possesses the properties whose existence is revealed to us by our senses, we call matter or substance"; but what, then, is it that proceeds from the end of the fingers, as represented at p. 825 of this work, and attracts the electric (magnetic) stream within a Geissler's tube? The repulsion by the flat hand, as I have seen it, is, if possible, even more curious.

† In *Nature*, pp. 304-6 and 328-30, of the present year (1883), is a report

these I shall not enter. But in the meantime I challenge the popular philosophers above mentioned to the disproof of that which I have sought to establish.

APPENDIX.

DR. HUXLEY'S "IDOLA."

I FULLY appreciate Dr. Huxley's talent, but cannot submit to his guidance, when I know that he is wrong. His greatest admirers must concede that he is human, and that he shares the common lot, *humanum est errare*.

Take as an illustration his paper on "Yeast," in the *Contemporary Review*, 1871, reprinted in his *Critiques and Addresses*, 1873.

of a lecture at the London Institution on "The Ether," summing up very well what we do *not* know, but infer, about this difficult subject of investigation. "Ether is often called a fluid or a liquid, and again it has been called a solid, and has been likened to a jelly because of its rigidity; but *none of these names are very much good*. All these are molecular groupings, and, therefore, not like ether. Let us think simply and solely of a continuous frictionless medium possessing inertia, and the vagueness of the notion will be nothing more than is proper in the present state of our knowledge." But it is characteristic of the present age of dreamy speculation that to this "vague notion" of an unknown "something" is to be sacrificed all the knowledge of substantial reality that mankind has accumulated. "One continuous substance filling all space, which can vibrate as light, which can be sheared into positive and negative electricity, which in whirls constitutes matter; and which transmits by continuity, and not by impact, every action and reaction of which matter is capable." This is the Thomsonian or mystical theory of matter; which is thus resolved into an everlasting dance of the vortices of Something of which "we have no distinct idea at all" (see No. 34 above). Is not this absurdity worthy to be placed side by side with that other piece of folly which made life to descend upon this planet on the back of a meteorite, like the image which fell down from Jupiter?

He gives us in this a well-written account of fermentation, and of the *modus operandi* of the yeast plant, to which I have nothing to object, till he gets to the description of the yeast plant as a mere sac or cell, and follows Schwann in his assertion that "fermentation is the most fully and exactly known operation of cells, and represents, in the simplest fashion, the process which is repeated by every cell of the living body."

Those who like the analogy may take it for what it is worth, —not much, I think,—but mark what follows!

"A wonderfully suggestive thought, opening up views of the nature of the chemical processes of the living body, which have hardly yet received all the development of which they are capable.*

"Kant defined the special peculiarity of the living body to be that 'the parts exist for the sake of the whole, and the whole for the sake of the parts.' But when Turpin and Schwann resolved the living body into an aggregation of quasi-independent cells, each, like a *torula*,† leading its own life, and having its own laws of growth and development, the aggregation being dominated and kept working towards a definite end only by a certain harmony amongst these units, or by the superaddition of a controlling apparatus, such as a nervous system, *this conception ceased to be tenable.*"

I have published my adhesion to the above view of Kant in a work which I have placed in the library of the Institute.‡ I have minutely described the trees I had under examination as to (1) the heart wood, (2) the leaves, (3) the course of the ascending sap, (4) the alkaloids formed in the bark, (5) the influence of respiration, and, in conclusion, "*the plant as an organised whole,*" and I remarked that this last definition is the conclusion to which I have been brought,—indeed, I might almost say *compelled* to come, so that I place no faith in any of the theories of vegetation which *isolate the different parts of the plant*, but I agree with Kant in what seems to me a clear definition that "the cause of the particular mode of existence of a living body resides *in the whole,*" and with Müller, from whose *Physiology* I quote, "that there is in living or organic matter a principle *constantly in action*, the operations of which are in accordance with a *rational plan*, so that the individual parts which it creates in the body are *adapted to the design of the whole*, and THIS IT IS WHICH DISTINGUISHES ORGANISM."

* *Critiques and Addresses*, p. 86.

† Yeast plant.

‡ *Quinology of the E. I. Plantations*, p. 19.

Now, Kant was a profound thinker, and Müller no mean physiologist; but all the truth they enunciated is to be set aside for the sake of an ill-conceived and weakly-supported cell *theory*, which is even now in its decadence.* It is virtually given up even by Huxley himself in this *his* explanation, for his millions of "quasi-independent cells" would not form themselves even into the body of a flea unless "dominated"—by what? "A certain harmony"! But does not this explanation range very closely on NONSENSE? Is it not, at the best, according to the old adage, *obscurum per obscurius*? But I proceed, "or by the superaddition of a controlling apparatus such as a nervous system." But, in the first place, *who* superadds? This is work for Divine prescience to foresee and for an Almighty hand to execute; all which supposition is impossible to Agnosticism. Perhaps he means "to *develope*," but this will not do; for it would imply that these *quasi* entities united themselves by some kind of inconceivable *Caucus* to devise means of "dominating" themselves, and then to execute (O most admirable cells!) the creation of a *nervous system!* and that as a *controlling apparatus!*

I do not, for a moment, think that Dr. Huxley would have written this for the Royal Society; but he no doubt appreciates correctly the mental calibre of his numerous readers among the public at large.

It is with a salutary dread of the application of the proverb *ne sutor ultra crepidam*, that I continue my criticism on the remaining medical statement,—"*The cell lives for its own sake, as well as for the sake of the whole organism; and the cells which float in the blood, live at its expense, and profoundly modify it, are almost as much independent organisms as the torulæ which float in beer wort.*"

Now, it so happens that an eminent physician and F.R.S. showed me, under the microscope, these said corpuscles in unusual abundance in the blood of a relative suffering probably from suppressed ague. This state of things clearly enough pre-indicated the fatal termination.

Further, I turn to a work sent me by the author,† who has made special researches on the subject, in which he shows, as

* Huxley is obliged to say that "Schwann burdened his enunciation of the cell theory with two false suppositions," &c.—See p. 86.

† *Experimente Untersuchungen über das Wesen der Chininwirkung.* Von D. C. Binz, Berlin.

drawn under the microscope, these bodies *killed,* to the great advantage of the whole organisation*, by the application of quinine.

Is it not something like throwing dust in the eyes of the reader to lead him to infer that this is *how cells live* for the sake of the whole organisation ?

Place before me a Stilton cheese, and tell me that these quasi-independent organisms are created *for the sake of the cheese*, and are really *part* of the cheese, since the cheese would not be worthy of its name without them, and I will listen, for there would be *vraisemblance* at least in your assertion ; if not *true*, it were at least *amusing* ; but do not *fatigue* me with the real NO-MEANING which, as Pope tells us, “ puzzles more than wit.”

From BACON'S WORKS, vol. vii., 272, ed. 1803.

“ Nam mens humana (corpore obducta et obfuscata) tantum abest ut speculo plano æquali et claro similis sit (quod rerum radios sincere excipiat et reflectat) ut potius sit instar speculi alicujus incantati, pleni superstitionibus et spectris. Imponuntur autem intellectui idola, aut per naturam ipsam generis humani generalem, aut per naturam cujusque individualem, aut per verba, sive naturam communicativam. Primum genus, *idola tribus* ; secundum, *idola specus* ; tertium, *idola fori*, vocare consuevimus. Est et quartum genus, quod idola theatri appellamus, atque superinductum est a *pravis theoriis*, sive *philosophiis*,” &c., &c.

The italics are mine.—J. E. H.

A discussion of a general character took place upon the paper, in which the Chairman (Mr. H. Cadman Jones), Mr. R. C. Shettle, M.D., the Rev. W. B. Galloway, and Mr. W. Griffith took part.

* *Die farblosen Blutkörperchen liegen abgestorben dicht an der Aussenwand der Vene.*

INTERMEDIATE MEETING, MARCH 19, 1883.

DAVID HOWARD, ESQ., VICE-PRESIDENT CHEMICAL INSTITUTE,
IN THE CHAIR.

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

ASSOCIATES:—The Rev. Chancellor L. C. Garland, M.D., Vanderbilt University, United States; the Rev. President M. Callaway, D.D., Princeton Institute, United States; Rev. S. Bailey, Sheffield.

A lecture on "Evolution under Control" was then delivered by Mr. C. SMITH, F.G.S. A discussion ensued, in which the following took part:—Rev. W. Guest, F.G.S.; Rev. W. B. Galloway, M.A.; Mr. S. R. Pattison, F.G.S.; Mr. J. Hassell; Mr. T. K. Callard, F.G.S.; Dr. Longhurst; Mr. H. C. Dent; Captain F. Petrie, F.G.S.; after which, the author having replied,—

The Meeting was adjourned.

INTERMEDIATE MEETING, MAY 21, 1883.

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

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

MEMBER :—Rev. W. C. Sparrow, LL.D., Ludlow.

ASSOCIATES :—President E. R. Hendrix, A.M., D.D., Central College, Fayette, United States ; Professor A. C. Thomas, M.A., Haverford College, United States ; Rev. J. H. Wythe, A.M., M.D., D.D., California ; Lady Freeling, London ; Miss Langham, Hastings.

Also the presentation of the following work for the Library :—

“Transactions of the Geological Society.”

From the same.

A special popularly-written Paper “On the Existence of God,” was then read by the Rev. J. Lias. Some communications thereon were received, and a discussion, in which several took part, ensued.

A second paper on “Degeneration and Evolution,” was read by Mr. Hastings C. Dent, after which the Meeting was adjourned.

ORDINARY MEETING, MONDAY, JANUARY 15, 1883.

(Specially held at the Society of Arts House.)

SIR JOSEPH FAYRER, K.C.S.I., F.R.S., V.P., IN THE CHAIR.

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

ASSOCIATES :—E. Irby, Esq., New South Wales ; Prof. A. F. A. King, M.D., Columbus University, United States ; General R. Thayer, A.M., United States ; E. James, Esq., London ; Rev. W. Lock, M.A., Oxford.

Also the presentation of the following works to the library :—

“Journal of the American Geographical Society.” *From the same.*
 ” ” ” Philosophical Society.” ”

The following paper was then read by the author :—

ON THE ABSENCE OF REAL OPPOSITION BETWEEN
 SCIENCE AND REVELATION. By PROFESSOR G. G.
 STOKES, M.A., F.R.S.*

TO those who believe that the order of nature is in accordance with the will of a Supreme Being, it must be axiomatic that there can be no real opposition between what we learn from the study of nature and what we may be taught by a direct revelation from that Being. We cannot suppose otherwise without impugning the truthfulness of God. Any apparent opposition must, therefore, arise from some deficiency in the student of science, or in the student of revelation, or in both.

The subject-matters of revelation and of science are so

* At the meeting of the Institute the following prefatory remarks were made by Professor G. G. Stokes, F.R.S.: “Before reading my paper I may state that I spoke of it specially to a friend of mine who is a Fellow of the Royal Society, and who is very eminent in a department of science of which I know, I may say, nothing. He is an eminent biologist, and, although he agrees with me in the final conclusions I have come to with regard to weighty matters, yet the mode in which he arrives at his conclusions is very different from that in which my own conclusions have presented themselves to me. I had hoped that he might have been present to have given you the benefit of his views, and I am sure that had he been here he would have done so in an exceedingly interesting manner. I regret to say, however, that I heard only to-night that illness prevents his being present.”

different that the cases in which there could be any room for an apparent conflict of conclusions are comparatively rare, touching only the outer borders. They may arise from mistakes on either side respecting the evidence on which the supposed conclusions are based. The man of science may over-estimate the evidence on which his supposed conclusion is founded, and may regard some ingenious working hypothesis with the confidence due only to a well-established theory. The student of revelation may forget how much the working of his own mind is involved in the deduction of conclusions from the materials before him, and may accordingly transfer to that which is human, and, as such, liable to error, the reverence which he feels to be due to all that comes from the Author of that revelation.

Let me refer to an example or two. The opposition to the Copernican System on the ground of its supposed contradiction of a passage in the Book of Psalms, belongs to times long gone by. But it is well within the memory of the present generation how geologists were looked on as semi-infidels, because, resting on the clear evidence which their science afforded of the antiquity of the earth, and of the succession of animal life upon it, they ventured to call in question the correctness of an opinion that the earth was created and furnished, or at least brought into its present condition from a previous state of chaos, in six literal days of twenty-four hours, and that to disbelieve this was tantamount to rejecting revelation altogether. The progress of knowledge has pretty well dispelled this notion as well as the other, and I doubt if any theologians at the present day think that the cause of religion has suffered in consequence.

Let me turn now to the other side. A subject which is exciting a great deal of interest at the present day is what is called evolution. Some think that we must make our choice between evolution and revelation; others think that there is no inconsistency between the two.

Suppose that we are in a lead mine, and contemplate the crystals of galena, fluor spar, &c., with which the cavities in the mine are lined. The question may occur to our minds, How came they there? Were they created as they stand, or did they grow by natural laws out of a previous condition in which they were not there? A person who knew absolutely nothing of natural science might, perhaps, say that they were created. But one who was better informed would know that crystallisation is a process going on constantly in the chemical laboratory, and in some cases observed to be taking place in nature, even at the present day, without any intervention on

the part of man; that several of the natural crystallised minerals have now been formed artificially; and that there is good reason for thinking that the earth was, in former ages, in a very different condition,—a condition in which the presence of water combined with a high temperature was eminently favourable to crystallisations which can hardly now take place. A person such as I have now supposed would naturally attribute the presence of the crystals in the cavities of the mine to the ordinary processes of crystallisation; he would look on the present state of things as something *evolved*, under the operation of the ordinary physical laws, out of a prior state that was different.

Let us turn now to another example, in part imaginary. Suppose that we knew nothing of the earth and planets, except their motions in accordance with the law of gravitation, and nothing of the nebulæ, and did not know that the solar radiation involves an expenditure of energy which has in some way to be accounted for. The motions of the bodies of the solar system can be calculated years beforehand, as is done in the Nautical Almanac Office, and in the same way their places years ago can be inferred from their present known orbits. In the supposed state of our knowledge, there would be nothing to indicate that they might not continue their motions for ever in the same way, or that the present state grew out of a previous state which was different. If the question were asked, How came they to be as they are? one man might answer, They were always so; another, They were created as they stand. Of course it would remain possible that the present state *might* have grown out of a previous different state merely in accordance with existing physical laws, but there would be nothing (under the supposed limitation of our knowledge) to justify us in assuming that it *did*. And if a further accession to our knowledge precluded, as it does preclude, the supposition that the planets have been always just as they are, the other two alternatives remain, that they were created as they stand, or that they grew into their present condition by the operation of physical laws out of a previous different state. If there were no indications of growth out of a different state we should not be justified in assuming that it was thus that they came into their present condition, though of course neither could we assume the contrary. On the supposition that they grew, the question, What was that previous state? and, How grew they out of it? is one belonging to the province of science, whether science can or cannot find a satisfactory answer; on the other supposition, the question is one with which science has nothing to do, as it

lies wholly outside its domain. The point I want to insist on is, that *unless* we see indications of growth from a previous different state, we have no right to assume that the question belongs to the domain of science at all, or to reject the alternative supposition.

These examples taken from the physical division of natural science were intended to lead on to the consideration of certain questions arising in the other, the biological, branch which have of late years excited a great deal of attention, and with which, from a theological point of view, we are more nearly concerned.

Naturalists recognise an enormous number of so-called species of plants and animals. It is true that the distinction between a species and a mere variety is often doubtful; for though species admits of a theoretical definition, the working out of that definition experimentally involves so much time and patience that practically we are left to reason by analogy of what we do happen to know in similar cases. Where some general resemblance is combined with differences greater than such as our experience warrants us in attributing to mere breed, we are obliged to regard the individuals as belonging to different species; but inasmuch as this is a conclusion depending on lack of evidence to the contrary, and the evidence we have is far short of that which it is conceivably possible to obtain, it is clear that the tendency must be towards the multiplication of species. But, with every allowance for such multiplication, it is evident that the number of species will be enormously great. And, large as is this number already, it is very greatly increased when we include the plants and animals of past ages which, or more probably only a portion of which, are preserved to us in a fossilised state.

The question then naturally arises, How came this great number of species to be as they are? Are we obliged to suppose that each member of this vast array originated in an isolated and independent creative act; or may we regard the observed condition as naturally evolved under the operation of laws either known, or conceivably open to scientific investigation, from some preceding condition of a simpler character?

There is nothing at all atheistic in proposing the latter question, or in answering it in the affirmative in case we should find reasonable scientific evidence in favour of an affirmative answer. It is a different thing altogether to assume *à priori*, independently of any evidence, that such *must* have been the case. For, if this were allowable, had we a right to assume that the present condition A *must* have grown naturally out of a different preceding condition B, then by parity of reasoning we should

have a right to assume that the condition B grew naturally out of a different preceding condition C, and so on indefinitely. This comes to removing God to an infinite distance, and that again comes practically to much the same thing as denying His existence altogether. At least it comes to this, *unless* we regard those laws, such as the law of gravitation and so forth, as by themselves alone evidence of a presiding mind, of whose will they are the expression; but this is a point of view hardly, I think, attainable by the uneducated, and, even as regards the educated, calculated to strike different persons differently, according to their various mental complexions.

To him who believes in a God, it is conceivable that the end He designs to accomplish might be brought about by an immediate *fiat* of His will, in a manner wholly beyond our conception, or that contrivances might be employed adapting means to an end, and ordered in accordance with laws open to our investigation. It needs but little acquaintance with the phenomena of nature to perceive that beneficent ends are constantly brought about through the operation of simple laws open to our investigation. To take a single example, regard the structure of the eye. The wonderful sense of sight in its integrity involves mysteries which we cannot fathom; but this much is clear, that it depends in some way on the formation of distinct images on the retina. Now, how is this effected? Why, there is an elaborate organ provided which refracts the rays of light so as to form images according to the very same principles as operate in the formation of images in the focus of a telescope constructed by the practical optician. Seeing, then, that useful ends are brought about by means, we should expect *à priori* that as the wisdom of the designing Mind must be immeasurably above our own, so contrivance should, as a rule, extend far beyond what we can trace. We should expect, therefore, *on purely theistic grounds*, that the doctrine of evolution, assumed for trial, would be a useful and ordinarily trustworthy guide in our scientific researches; that it might often enable us to go back one step, and explain how such or such a result was brought about by natural laws from such or such an anterior condition, and so might lead us to extend our knowledge of the operation of natural causes. But this is a very different thing from assuming it as an axiom, the application of which may be extended step by step indefinitely backwards.

The only theory, so far as I am aware, in which an attempt is made to refer the phenomenon to known natural causes is that famous one with which the name of the eminent naturalist who has but recently departed from among us is inseparably

connected. The theory of ancestral derivation and the survival of the fittest is one which from its nature can hardly, if at all, be made a subject of experimental investigation, or even of observation in the records of the past. So far as it may be accepted, it must rest mainly on the estimate which may be formed of its own inherent probability; though, doubtless, an underlying feeling that the phenomenon must in some way be explicable by natural causes has contributed not a little towards its propagation.

The theory, I need hardly say, is highly ingenious; but any variation which we can actually observe goes but an infinitesimal way towards the bridging over of the interval which separates extreme forms, such, for example, as an elephant and a mollusc. Indeed, Darwin himself, as I am informed, was of opinion at first, that we required at least four or five distinct centres to start with. The theory has been accepted by many eminent biologists with a readiness that is puzzling to an outsider, especially one accustomed to the severe demands for evidence that are required in the physical sciences. I think a large number of scientific men would admit that it is very far indeed from being admissible to the rank of a well-established theory, however ingenious as a hypothesis; true possibly as accounting for permanent or sub-permanent differences between allied forms, but not conceivably bridging over the great gulf which separates remote forms of life.

As to the origin of life itself, it was not intended on this theory to account for it, and the experimental researches of our foremost scientific men are adverse to the supposition of its production by spontaneous generation. Granting the origin of life by a creative act, we are not very closely concerned, theologically speaking, with the mode of creation. The Scriptural account of the creation seems, indeed, to imply successive creative acts; and the supposition that there were such relieves us of certain scientific difficulties, by placing those difficulties outside the domain of science, and falls in with what we are taught to expect in the future. But there is one point in which I think theology is more deeply involved, and respecting which it becomes a serious question whether there is any real scientific evidence in opposition to what seems at least to be the teaching of revelation; I allude to the creation of man. In the account of the creation it is distinctly stated that man was separately created, "in the image of God," whatever that may imply. Nor is this a point in which by a wide licence of interpretation we might say the language was merely figurative; that we can afford to understand it so, for that Scripture was not given to teach us science. Our whole

ideas respecting the nature of sin and the character of God, are, as it seems to me, profoundly affected according as we take the statement of Scripture straightforwardly, which implies that man was created with special powers and privileges, and in a state of innocence, from which he fell, or, as we suppose, that man came to be what he is by degrees, by a vast number of infinitesimal variations from some lower order of animal, accompanied by a correspondingly-continuous variation in his mental and moral condition. On this latter supposition, God is made to be responsible for his present moral condition, which is but the natural outgrowth of the mode of his creation. As regards the lower animals, little change would apparently be made, from a theological point of view, if we were to interpret as figurative the language which seems to assert a succession of creative acts. But the creation of man and his condition at creation are not confined to the account given in Genesis; they are dwelt on at length, in connexion with the scheme of redemption, by St. Paul, and are more briefly referred to by our Lord himself, in connexion with the institution of marriage.

Now against these statements so express, so closely bound up with man's highest aspirations, what evidence have we to adduce on the side of science? Why, nothing more than a hypothesis of continuous transmutation, incapable of experimental investigation, and making such demands upon our imagination as to stagger at least the uninitiated.

If an undue literalism of interpretation on the theological side created apparent opposition between science and faith, in respect to the Copernican System, and to the antiquity of the earth and of life upon it, I cannot help thinking that here apparent opposition arises from the erection, on the other side, of a scientific hypothesis into the rank of an established theory.

Some have endeavoured to combine the statements of Scripture with a modified hypothesis of continuous transmutation, by supposing that at a certain epoch in the world's history mental and moral powers were conferred by divine interposition on some animal that had been gradually modified in its bodily structure by natural causes till it took the form of man. As special interposition and special creation are here recognised, I do not see that religion has anything to lose by the adoption of this hypothesis; but neither do I see that science has anything to gain. Once admit special divine interposition, and science has come to the end of her tether. Those who find the idea helpful can adopt it; but for my own part this combination of the natural and the supernatural

seems somewhat grotesque,* and I prefer resting in the statement of a special creation, without prying into its method.

In writing thus, I am well aware that I have been dealing with subjects which do not belong to me, and I have no claim whatsoever to weigh the balance of evidence as it ought to appear to the minds of others. The knowledge of all of us is but limited, even in those subjects which we know best, and two men equally honest, and equally truth-seeking, may legitimately entertain different views as to what appears the most probable conclusion in matters in which certainty, or what practically amounts to certainty, cannot be reached.

To take a purely fictitious illustration, suppose that some physiologist who had no great knowledge of physics framed some theory of the upward growth of trees in spite of gravity, a theory involving the hypothesis of certain physical actions. Some physicist might see that the assumed physical actions were, if not contrary to physical principles, at least very difficult to reconcile with them. He, in his turn, might frame a theory which seemed all very beautiful from a physical point of view, but which involved physiological assumptions which the physiologist would regard as highly improbable. Each man, seeing only a portion of the whole truth, would naturally think his own theory highly probable, or perhaps nearly established. But, of course, both could not be true, and it might be that neither was true: yet the conclusion of each might be justified according to his own knowledge.

But then comes the question, If each of these men knew of the opinion of the other, how ought his views as to what was most likely true to be modified? Each of us knows such a small fraction of the sum total of human knowledge that we are all, in great measure, dependent, and rightly dependent, on authority, on the knowledge of our fellow-creatures as to subjects with which we are but imperfectly acquainted. Authority then takes the place of direct knowledge, and instead of weighing the evidence derived from phenomena which we ourselves have investigated, or which we are able to follow in the investigations of others, we must estimate, as best may be, the weight to be assigned to authority. What that weight should be depends very materially upon the

* Of course, it is not to the combination in itself that this is meant to apply, but to the combination in our attempted reasoning; in other words, to the endeavour to infer from merely natural laws what was the condition anterior to the stage at which a supernatural power is supposed to have intervened.

nature of the asserted conclusion. It may be merely the result of some measurement—astronomical, suppose—carried out by certain and definite methods, though subject, of course, to the inevitable errors of observation. Though unacquainted, it may be, with the particular process employed, we know enough of the general nature of such processes to give us confidence in the asserted conclusion, especially if several men qualified to judge concur in it. It may be, however, that what we are asked to accept on authority is some speculative theory, the arguments in favour of which depend on observed facts in great detail with which we are not acquainted. Still, even in such a case, we may usually form some sort of notion of the general character of the evidence, and of the degree to which speculation, which enters more or less into every theory, is checked by actual fact.

There are one or two other considerations which must not be wholly left out of sight in estimating the value of authority. There is apt to be a tendency to attach undue importance to what one has oneself made out. Perhaps the most straightforward seeker after truth is not wholly exempt from some slight bias in this direction; but different individuals will vary immensely in the degree in which they are led by it. It may often happen that, though we are unable to follow a person whose conclusions we wish to weigh in the particular subject to which those investigations relate, we are able to follow him in some other investigations. We can thereby form some sort of rough gauge of the strictness of the man's impartiality with respect to his own investigations.

Again, an original investigator is gradually led to adopt some theory, after years, it may be, of patient labour, as representing the most probable conclusion from his long-continued study. In estimating the probability, he has the whole of the evidence before him, adverse as well as favourable; and though, it may be, the latter, in his judgment, immensely preponderates, he does not leave out of sight the former. But one who has merely learned from him is not able to take, at least for a long time, an equally comprehensive view; he is predisposed by the great name of his master to adopt his conclusion, and is apt to express himself in a tone of confidence which his master would hardly have employed. The public are thus led to suppose that the conclusion is a thing about which there cannot be any manner of doubt.

In case scientific evidence should seem to point towards a conclusion different from that which we should naturally have been disposed to draw from what we accept as revelation, we

are not at once to reject either in favour of the other, but calmly to weigh the whole of the evidence. It is one thing to accept a revelation, another, and a very different thing, to determine how much is involved in it. With respect to the latter, human fallibility steps in, and we are not, therefore, to set it down as irreligious to follow out the conclusions of science, even when they seem to militate against what *prima facie* we should have supposed to have been revealed. On the other hand, if some conclusion to which science seems to point throws a serious difficulty in the way of what we have been in the habit of considering was revealed to us, specially if it be a difficulty of a moral nature, we have a perfect right to demand severer evidence before we can accept it than what might have sufficed to lead us to regard it as in all probability true had there been no such appearance of opposition. We have moral faculties as well as intellectual, and we have no right in judging of the probability of a conclusion to make an arbitrary selection of one part of our complex nature, and ignore the rest. We may indulge as freely as we please in our scientific speculations; and in most cases there is nothing but scientific evidence to bear on the probability, or otherwise, of the conclusions to which we are led as being the most probable. But in those rare cases in which there is we have no right to shut out of court all but the scientific witnesses, and give our verdict on their evidence alone.

The CHAIRMAN (Sir Joseph Fayrer, K.C.S.I., F.R.S.).—I am sure I shall only be expressing the unanimous feeling of this meeting by tendering our thanks to Professor Stokes for the very instructive and edifying paper he has just read. The paper deals, as you will have perceived, with many interesting questions—questions which have greatly occupied men's thoughts of late, and are occupying them at the present moment. In fact, the paper is one that would afford subjects for discussion and inquiry to an almost indefinite extent. I shall not anticipate any of the questions which some, I hope, will put, but will at once invite you to begin the discussion. Will Sir J. Risdon Bennett give us his views?

Sir J. RISDON BENNETT, V.P.R.S.—It is with extreme diffidence that I venture to respond to our Chairman's request that I should offer a few remarks on the subject of Professor Stokes's paper, because I regard it as one which requires, on our part, a great deal of consideration before we can publicly express our conclusions upon it. It is certainly a paper requiring a great deal more consideration than I can venture to give at the present moment. Therefore, I shall not offer anything approaching to criticism on the way in which the subject has been dealt with; I may, however, say, that it strikes me Professor Stokes has taken precisely the line which is most likely to be productive of good in the present state of public opinion upon this question.

I am one of those who have always thought it scarcely creditable to Christian people that they should be so much alarmed, as they sometimes appear to be, at the probable influences of science, as developed in the present day, upon revealed religion, especially with regard to the leading point of the evolution question—namely, the existence of a God with a supreme and constant controlling power. (Hear, hear.) Doubtless, this subject is one that is calculated to fascinate the minds of a large number of people, and I might add that it has been worked out by scientific men, not only with extreme care, but, as I believe, with honesty of purpose. I myself have not the smallest hesitation in crediting all the ascertained facts that have been given to us by those who have laboured so perseveringly on this subject. Their deductions are matters of great interest, but, as Professor Stokes has so admirably put it, minds differently cast are required to look at this subject in such a way as to enable us to come to correct conclusions upon the inferences drawn by Darwin and other evolutionist teachers as to the doctrine they have put before the world. I think, also, that Professor Stokes is correct in leading us to infer, even if he did not absolutely assert, that many men who have been led to draw conclusions adverse to revealed religion have done so without taking into consideration the whole of man's constitution. They have omitted to take due cognisance of the laws which regulate man's moral being, and it would even appear as though they had agreed to ignore the existence of any such constitution at all. (Hear, hear.) I have been much struck, occasionally, when conversing with evolutionists upon this subject, at finding how completely they are at sea with reference to the question of the probable origin of man. One of my conversations on this point was with Professor Kitchen Parker, who, I may say, in passing, is one of the most laborious and trustworthy workers in developmental anatomy we have at the present day, and a man whose mind is as simple and open to truth from all sides as it is possible to be, while, at the same time, he is a very sincere and humble Christian. As just stated, I have been greatly struck with the results of my conversations with him and others on this subject. I have put the question point-blank:—Assuming all the evolutionists have stated to be taken for granted, and that all existing animal creation has been developed from some simple protozoon: where does man come in? But I have never yet obtained any answer to that question. (Hear, hear.) The supposition is, that the original protozoon, or the line it takes its development from, has somehow been lost. There is no line from which, taking animal creation from the commencement, and including all the higher vertebrate animals, we could, on the evolution theory, understand man to have made even a partial entrance so that his existence and constitution may be accounted for. We are, therefore, at liberty to take all that has been stated with reference to the leading facts of evolution, and still are compelled to turn round and ask—How about man? Whence does he come? What is his origin? By what line of evolution has he risen? This, I think, is the point that ought never to be lost sight of. I also think that, after all, we must fall back on the evidence derived from other

lines of thought and investigation to which Professor Stokes has alluded, in order to obtain any satisfactory decision upon this subject. It is in vain to debate man's physical nature without reference to his whole nature ; and we are bound, in any fair discussion of the question, to take into consideration the moral nature of man, as well as his physical and intellectual constitution. (Hear, hear.) I have only to say that I am much indebted to the authorities of this Institute for affording me the opportunity of hearing this interesting paper. I had not contemplated offering any observations on the subject, and I have only done so in response to the Chairman's request, feeling, as I do very deeply, that I am unable to do anything to advance the subject beyond the point to which it has been taken in the admirable paper of Professor Stokes. (Applause.)

Professor LIONEL S. BEALE, F.R.S.—I need scarcely say that we all feel greatly indebted to Professor Stokes for his valuable paper. It seems to me that the subject is one that concerns everybody, and that it ought not to be considered the exclusive monopoly of scientific men. I confess that while, as Professor Stokes is aware, I heartily agree with him in every word he has said, I am inclined to go even further than he does in the same direction. Indeed, I am not sure that it is quite right to speak as tenderly as Professor Stokes has done of those who have taken up the views to which he has drawn our attention. A great many scientific men have not been in the habit of putting their doctrines before us in the gentle and considerate way suggested by Professor Stokes, and some of them have unquestionably laid down the law they declare shall be obeyed in the most peremptory manner. They do not say, for example, "Let us discuss how or why it is that a tree grows upwards ;" but rather they declare, "The tree grows upwards in obedience to certain physical laws, which have existed from the foundation of the world, and will exist to the end." When we come to ask them to explain these physical laws, what do we get? We are told that they can explain a good deal, and by-and-by, at some time near or distant, everything is to be fully accounted for by physical law. But, when we say, "Can you tell us how non-living and inorganic matter comes to be living matter?" all the answer we get is, "This *must* be due to the properties of the original particles. The creation of matter, they say, does not concern us. Every particle of matter has been created and endowed with certain original properties, and it is in obedience to those properties, and the conditions under which the subsequent work has been carried on, that the results we see have been produced. If the mind could only go back to the first creation of matter, and had sufficient knowledge to understand what were the properties with which it was originally endowed, our intelligence, if sufficient, would enable us to fully explain how and why everything is produced at the present day, and will be produced in the future." (Applause.) This, then, is what it really amounts to ; and the issue is simply this, Are we, and everything living, merely matter, and are all vital actions, all thoughts, and feelings due to the mere properties of matter ; or are they not ? (Hear, hear.) Can science account for the formation—I will not say

of man—I will take a much more simple proposition—can science account for the existence of the simplest particle of living matter? We are, as yet, a very long way from the consideration of the far more complex question concerning the nature and origin of man. If the present rate of progress continues, it will be a century at least before we can reasonably enter upon that subject. Let us, then, begin with the origin of the simplest living particle, and if the changes which are said to take place in non-living matter, and are supposed to result in the formation of the simplest living particle, can be fairly explained on physical grounds I shall be willing to grant so very much that I am sure my opponents will be satisfied. If only that one thing can be explained, you may depend upon it that everything else will, and must follow in time. I say, therefore, let us fully discuss this simple point, How does the living originate from the non-living? Does it originate from the non-living in obedience to physical laws, or does it result from some special or superphysical action? There are many, and I myself am one, who maintain most strongly that no man of science has yet shown the vestige of a reason for the inference that the living springs from the non-living in obedience to physical laws or physical action. I have maintained this position for the last twenty years, and I maintain it still. Some of the Fellows of the Royal Society do not behave as they ought to do towards those who take this view. Our opinions are unquestionably based on reason and observation. (Hear, hear.) Upon abstract scientific questions the public cannot judge, but surely the public ought to insist that these matters should be investigated, and that the whole of the facts should be plainly and clearly stated. If this were done, many well-trained intellects would be fully able to judge concerning the merits of the case, and scientific spirits claiming to be privileged would be compelled to give reasons for the faith that is in them. (Hear, hear.) At this time the real matter is disguised and obscured by a cloak of mysterious language. (Hear, hear.) If some scientific men are, as they pretend and declare, really acquainted with the facts, let them state them in such a way that persons of ordinary intelligence can understand. It is nonsense for men to say among themselves: "We know certain things which ordinary minds must fail to comprehend; we are able to see through a greater number of deal boards than the rest of the population can pretend to do; we are privileged beyond all others." (Hear, hear.) Science is open to all the world, and it is monstrous to put forth the doctrine that these questions, which lie at the very foundation of all thought and knowledge, are only to be dealt with by a favoured few. They are accessible to all, and, if scientific men will only state the facts in simple language, they can be easily comprehended. Let this subject be put forward in a plain and straightforward way, and the public will be quite able to judge between us. I, for one, at any rate, am ready to accept their verdict, or that of any body of scientific men who will meet together and have the subject fully and fairly debated. It never has been so debated. In spite of the hundreds of miles of print that are being continually published, this

question has not yet been fully and impartially discussed. (Hear, hear.) Those who differ from dogmas which declare that everything depends on the properties of particles, and that every change is due to physical laws, have not been able to get themselves fairly heard. The points they have to urge have never yet been fairly considered ; and the remark applies even to the simplest points in connexion with this great and important subject. There can be no doubt that the issue is a portentous one. The imagination is not able to conceive a greater issue than arises out of the difference of view between those who believe that an Infinite Power *lives*, and interferes and has interfered for special purposes, and those who hold that all the phenomena of nature are due to the inherent properties of lifeless matter and to antecedent phenomena. (Hear, hear.) These two conclusions are incompatible ; and however we may shuffle, and say there is much to be said on both sides, one thing seems perfectly certain, and that is, that if the physical views put forward, not by one or two persons, nor by ten or twenty, but by hundreds, are true—if they do not imply denial of the existence of a creative Deity, they unquestionably imply the denial of the existence of a *living* Deity, and of a Deity men could love, honour, or worship. (Hear, hear.) Of this I feel assured, that if these physical laws have led to the formation of living matter—of all the living things on the face of the earth—there can be no reason for accepting the conclusion that there is a living God ; and upon this idea the acceptance of religion depends. If, therefore, the scientific views put forward at the present day, and received with implicit faith by large numbers of people, are true, we must modify our ideas extremely ; and I, for one, fail to see on what grounds religion is then to rest. In this view I do not stand alone ; but, at the same time, I admit there are persons for whose opinions I entertain respect who differ from me. When we endeavour to work the question out, by going back, as far as we are able to do, to the origin of things, we arrive at two incompatible conclusions, which cannot both be true. We are unable to accept both, but it seems to me we are, from the very nature of our mind, forced to accept one or the other ; and, this being so, I need scarcely say that the acceptance of one of these conclusions must be unsatisfactory in the extreme, because it is contradicted by the workings of a man's own mind, as everybody who allows his understanding to have the question and arguments fairly presented to it, must feel. I must apologise for having attempted to go into this great subject, because it is so vast that it would be impossible adequately to deal with it in the limits of a discussion such as this. I have only endeavoured to say just a few words about what seems to me will be the real point at issue in time to come, namely—as to whether science has proved, or is likely to prove, a gradual transition from the non-living to the living, and that the non-living and living are one. I hold that nothing at all has as yet been done to show that there is the faintest reason for the belief that the living results from the non-living, in consequence of the action of physical laws. We can readily imagine the existence of the non-living, for ever and ever, without anything

being produced therefrom ; while no one has as yet shown that the living *must* issue from the non-living. As far as I know, there is absolutely no reason for coming to the conclusion that the non-living has evolved the living. That the living have existed is a fact that has yet to be explained in a manner differing from that in which the existence of the non-living can be established. Therefore, I hold that no one has shown that life, in its lowest conceivable form—not even the life of the Bacterium—has anything to do with physics. (Applause.)

Dr. WALLICH (a Visitor).—There is one point in the present discussion upon which I should wish to offer a few observations, inasmuch as it relates to a branch of natural history to which I have devoted special attention. It has been alleged by certain eminent biologists, that distinct evidence of Life having originated on our globe by what has been termed “Spontaneous Generation” is derivable from a study of the lowest organic forms ; and, as is well known, modern Materialism rests absolutely on this assumed foundation. Speaking, as I am able to do, from a personal study of these forms extending over thirty years, I can unhesitatingly affirm that the entire mass of evidence they furnish leads to a diametrically opposite conclusion ; the marvellous manner in which their vital functions are carried on, in the absence of any appreciable organisation of a sufficiently elaborate kind to enable us to account for it, being of itself proof that life is something more than a mere occasional attribute of matter. I can, therefore, fully confirm what has been said by my friend Dr. Lionel Beale, that nothing has heretofore transpired which can furnish ground for the belief that Life is the result of physical action only. But it needs no special scientific education to bring this fact home to most of us. We know inanimate matter to be under the exclusive dominion of molecular and chemical forces, the interactions of which can be predicated with tolerable certainty, because they remain invariable so long as the attendant conditions continue unaltered. We also know that, in the case of animate matter, these interactions become temporarily subject to modifications, the precise extent and nature of which we are unable to predicate otherwise than empirically and approximately. The physical laws which govern these forces are never abrogated, but they do not, for the time being, exercise the same unrestricted sway in the case of animate, that they exercise in the case of inanimate matter. And, going a step further—whether our experience be derived from the human frame or the humblest living unit in nature—we know but too surely that, as soon as the principle we call life departs from the clay of which it was a “tenant-at-will,” the whole of the material forces instantaneously regain their sway and again reign supreme. Surely, then, no minds but those distorted under the pressure of a dominant hypothetical illusion can, for a single moment, fail to recognise the significance of such evidence. It is, for the most part, on the authority of Professor Haeckel that the doctrine of Evolution has been pushed to the extremes above referred to. He has gone the length of publishing as demonstrable facts a number of

observations in relation to the lowest organic types which I unhesitatingly declare to be fictions. I have over and over again endeavoured to direct public attention to the serious character of the errors in this department of natural history committed by Haeckel and those who are his advertisers and supporters. But authority, and the arrogant claim to infallibility put forward by those who rank as leaders in science, completely block the way to enlightenment wherever it interferes with their dogmas. And yet it stands on record that Haeckel, and those who think with him, hold the doctrine of evolution to be incomplete without Spontaneous Generation for its basis. Whereas the pure Darwinian doctrine—in which I implicitly believe—authorises no such retrogressive application, and, above all, repudiates any connexion with metaphysical speculations. I would here mention that I make this statement because I am in possession of indisputable evidence that Mr. Darwin regarded such an application of the doctrine of evolution as altogether *ultra vires* in the present state of our knowledge; and moreover maintained, from first to last, that no testimony deserving of credence had as yet been adduced in support of Spontaneous Generation.* Nevertheless, Haeckel and the rest of those who have made Spontaneous Generation the basis of a materialistic hypothesis of creation, are the very persons who, amidst the plaudits of a wonder-stricken public, proclaimed in 1869 the discovery of "*Bathybius*" extending in one continuous living sheet over hundreds of thousands of square miles of the ocean bed, and were not ashamed to pass off this monstrous fiction as a determinate fact in "Exact Science"! No wonder they shrink from affording those who contest their views any opportunity of exposing their worthlessness. From 1868, when the discovery of *Bathybius* was first announced, till 1874 when its funeral dirge was pronounced in significant but strangely halting whispers by the naturalists on board the "Challenger," I stood alone in denouncing it as a fiction based on a reckless misinterpretation of the nature of a substance which is the *effete product*, and *not* a living embodiment of the lowest conceivable type of animal life. What the naturalists of the "Challenger" achieved and let the world know, after groping about the bottom of every sea and ocean

* "The recent searching investigations of Professor Tyndall, Dr. Burdon Sanderson, Professor Lister, and others, have forcibly shown that there is no reliable foundation for the theory of 'spontaneous generation,' or as it is now more logically termed, 'abiogenesis,' *i.e.* the development of life without any influence derived from pre-existing life. Professor Lister has recently shown that the lactic acid fermentation of milk (the ordinary process of turning sour) does not take place without the presence of a peculiar organism; of which, if the invisible germs be excluded, the milk remains sweet for an almost indefinite period of time. And Professor Tyndall has observed that, if fluids the most prone to decomposition and the development of organic life be carefully exposed to the pure air wafted over the snow-clad summits of the Alps, they undergo no change."—*Preface, Transactions of Victoria Institute, Vol. XI.*—M. Pasteur's investigations have had a similar result to those of the above-named.—(Ed.)

for three and a half years was, that they had signally failed to find the least trace of any such living and world-enveloping monster! I have only to add that, were the physicist or chemist to succeed in producing in the laboratory a combination of elementary substances in which vital actions manifested themselves in the absence of any antecedent germs of life, we should still be as far off as ever from having arrived at a solution of the problem of what Life is. For, even then, we should derive all our knowledge respecting it only from its phenomena. And, taking these facts as my scientific standpoint, I venture to maintain that, however far our knowledge of the physical laws which govern the universe may be extended in time to come, the one paramount problem of Life will still confront and defy all human efforts.

Mr. W. GRIFFITH.—The learned Professor alluded, with some force, to the respect due to authority; and, considering that he occupies the chair which was at one time occupied by the great Sir Isaac Newton, it may seem somewhat presumptuous in me to offer any observations that may appear to differ from what he has stated. But the question at issue is really one of fact. All sciences—physical and metaphysical, moral and my own peculiar one of the law—if they have any truth in them, are collections of facts and logical deductions therefrom. If we look for a basis of fact, we find that the theory of evolution, carried to its extremity, is merely theoretical, and has nothing solid upon which it can rest. Nor does it solve the most important questions of the problem, inasmuch as it overlooks some of the most important elements that ought to enter into the discussion. Nevertheless, while I fully agree that the atheistical evolutionist has nothing on which he can fairly rest his hypothesis, I do think, with Dr. Wallich, that it is questionable whether we may not be making our path needlessly difficult. The learned Professor has told us that, in his opinion, if A were evolved from B, and B from C, and so on, the result would be, that by removing the Creator to an indefinite distance we might come to the conclusion that there was no Creator at all. Now, I think that this is hardly a fair description of the theory we have met to confute. We may remove the argument from one limit of inquiry to another, and yet we may admit that, in the extremest limit, there were certain qualities impressed upon matter by the creative energy, and that those qualities have evolved themselves, and produced, by a gradual system of development, the grand and magnificent results we are now enabled to witness. I do not say that it is so. The elements of inorganic chemistry possess distinct powers or virtues; organised life—vegetable, animal, or moral—possesses distinguishing characteristics. Many of these powers and characteristics, so far from being developed the one from the other, are even antagonistic or destructive the one of the other. Who has yet shown that the Homogangliata of Owen, the Articulata of Cuvier, have developed into the Heterogangliata or Mollusca? and that this second class have developed into the highest, the Myencephala of Owen or the Vertebrata of Cuvier? But, admitting the historical evidence contained in the first chapter of the first book of the Bible,

I would ask, Why should we continue to present and perpetuate difficulties which are not necessarily involved in the question we have to consider? It rather tends to raise our idea of the greatness and power of the Creator, if we suppose that His omniscient omnipotence could attach to mere crude atoms of matter qualities by which that matter could evolve such great results. This supposition does not in any way diminish the power, the omniscience, and the grandeur of the Almighty Being. If this be so, why should we make the difficulty greater for those who already find sufficient obstacles to the acceptance of the fact of the creation of a human, or moral, or spiritual being? If this difficulty can be lessened, we shall have prepared the way, both for the moral and the historical evidence. There can be no doubt, as already remarked by Professor Stokes, that man is a complex being, who possesses moral as well as physical and intellectual qualities. He will then find that revelation is suited to the moral qualities, and this prepares the way for that portion of the argument which bears on the historical evidence.

Mr. D. HOWARD, V.P.I.C.—I have heard Professor Stokes' paper read with special interest, and I regard it as one of the greatest value, not only on account of the high scientific attainments of its author—and there is no one who might not learn something from the paper—but also in reference to the wide spread of scientific teaching, to which so much attention is being paid at the present time. Unfortunately, science has lost the title it used to bear in the days of my boyhood—that of inductive science, a term now solely applied to the physical sciences; and we find, in the majority of the scientific teachings now spread abroad among the people, unproved deductions put forth with the strongest dogmatism. This being so, I think it most important that we should have clearly laid before us the true lines of science, as has been done in Professor Stokes' paper. And we need also to have put before us how very little, even apparent, opposition there is between religion and science when each keeps to its own lines. It is unfortunate that a large proportion of those who speak upon this subject—I will not say of those who think upon it—first of all make up their minds upon the theoretical proposition, and then look round for the facts by which they may support their arguments. Others, again, bring into use a habit of mind which might, perhaps, be valuable in our law-courts, and seize at once upon those facts which tell upon their own side of the question, while they altogether ignore those that would tell the other way. This practice is resorted to, consciously in some cases, and in others unconsciously. Science is not a matter of theory alone, but of theory grounded on facts. Unhappily, however, in too many cases, we establish theories upon imperfect generalisation, and then endeavour so to force our facts that they may suit the theory, saying, that if the facts don't suit, it is so much the worse for them. (Laughter.) I would, therefore, specially recommend this paper to the notice of those who, either by their writings, or by their personal influence, have any power in directing

the spread of science among the masses. I would urge them to see that the science so spread is true science, and not a series of vain theories enforced by mere dogmatism, which, I must plainly say, is the case in regard to a great many of the elementary science-books I have lately read—books which, I confess, go entirely beyond my comprehension; for, even in sciences of which I know the most, I often find myself at a loss to follow my shilling volume.

Dr. RAE, F.R.S. (a Visitor).—I am afraid that this subject is quite beyond me. I have thought of it for many years, and wish I were able to speak as fully and clearly as I should like to do, the sentiments I entertain. I have studied nature a good deal, but have read very few books. I have heard it argued, and have myself thought it probable, that life did not begin at one centre—in one part of the world,—and I wish it to be understood that in speaking of nature I do not wish to introduce the name of the Deity. How life began is a question that has puzzled every one; but I think it must have begun in a very simple and natural way. We may assume that the world must have arrived at a fitness for the introduction of life when it reached the stage at which it could support life, such as we know it to be; and it may also be assumed that one portion of the earth became so fitted sooner than another, but it does not follow that life spread from that particular beginning all over the world. I think it very easy to suppose that, when certain parts of the globe became fitted for the reception and support of living things, in those portions of the earth life commenced. I do not pretend to go into the question, whence or how it sprang. Let us take the different forms of life we have in Australia, both in the animal and vegetable kingdoms, and consider whether they have been evolved from some other kind of life. Everything there in the shape of organised life is different from that which we find elsewhere. The trees and plants are of different forms from those belonging to other parts of the world. To my mind it is much more simple to suppose that the life found there began in that part of the globe. Be it remembered that, in putting forward this view, I do so most humbly, and not at all as asserting that I am in the right, but merely for the purpose of expressing my own thoughts on the subject. I ask, therefore, is it not much more simple to suppose that in these places, where the differences are so great in the various forms of life, there may have been a commencement of life? I may state that I have gone from the Arctic region, leaving plants of certain species growing there. I have afterwards found myself among the Rocky Mountains, at an altitude of 7,000 or 8,000 feet. Had I been conveyed to those mountains blindfold, I might have thought that I had been transported back to the Arctic zone, because, in both places there were the same forms of life, although the two parts of the world are thousands of miles asunder. Which, I ask, is the simpler proposition—that the plants were carried from one place to the other, or that in each case they began to grow because the temperature and other conditions were suited to their existence? Is it not more easy to suppose that, the climate of the Rocky Mountains

being the same at certain altitudes as that of the Arctic region, the life of the plants commenced in each place? As to the question of evolution, I have listened to many of the lecturers on that subject, and have not yet heard an argument that would in the least convince any plain man accustomed to simple language and exercising only such understanding as I pretend to possess. I am sorry to have taken up the time of the meeting, and am afraid I have rather gone out of the way in expressing my views.

Mr. T. K. CALLARD, F.G.S.—Starting with the assumption that the Revelation of God must be in harmony with what He has done in nature, I would remark that, going back to the earliest forms of life—say to the bacteria—I thoroughly agree with what has been said by Professor Beale and Dr. Wallich; but I do not think that they have gone quite far enough, because, admitting that they have put the point in a satisfactory way, I think that even Darwin would have conceded as much as they. He would certainly have admitted a Creator, and would have allowed that life did not originate from the non-living. In fact, he starts with a Creator; and the Evolution doctrine, which is regarded as so important, which has been so much discussed of late, and which bears the name of Darwin, also begins with a Creator; but it afterwards leaves the process of development to natural and physical laws. The question which I regard as the most important—relates to the being and origin of man. With regard to Revelation, I would say that if the First Epistle to the Corinthians, chapter 15, is a part of the Revelation of God, that Epistle clearly speaks, not only of man, but of the first man, and contrasts that first man—Adam—with Christ. Well, if that be Revelation, the question is: Does the hypothesis which not only Haeckel, but Darwin, gives us as that of the origin of man, harmonise with what we are told in that chapter? I think it does not. There was a first man—so the Apostle Paul seems to have believed, and so he has taught us. But if we go to the Evolution theory, where, I ask, is the first man? If man came from an anthropoid ape, in what way did he come? If it were by such infinitesimal changes as the evolutionists speak of, then I ask, when did the first man appear? There must have been some hundreds of generations between the anthropoid ape and man. Where, therefore, can you put your finger and say, “This is the first man, of whom the Apostle Paul has spoken”? We have got, for generations, partly ape and partly man. If Paul were correct, where was the anthropoid ape, from which man came, in the Pliocene period? We are told that in the Miocene they have found the bones of the ape; but the Pliocene came after the Miocene, and no bone of an anthropoid ape has been found in the Pliocene period. Then we come to the Pleistocene; and geologists are pretty well agreed that we must not put man further back than that. Man must be put on this side of the Glacial period. Is there, then, any evidence of an anthropoid ape having lived through the Glacial period? If the Glacial period and the Pliocene period were interposed between man and the anthropoid ape, then, I ask, how could man by any possibility have come from the ape? And, if

he did not come from the ape, I hold that the whole theory of Evolution, as far as man is concerned, breaks down.*

MR. W. P. JAMES.—I should be very glad to hear Professor Stokes give his opinion on the subject of Natural Selection, which, I think, has hardly been touched upon this evening. The term "evolution" is, in itself, extremely vague, and simply means that the higher forms of life have been derived by generation or otherwise from the lower forms. It is clear that there may be many forms of evolution, some of which would be entirely in accord with Theism. On the other hand, an extreme form, such as that upheld by Haeckel, may be a thin disguise for Atheism, although he prefers to call it Monism. But the form which is associated with the name of Darwin rests entirely on Natural Selection. Darwin's theory of Natural Selection is, in fact, his great point. When he is asked, "How did the higher forms of life arise from the lower?" his answer is that they were produced by Natural Selection, a theory so well known that I need not describe what he means by it. I should be much pleased to hear Professor Stokes give his opinion on this subject a little more at length. It is now apparent that many persons who believe in some kind of evolution are beginning to venture to say that Natural Selection is not enough to account for all the phenomena of animated nature. It requires some courage for any one to do this in the scientific world, where, for a long time—fully twenty years—the theory of Natural Selection has held more or less undisputed sway. But, I rather think, we can now trace a reaction against it among our scientific men. (Hear, hear.) Professor Mivart may be mentioned as an illustrious example among those zoologists who have been bold enough to say that in their opinion Natural Selection does not suffice to account for the development of the higher forms of life from the lower. This is the central point of Darwin's theory, and, if this breaks down, his doctrine of evolution necessarily goes with it; it is abolished and done away with, though not necessarily other forms of the doctrine. Few condemn evolution pure and simple. I am rather inclined to think that a true answer to the question, "How is it that the higher forms of life have succeeded the lower ones in past times?" is to be found in some theory of evolution. Natural Selection, however, alone is Darwin's theory. We

* "We cannot pronounce it to be a conquest of science that man descends from the ape or from any other animal. We can only indicate it as an hypothesis, however probable it may seem. Let us hope the men of science in England will not fail to examine this most serious question—whether the authority of science will not be better served if it confines itself strictly to its own province, than if it undertakes to master the whole view of nature by the premature generalisation of theoretical combinations. We must really acknowledge that there is a complete absence of any fossil type of a lower stage in the development of man. I am bound to declare that any positive advance which has been made in the province of pre-historic anthropology has actually removed us further from the proof of such connection—namely, with the rest of the animal kingdom."—*Professor Virchow.*—(ED.)

need only remember that the title of his book is "The Origin of Species by means of Natural Selection"; and how this is understood by Haeckel and his admirers we very clearly see. They hail the Darwinian theory with rapture, because, in their opinion, it takes the place of a Creator. It is this principle that they have trumpeted to the world over and over again as a key to the adaptations of the organic world, and as doing away with the necessity for any Mind in Nature. Last year the views entertained by Haeckel were clearly expressed in an address reported in *Nature*, which, I dare say, many now present have read. If I may be allowed to express an opinion of my own, I would venture to say a few words with reference to plants, as I have studied them more than animals. Among the plants I have specially studied the Algæ, and I find in them features that cannot be accounted for by the theory of Natural Selection. According to this doctrine no animal or plant possesses any useful quality which it has not acquired through that process. Therefore, conversely, you have to show that all the distinct properties it now possesses are of use to it, for, if they are not of use, the question arises, How could it have obtained those properties by Natural Selection? Let us take the diatoms among Algæ. It is difficult to see how their sculptured valves can be accounted for by Natural Selection. How are all the beautiful patterns, the little wheeled windows, and the delicate lines we find in them to be traced to this origin; because, one necessarily asks, of what advantage can they be to the plant? How is the plant benefited by them? and if it be not benefited, how can it have acquired them by Natural Selection? The same remark may be applied to the beautiful shades of red that are seen in the Red Sea-weeds—one of the most splendid series of red and crimson hues to be found in nature. According to theory these brilliant colours must have been obtained because they were needed by the plant; but I have not yet heard that any use has been suggested for them. I should be glad to hear Professor Stokes say something about Natural Selection, and tell us whether he thinks it adequate to the production of the many varied forms of life by which we are surrounded. (Applause.)

AN ASSOCIATE.—I should like to ask one question of Professor Stokes, and his answer will be for my own benefit in my work. In answer to those who are opposed to us on the great question of a belief in God as evidenced in Creation, I have been in the habit of arguing thus—and I should like to be put right if I am in the wrong, so that I may not use the same argument again:—"You say that the various adaptations of structure we find in animals and plants as affecting their habits and mode of obtaining their food, are the result of some force within themselves which you call natural selection." Am I right in saying that this natural selection is equal to the power of thought? If, for example, the marvellous form and action of the pitcher-plant, so well described the other night by a member on my right (Mr. W. P. JAMES); or the bill of the snipe, with the peculiar muscle at the end by which it is opened, and the nerve by which it feels, are the result of this natural selection, am I correct in saying that what you term natural selection is equal to the exercise of mind, and that, therefore, the pitcher-

plant and the beak of the snipe have become what they are through an intellectual and reasoning process, so that in each case the plant and the bird possess the power of thought? Did the pitcher-plant become what it is because it was able to procure some benefit by altering its form, and, if so, is not this tantamount to the power of reasoning? Again, is not the development noticed in the formation of the parrot's bill traceable through the action of the creature itself to a discriminating intelligence? But, if this be not the case, can we do otherwise than say that these things have been brought about by a power outside the plant and the animal, to which we give the name of God? For my part I cannot assent to the proposition that the results we thus witness can possibly have proceeded from aught but the great First Cause—from God the Creator of all things. (Hear, hear.) If I am in the wrong, I beg that I may be put right.

The CHAIRMAN.—As our time is now almost expired, I will, unless anyone else desires to address the meeting, call on Professor Stokes to make his reply; but, before doing so, I will venture to say a few words. First of all, I offer my humble tribute of admiration to the paper with which Professor Stokes has favoured us. I have admired it throughout, and, as far as I understand the subject, I agree with it throughout. I especially liked that portion of it in which he dealt with the doctrine of evolution, which is the latest product of scientific investigation, and, I suppose I may add, the latest emanation from the mind of the great man who has recently departed from among us. I have heard it said, and I cannot deny that there is truth in the remark, that there has been among scientific men, as I am sure there has been among others, a great deal of dogmatism and intolerance, as well as of very hard speaking upon this subject, which have not been at all germane to the matter. But I think I may defy any one to say that this was the case with the illustrious man to whom I have just referred. If ever there were a humble, patient, and persevering investigator, and seeker after the truths of science—and the truths of science are the truths of all things—for there is no other truth—I believe Darwin to have been that man. (Hear, hear.) I cannot tell whether his theory of evolution be true or not—time will prove that—but I know that all the scientific discoveries that have been made have met with opposition as they have appeared. One's mind naturally reverts to the time when Galileo was tortured for declaring that the earth went round the sun; and the same fact might be illustrated in many other ways. We might go back even to a much earlier period, and recall the words used by a certain Doctor of the Law, when he said—"Refrain from these men and let them alone; for if this counsel, or this work, be of men it will come to naught; but if it be of God ye cannot overthrow it." I would always, and gladly, take the opportunity of saying how much we are indebted to the scientific men of the present day. I have no sympathy with those who decry them, and call them hard names. Among the men of science of our day there are many who are as hard-working, as good, as honest, and as truthful as are to be found in any other sphere of life; and we are infinitely indebted to them for the knowledge they have given us of

the truth. As science produces many of the advantages we enjoy, it also increases our knowledge of all things; and so it may be with regard to the doctrine of evolution. I do not here allude to those extreme forms of evolution which would exclude the Creator. I cannot think of evolution without an Evolver; I am unable to imagine a creation without a Creator; and I have no conception of a law without a Lawgiver. (Hear, hear.) Nor have I read anything in the works or doctrine of Darwin implying that he entertained a contrary opinion. Who, I ask, are we, that we should dictate or attempt to limit the Almighty in His modes of creation? I do not see that it is in any degree less wonderful that He should have been the author of a gradual process of development than that the results we see around us should have been produced immediately. Does not the process of evolution go on in each individual? and may not the same thing be true of the race that is of the individual? You have, therefore, no right to speak dogmatically or to condemn scientific men. Our duty is to be patient and to wait. If we only look for the truth earnestly, we are not likely to go wrong. I am sorry that there should be any apparent antagonism between science and religion. Natural theology is science, and science is natural theology. Who shall say that, as Galen of old, when he wrote his anatomical books, thought he was writing a hymn to the Creator, Darwin did not think so likewise? I think it exceedingly probable that he did. (Applause.) I now call on Professor Stokes to reply.

Professor STOKES.—I will only reply very briefly to some of the remarks that have been made this evening. A good many of those who have spoken have merely signified their general assent to what I have brought before the Institute in the paper I have read. I think that one of the arguments I used has been a little misunderstood. It is in that part of my paper in which I say—speaking of the possibility of particular instances of the multiplicity of species having been due to some process of evolution—there is nothing atheistical in the supposition; but it is a very different thing to assume, *à priori*, that such *must* have been the case. I have no objection to the supposition that condition A may have arisen out of the preceding condition B, and that condition B may have arisen out of condition C, and so on. What I do object to is the assumption which changes the word “may” into the word “must.” (Hear, hear.) I believe, as I have already expressed myself, the probability is, that this evolution of effect from cause extends far—very far—beyond anything we are able to trace. But still, at every step, when we can no longer trace the process of descent, we ought to put in the word “may,” and have no right to insert the word “must.” With respect to Dr. Rae’s remarks, I would remind you that I have said nothing about the geographical distribution of species. It is a subject on which I have no right to speak, as it belongs to an important branch of biology. Dr. Rae’s remarks have been very interesting; but I did not venture upon the subject with which he dealt. When I spoke of four or five different centres, what I meant was, not geographical centres, but particular conditions of animal life which Darwin failed to connect one with

the other ; but, given which—I suppose he would have said he imagined they came by creative acts—the rest could have been developed by the process of ordinary evolution. I suppose Dr. Rae has understood that I used the language I employed in a geographical sense ?

Dr. RAE.—I am afraid I did not hear you distinctly.

Professor STOKES.—Another speaker has referred to the obvious distinction between natural selection and evolution. You may say that evolution is a genus of which natural selection is a species. The denial of natural selection, if you do deny it, is not, as a matter of course, a denial of evolution. Evolution is a much wider thing. One of the speakers has asked me—and I do not know whether I quite followed him in his reasoning—how far, say in the case of the pitcher-plant, the supposition that the pitcher is obtained by natural selection involves the idea of mind existing in the plant, or how far, so to speak, it involves the action of mind outside the plant. But no one says that it does involve mind in the plant. The process, according to Darwin's theory, involves a certain hypothesis to start with, and then deduces, deductively, the existence of those organs which are favourable to the development of the plant or animal. It involves the process of what may be called slight casual variations between the plant, as it springs from the seed, and the parent plant ; and, in the case of animals, similar variations between the animal as it becomes developed and the parent animal. It also involves the hypothesis that certain peculiarities have a tendency to be transmitted by hereditary descent, both in plant and animal ; and, likewise, the supposition that great multitudes must have perished while this process has been going on, but that gradually there was a tendency towards the preservation of those plants and creatures that were best suited to their surroundings. As to the probabilities in favour of or against this process, that is a matter on which I do not dare to speak. I am not a biologist, and I would rather leave that point to those who have made that branch of science their particular study. In conclusion, I have only to say that it gives me the greatest pleasure to join in the opinion expressed by our Chairman, as to the exceeding truth-loving character of that great naturalist, the late Dr. Darwin. I had the pleasure of a slight acquaintance with him, and knew him to be a man to whom everybody looked up with reverence and respect.

The meeting was then adjourned.

REMARKS BY PRINCIPAL J. W. DAWSON, C.M.G., F.R.S.,
CHANCELLOR OF MCGILL COLLEGE, MONTREAL.

I beg to thank you for the *proof* copy of Professor Stokes's paper on "The Absence of real Opposition between Science and Revelation." In this I thoroughly agree with the author of the paper. The so-called "conflict"

between science and religion depends on ignorance of one or the other, or on a dishonest and partial representation of the testimony of nature, or that of revelation, or of both. In those branches of natural science in which I myself work, it is the growing tendency of discovery to corroborate and elucidate the references to natural things in the Bible. This I have often had occasion to notice and comment upon in the discussion of scientific subjects.

In so writing, however, I do not refer to the doctrine of spontaneous evolution of living beings, and of man, as held by a prominent school of German and English biologists. This doctrine I regard as equally at variance with science, revelation, and common sense, and destitute of any foundation in fact; it belongs, in truth, to the region of those illogical paradoxes and loose speculations which have ever haunted the progress of knowledge, and have been dispelled only by increasing light. For this reason I have always refused to recognise the dreams of materialistic evolution* as of any scientific significance, or, indeed, as belonging to science at all. They bear no closer relation to science than fogs do to sunlight, and I anticipate a time not far distant when they will be dispelled, and when men will see much more clearly than they now do the agreement between the Word and the Works of God.

February 28th, 1883.

APPENDIX.

The following remarks occur in the first article in *Nature* for June 28th, 1883, which discussed some opposite views propounded in a recent work :

“A great deal has been written on the transformism-theory of Lamarck and Darwin, and it must be expected that much more will be written. One of the principal objections made to it is, that if man is really the descendant of the ape, and the ape that of other mammalia, if, generally, there exist links between all animals, living and extinct, so that all animals trace their origin to a common ancestor, how is it that no link really exists between man and ape, or between fish and frog, or between vertebrate and invertebrate? Embryological considerations, it is said, show a real connexion between very different animals: a frog, for instance, is a fish for some time during its youth, and amphioxus looks very much like an ascidian.

“But, notwithstanding numerous arguments to support Lamarck's theory, no transformist can show any species gradually losing its peculiar characters to acquire new ones belonging to another species, and thus transforming itself. However similar the dog may be to the wolf, no one has found any dead or living animal or skeleton which might as well be ascribed to wolf as to dog, and therefore be considered as being the link between the two. One may say exactly as much concerning the extinct species; there is no gradual and imperceptible passage from one to another. Moreover, the first animals that lived on this earth are not, by any means, those that one may consider as inferior and degraded.”

* The theory is a scientific blunder, untrue in its facts, unscientific in its method, and ruinous in its tendency.—*Agassiz*.

ORDINARY MEETING, APRIL 16, 1883.

REAR-ADMIRAL HENRY D. GRANT, C.B., IN THE CHAIR.

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

MEMBERS : R. Hills, Esq., New South Wales ; Rev. R. F. Hessey, M.A., Basingstoke.

ASSOCIATES : I. A. Arnold, Esq., United States ; T. W. E. David, B.A., New South Wales ; S. L. Jepson, A.M., M.D., United States ; C. C. Jones, Esq., Jun., United States ; Rev. S. Mitchell, New South Wales ; Christopher Rolleston, Esq., C.M.G., New South Wales ; B. B. Warfield, Esq., United States.

The following Paper was then read by the Author :—

BABYLONIAN CITIES.—By *HORMUZD RASSAM, ESQ.*

IT may be remembered that a little more than three years ago I had the honour of reading a paper before you in connexion with my discoveries in Assyria and Babylonia. Since then I have been out twice to that country, superintending the national researches on behalf of the Trustees of the British Museum, and I am glad to say that in my several explorations I have been rewarded with new discoveries of monuments and records of those celebrated and ancient kingdoms.

I have already casually noticed before you my fortunate discovery of the City of Sippara or Sepharvaim of the Bible ; but as I did not enter then fully into the way I hit upon it, I

do not think it would be out of place here to give you a short *résumé* of the fact.

The year before last, while on my way to Babylon, from Baghdad, I happened to be spending a night at an Arab's house in a village called Mahmoodia, about fifteen miles to the south-west of Baghdad, where I generally halted on the route to Babylon. As my host knew what I was searching for, especially as I had a number of workmen digging in the mounds in the vicinity, and he had seen some objects on which cuneiform characters were inscribed, he told me that when he was escorting a wedding-party northward, he had picked up a piece of an inscribed brick at a place called Dair, which he brought to show me. I saw that the writing was like that generally found in Babylonia on bricks upon which the name of Nebuchadnezzar is inscribed, and so I lost no time in accompanying him to the spot, as I was anxious to see if I could find any sign of an old city there to dig at. The place was about six miles from the village of Mahmoodia; but as I had to make a detour in order to reach it, on account of the rise of the Euphrates, which inundated the country, we had to pass a large artificial mound called Aboo-habba, which I perceived to be the remains of an old Babylonian city. I thought at first that that was the ruin to which my Arab guide was taking me to, but he soon undeceived me by saying that it was about three miles further. Had there been any workmen with me, I should have placed, then and there, three or four gangs to try it. We then went on to Dair; but though I found I was not deceived by my guide, yet, after seeing Aboo-habba, the other ancient ruin seemed quite unimportant in comparison, as the sequel will show.

The difficulty was the finding of workmen in the neighbourhood, as the Arabs of the place asked more exorbitant wages than I could possibly allow—not that I could not afford to employ a few workmen on a high scale of pay, but was obliged to keep to a certain standard for fear of dissatisfaction in other quarters. When such difficulties arose, I generally brought the required number of workmen from other diggings, by giving them an extra allowance for what was called “special service.” These men did not only work for the time being, but showed new hands how the work was to be carried on. In most instances the old hands served as superior workmen or diggers, receiving, according to rule, better pay. Whenever a new place is opened, I am invariably asked more than double the pay that I am able or willing to allow, as the Arabs have an absurd idea that the English are

made of money, and have the art of turning dust into gold! In this instance I brought two gangs of workmen from Babylon, headed by an Arab overseer; and, as I had first to try two mounds situated on the high road to Hillah, and within half a mile of the village of Mahmoodia, we were able to induce some of the poor wayfarers to accept service under us. The bait was tried with effect in the following manner. Thousands of Moslem devotees, especially the Shea sect, visit the shrine of Hosain at Karbala the whole year round; and, as a large number are very poor, they subsist by begging. Some of these visited the excavations on their way, and as many of them were almost starving, I told the head overseer to offer them food and money on condition they assisted in the digging. Many of them who were Kurds were glad to accept the offer, and before many days were over I had a good number in my employ. No sooner did the neighbouring Arabs see that I was able easily to obtain the workmen required than they consented to work at the rate I first offered them, and, soon after, I could employ as many workmen as were required for less than half the amount they demanded when I first went to the place.

As the site of Abou-habba seemed to me a most promising one for extensive operations, I moved my head-quarters thither to superintend the works in person. At the mound itself there were no Arabs residing, but within a mile of the place there is a mausoleum of the patron saint of the neighbourhood, called Seyid Abdallah, and near which the guardian of the shrine and his near relations dwelt. I had my camp pitched near his, and to make him interested in our work I appointed him an overseer, and offered his brothers and connexions good berths, which they accepted most willingly.

As Dair was also far away from an inhabited place, I had to send workmen to dig there from Seyid Abdallah, but had soon to give that up, as I found scarcely any good sign of ancient remains to warrant the work being carried on in that locality. At Abou-habba, however, I was rewarded, after three days' trial, by one of the gangs coming upon the wall of a chamber, on examining which I could see it belonged to the old Babylonian style of building. This success encouraged me to prosecute the research with uninterrupted perseverance, and before many days were over we came upon other buildings in different parts of the mound. This made me work with redoubled energy, and very soon afterwards we came upon a chamber paved with asphalt, which proved to contain the history of the new city I had discovered. Heretofore all Assyrian and Babylonian structures were found to be

paved generally either with stone or brick; consequently, this novel discovery led me to have the asphalt broken into and examined. On doing so, we found, buried in a corner of the chamber, about three feet below the surface, an inscribed earthenware coffer, inside which was deposited a stone tablet covered with an inscription, on the top of which was represented some deity which has since been identified by Assyrian scholars with the sun-god; also two figures above, holding an emblem of the sun before him, and two priests leading a youth, evidently a prince, to present to him. With this tablet I found two perfect terra-cotta inscribed cylinders, covered minutely with inscription, giving also the history of the place.

In the Proceedings of the Society of Biblical Archæology of December, 1881, I find the following notice taken of the inscription on the above stone tablet, by the able Assyrian scholar, Mr. Theophilus Pinches, of the Department of Oriental Antiquities in the British Museum:—

“The inscription, which covers the rest of the obverse and the whole of the reverse, begins by mentioning the wrongdoings of the Sutû, ‘a wicked enemy,’ who seem to have carried off the property of the temple of the sun-god, and destroyed the sanctuaries. Simmas-Sîgu, king at that time, asked for the restoration of the property, which was refused. Simmas-Sîgu then began the restoration of the temple, intrusting the work to one Ekur-suma-ibassi, a man bearing the title of  in Akkadian: gassu. The work was continued in the reign of Ê-Ulbar-sakin-sumî, but it remained for Nabû-apla-iddin, king of Babylon, ‘the proclaimed of Marduk, the beloved of Anu and Bél, gladdener of the heart of A-edina, the man, the warrior, who attained to the kingdom, the bearer of the strong bow, the destroyer of the wicked Sutû, who had made their sin great,’ &c., &c., to thoroughly restore the temple. Then comes a long description of the repair of, and additions to the shrine and temple, and the confirmation to the seed of Ekur-suma-ibassi, of the guardianship of the sanctuary, now adorned with the image of the sun-god, and with chased gold and bright crystal. Besides this, the king founded a shrine for the sun-god in Bît-kar-zagina, beside the Euphrates, where victims were offered, and honey and wine bestowed. The inscription, which now becomes very difficult, speaks of the services of the temple, and the delivery of the stone, of which a copy was made, into the hands of certain men. The date ‘Babylon, month Nisan, 20th day, and 31st year of Nabû-apla-iddin, king of Babylon,’ is then given, after which come the usual curses on those who

should destroy, and blessings on those who should restore, the monument in question."

I have been puzzled to determine why these relics were buried in asphalt pavement, because, if those who hid them there wished to preserve them from destruction from the enemy, they could not have placed them in a more conspicuous place; for a man who is accustomed to the mode of Assyrian paving could not help noticing the difference. This discovery at the outset was most fortunate, as it proved to us the exact site of the temple and city of Sippara. Different savants and historians supposed it to be in other parts of Babylonia, immediately on the banks of the Euphrates, but now we are certain of the exact spot being on the great historical canal of Babylonia, called Nahr-malka, or the royal river, about six miles from the Euphrates, but its source about twenty miles westward. This canal was the wonder of the age when the Babylonian kingdom was at the zenith of its power, as it must have been about one hundred and fifty miles in length, and bridged over in many places. Xenophon tells us that the Greeks had to cross it on bridges made of palm-trees when they were retreating northwards after the death of Cyrus. It runs from the Euphrates as far as Aboo-habba, when it divides; the main body passes Dair, and runs in an easterly direction as far as Shat-el-hai, passing within a few miles of Seleucia and Ctasephon; the other part takes a more southerly direction nearer the Euphrates, passing through endless cities, one of which is supposed to be Cuthah, known by the Arabs as Tel-Ibraheem. The remains of the former are now called Yosephia, and the latter Habl-Ibraheem. Both these canals are crossed by wayfarers who travel between Baghdad and Hillah, in the vicinity of Babylon, and between the former place and Musayib, on the way to Karbala.

It is most interesting to examine this canal all the way between the Euphrates and the Tigris, because a traveller cannot help being struck with the remains of its former grandeur, when it must have irrigated hundreds of miles of alluvial soil.

On all sides are found remains of innumerable small water-courses, which were fed by these two grand canals; and at different intervals remains of prodigious basins are seen, in which a surplus supply must have been kept for any emergency, when the water in the Euphrates falls low, especially in summer. It is said that there were two Sipparas in Babylonia; the one which I discovered was for the worship of the sun, and the other for the worship of the moon. They were represented as being situated on either side of the river

Euphrates, and as my Sippara is not on the bank of that river, and there is no sign of any important ruin on its western side, I consider that Nahr-malka was meant by the word "Nahr," as it divides Aboo-habba from Dair, which I believe to be the site of the Sippara of the moon-god.*

In the course of last year we discovered, off and on, especially in one room, between forty and fifty thousand inscribed clay tablets; but, unfortunately, they were not baked, as they generally are found in Assyria; and the clay of which they were made was so coarse that as soon as they were exposed to the air they crumbled to pieces. We found that the only way to preserve them was to have them baked, which we did with success. Fortunately, the most important documents were inscribed on terra-cotta cylinders, of which were found a great number of different sizes and shapes.

The style of the architecture of Aboo-habba is quite different from that found in Babylonia or Assyria; and from all I could make out, it seems to me that Sippara of the sun-god was divided into two distinct buildings, one for religious purposes, and the other as a place of habitation for priests and royalty. Each block of building was surrounded by a breastwork, faced in some places with kiln-burnt bricks to make the building more secure. Both the temple and its environs must have been inhabited by two distinct peoples, because the height of the original rooms was twenty-five feet; but the later occupants of the place seem to have had the rooms filled up with *débris* as far as the middle, and then had them paved, making it appear as if the latter was the original height. It was in this manner that I found the room in which was discovered the asphalt pavement.

The mound on which the buildings of Aboo-habba are erected is about 1,300 feet long by 400 feet wide, containing, according to my reckoning, at least 300 chambers and halls. Of these I have only been able to excavate about 130, as our explorations have been put a stop to by the Turkish Government refusing to grant us another firman for the continuation of our researches in Assyria and Babylonia.

I believe when Cyrus the younger marched through Mahmoodia with the Grecian auxiliaries, about four hundred years before the Christian era, to combat his brother, the great King Artaxerxes, Sippara could not have been in existence, because Xenophon does not make any mention of it in his "Anabasis." It is very unlikely that such an important city could have been unnoticed, especially as the troops must have

* Nahr means in Semitic languages both river and canal.

passed through it, or very near it, both before and after the battle of Cunaxa.

This Sippara has now been satisfactorily identified with the city of Sepharvaim, mentioned in the Old Testament in five different places. In the 17th chapter of the 2nd Book of Kings it is said: "And the king of Assyria brought men from Babylon, and from Cuthah, and from Iva, and from Hamath, and from Sepharvaim, and placed them in the cities of Samaria instead of the children of Israel." Then in the 18th chapter of the same Book, when Rab-shakeh, in his boastful address to the Jews at Jerusalem about the victories gained by his master, Sennacherib, said: "Where are the gods of Sepharvaim, Hena, and Iva?" The city of Sepharvaim has also been famous among the ancients as being the oldest city known, and which the Chaldean and Grecian historians, many centuries before the Christian era, mentioned as being the place where the second father of mankind resided, and where he had buried the Antediluvian records. He was known by the Greek and Chaldean historians by the name of "Xisuthrus," and as there was no affinity in either sound or meaning of that word with that of *Noah*, some doubters considered the whole story of the Chaldean account of the Deluge a mere phantom; but now the buried records of the past come to our assistance, and reveal the truth in explaining what was considered a great mystery and a delusion! The cuneiform inscriptions tell us that God had destroyed all life by a great flood on account of the wickedness of the people, and had saved a good man, whom the Assyrians called "Khasis-adra." The meaning of this "Khasis-adra," is "*he who escaped the flood*"; and it seems that when Abydenus, the Greek historian, chronicled the legend of the Deluge from Berosus, about 268 B.C., he corrupted the word into "Xisuthrus;" and what makes it still very unlike the Semitic sound is the form of the Greek termination. The learned Dr. Friederich Delitzsch, Professor of Assyriology in the University of Leipzig, informs me that he has been able to decipher the cuneiform prototype of Xisuthrus or Noah as Hisi-Sudda; but he has not yet determined to fix upon the exact meaning of the name, though he explains the latter part of the word, "Sudda," as "life." It is the same with the Hebrew words Elijah or Eliyah, and Joshua, which are rendered into Greek and English *Elias* and *Jesus*. Then as regards the meaning of the words "Khasis-adra," or "*he who escaped the flood*," it was a very appropriate nickname or title given to Noah by the Gentiles, the same as that given to Abraham by the Canaanites after he crossed from Mesopotamia. The first time he was called

“the Hebrew,” or passenger, was soon after he crossed the Euphrates to the Land of Promise, as the word “Abar” means to cross or to pass.

With regard to the Deluge, it is an undeniable fact that its story has been believed from mediæval time all over the world—by believers in Revelation or pagans, by civilised or uncivilised peoples, by the descendants of Shem, or those of Japhet and Ham; and whether those nationalities believed in the God of the Hebrews, Christians, Mohammedans, or in any other gods, they all came to the same conclusion, that the Lord of the Universe, on account of the wickedness of man, had caused the earth to be submerged with water, whereby all living creatures were destroyed.

Nicolas of Damascus, who lived about the time of Augustus Cæsar, also makes the following allusion to the Deluge. He says: “There is above Minyas, in the land of Armenia, a very great mountain, which is called Baris, to which it is said that many persons retreated at the time of the flood, and were saved; and that one in particular was carried thither in an ark, and was landed on its summit; and that the remains of the vessel were long preserved upon the mountain. Perhaps this was the same individual of whom Moses, the legislator of the Jews, has made mention.”*

The Hindoos have a tradition that a personage called “Manu” was ordered by a great fish to build a ship secured to the horn of Brahma in a fish form, to escape the Deluge, and was at last landed on a northern mountain, which brings their account identically to that mentioned in Genesis.

A model of Apamea, a heathen coin, evidently struck in the reign of Septimus Severus, about the second century, represented the tradition of the Deluge by a floating ark, two persons within and two leaving it, with two birds, one on the ark, and the other is flying to it with a branch.

Amongst the Chinese the tradition is that the founder of their civilisation, “Faho,” escaped from the flood, and was the first man, with his wife, three sons, and three daughters, who occupied the rehabilitated universe. And in like manner, amongst other uncivilised and savage nationalities in the Western hemisphere, who were not known to the people of Europe or Asia 400 years ago, the same tradition exists as regards the Deluge, which shows the general belief in that visitation of Divine wrath.

Amongst the records I discovered in Nineveh, in 1854,

* Josephus, *Antiquity of the Jews*, Book i. 3.

belonging to the library of Assur-bani-pal, king of Assyria, commonly known as Sardanapalus, there was found a tablet recording the history of the Deluge, which, though differing somewhat from that given in Genesis, tallies wonderfully with the inspired account. Unfortunately, this record was very much injured, and a large part of it is required to make the Assyrian history of the Flood complete. The hero of the Deluge, Noah, who is named in the cuneiform text Sisit, or Khasis-adra (known to the ancient Grecian historians by the name of Xisuthrus) was warned by the gods to prepare himself an ark, as all living creatures were doomed to be destroyed for their wickedness. The ship was to be of a certain length, width, and depth by the cubit measure, and it was to be launched into the deep. The Divine command was obeyed; and after the ark was built, it was covered over, in and out, with bitumen, to make it water-tight. According to the late George Smith's reading of the text, the words Khasis-adra, or Noah, are rendered thus: "I caused to go up into the ship all my male and female servants,* the beasts, the animals of the field. . . . Shamas spake, I will cause it to rain from heaven heavily. . . . Enter the ship, shut thy door. . . . I entered, shut my door. . . . To guide the ship to Buzursadiribi the pilot I gave. The bright earth to a waste was turned. The flood destroyed all life from the face of the earth. . . . Ishtar, the great goddess, said, the world to sin has turned; six days and nights the storm overwhelmed; on the seventh the storm was calmed; I opened the windows, I sent forth a dove . . . it searched a rest, which it did not find, and returned. I sent forth a swallow, and it returned. I sent forth a raven, and it did not return," &c.

Since the publication of the above translation, however, much progress has been made, and Mr. Pinches now renders this part of the Deluge text as follows:—

"I sent up to the ship the seed of life of every kind; all my family and my slaves, the animals of the field, the beasts of the field (and) the sons of the people all of them I sent up. Samas fixed the time, and there spake a voice (?): 'In the night I will cause it to rain a heavy downpour. Go down to the midst of the ship, and shut thy door. The time is come, said (?) the voice (?).' In the night he caused it to rain a

* I do not believe that this word "servant" has been properly translated. It must either mean followers or suit. Indeed I am still somewhat sceptic as regards the altogether correct rendering of some words of the cuneiform inscription, especially the Deluge record which I quote.

heavy downpour I went down to the midst of the ship and shut my door.

“Mû-sêri-ina-namari arose, a dark mist from the horizon of heaven everything bright turned to darkness brother saw not brother Istar spoke like a mother, the supreme goddess called out with a loud voice: ‘Everything is turned to corruption’ Six days and nights the wind blew the storm destroyed. On the seventh day the storm quieted. I opened my window I sent forth a dove a resting place it did not find, and it returned. I sent forth a swallow; a resting place it found not, and it returned. I sent forth a raven, and it left it did not return. I sent forth the animals,” &c.

According to the account given by Berosus the Chaldean priest of Bel, who lived in the time of Alexander the Great, when that monarch possessed Babylon, about four hundred years before the Christian era, it is said that “Xisuthrus, warned by Kronos of a coming flood, wrote a history of the beginning, course, and end of all things, and buried it in the City of the Sun, Sippara; built a vessel five stadia long and two broad, and put on board food, birds, and quadrupeds, wife, children, and friends. After the flood abated Xisuthrus sent out birds which, not finding food or rest, returned. Again he sent and they returned with mud on their feet—the third time they returned no more. The vessel being stranded on a mountain, Nizir, east of the Tigris, he quitted it, built an altar, and sacrificed to the Gods, and disappeared; the rest went to Babylon from Armenia. When part of the vessel remains in the Corcyrian (or Kurdistan) mountains, they dug up the writing at Sippara and built temples and cities, and Babylon became inhabited again.”*

While the excavations were being carried on at Aboo-habba, I had some workmen trying the mound at Tel-Ibraheem, or what the Arabs commonly call Habl-Ibraheem, which means the rope of Abraham, from the shape of the great canal which runs to it from Aboo-habba, a distance of about thirty-five miles. This ruin is supposed to be the site of ancient Cuthah; and although report said that some excavations had been carried on in it before I went there, I could find no traces whatever of such explorations anywhere. I had been trying for two years to go and examine this mound, but the difficulties were the want of water and finding workmen to venture so far away from any inhabited place. I at last managed to in-

* Cory's *Ancient Fragments*, 26-29.

duce some of the Babylonian and Birs Nimroud workmen to accompany me thither for three or four weeks; and most fortunately, when the time came that I could go there to superintend the work in person, the Tigris rose unusually high, and inundated the country to within half-a-mile of the mound, which enabled us to have a regular supply of water as long as we were working there. I of course did not care to drink that water, as it looked anything but tempting, so once a week I sent and got some water for myself from the Mahaweel-Euphrates canal, about six miles to the south-west.

We were very much tried while we were there by the constant sand storms that blew in the day-time. On several occasions the dust was so thick that I could not see the tents of my followers, nor dared to go out of my tent; and once the atmosphere was so thick with it that our water-carriers lost their way, and could not find the mound until the storm subsided. I had for hours to sit still with my eyes closed, without attempting to do anything, much less to open my mouth for the purpose of eating and drinking, as I should have been choked with sand. In the several excavations I found very little of ancient relics to warrant me to remain longer than a month, during which time we discovered a few clay tablets and bowls inscribed, the former with cuneiform, and the latter with Hebrew and Syro-Chaldean characters. In one part of the mound, after having penetrated about twenty feet below the surface, we came upon an ancient edifice, the walls of which seemed as if they had been built a short time ago. As we had to dig in some places about thirty feet before we came to the bottom of the chambers, I was obliged, for the sake of saving time and expense, to work by tunnelling. From the nature of the soil found in these chambers, it seemed to me that this structure was never inhabited; but the owner, whoever he may have been, must have abandoned it before it was roofed, and ordered it to be filled in after it was built. This mound is about two miles in circumference, and about sixty feet high; and although I had no less than twenty tunnels and trenches opened in it, there were no signs discovered in it to make me think it belonged to the early Babylonian period. It is true that we found some kiln-burnt bricks like those usually found in Babylonia, with the name of Nebuchadnezzar on them, yet I do not think this place was of much importance at the time of that monarch. I have no doubt, however, that in later days it must have been a very flourishing place, because unmistakable remains extend for miles around, which indicate that the city and its surroundings were thickly inhabited. Had my firman been renewed, and I could have afforded to spend a hundred pounds upon making

another trial in the same mound, I should certainly have attempted another expedition to it, though I might have been buried in the sand again!

In that part of Babylon called Imjaileeba we have always been finding records of the past; but, the more I dig there, the more puzzled I am what to make of it. With the exception of half-a-dozen rooms I discovered on the borders of what was once a grand palace of the kings of Babylon, where Belshazzar was supposed to have lost his life when the capital of Chaldea was captured by Cyrus, I could find no regular structure to enable me to identify any part of the different buildings which must have existed at the time. The whole place seemed to have been upheaved or overthrown by an earthquake or some other supernatural destruction. In some places objects of antiquity were found almost within a foot of the surface, and in other parts, not more than a few yards further, we come upon Babylonian relics almost as deep as the former foundation. At one time I thought I had hit upon some ancient walls to enable me to penetrate with a definite object into the interior of a regular building, but was soon doomed to be disappointed, because, what I thought at first sight to be a regular Babylonian building, was found afterwards to have belonged to a ruder period, when the Parthians occupied the country.

Every time I returned to that country I did all in my power to trace the original outskirts of the city, but the more I tried to come to any definite result, the more I was confounded: and so with regard to the discussion about the topography of Babylon between Mr. Rich and Major Rennell, which increased my difficulty not a little; and whether I followed the theory of one or the other, I felt that I was driven nowhere.

The only positions which can now be fixed upon with any accuracy are, I think, the palace of the kings of Babylon, called Kasr or Imjaileeba, the temple of Belus, known as Birs Nimroud, and the hanging gardens, which the Arabs call Babel, but which Rich and other travellers erroneously styled Imjaileeba.

A broken terra-cotta cylinder was discovered in my explorations at Babylon which Sir Henry Rawlinson deciphered and found to contain an account of the taking of that city by Cyrus as it is mentioned by Herodotus and Holy Writ; but, unfortunately, a good deal of it is missing. From the reading of this imperfect record we can now not only fix the year in which that memorable impious feast described by the Prophet Daniel took place, but even the month and day of its occurrence. According to the deciphering of this

inscription, we find the last events of the reign of Nabonidus, the father of Belshazzar, very minutely related, verifying the words of the prophet and Grecian history. The difficulty which overwhelmed the brains of some men with reference to the existence of the names of Belshazzar and Darius in the story related by Daniel, and omitted by Herodotus and others, has now been satisfactorily explained. The long-buried ancient records of the past, which have revealed to us from time to time most important facts connected with the Bible, inform us that though Nabonidus was the *de facto* king at the time of the fall of Babylon, yet he was absent at the time, and his son Belshazzar was in command of the Babylonian army, and acting as Regent at the Chaldean capital. With regard to what seems a discrepancy between the account given by Daniel and that related by Herodotus and Xenophon as to the name of the Persian king, it has been proved that, though Cyrus was in command of the Medo-Persian army, he was really not the king, but a mere satrap or viceroy, acting for his grandfather Astyages, who was the real monarch, and was called "Darius Medus."

The Greek historian, Syncellus, who lived in the eighth century, calls this Cyrus of Herodotus and Xenophon "Darius Astyages," which shows that at his time there must have been some record in existence which explained the various appellations of both Cyrus and Darius.

What I wanted to be convinced of more than anything else was the exact time the Euphrates ran through Babylon, as Herodotus makes an allusion to it in the following words:—"Queen Nitocris enclosed herself therefore with these defences by digging, and immediately afterwards made the following addition. As the city consisted of two divisions, which were separated by the river, during the reign of former kings, when any one had occasion to cross from one division to the other, he was obliged to cross in a boat, and this, in my opinion, was very troublesome; she therefore provided for this, for, after she had dug the reservoir for the lake, she left this other monument built by similar toil; she had large blocks of stone cut, and when they were ready, and the place was completely dug out, she turned the whole stream of the river into the place she had dug. While this was filled, and the ancient channel had become dry, in the first place she lined with burnt bricks the banks of the river throughout the city, and the descents that lead from the gates to the river, in the same manner as the walls. In the next place, about the middle of the city, she built a bridge with the stones she had prepared, and bound them together with plates of lead and iron. Upon

these stones she laid during the day square planks of timber, on which the Babylonians might pass over; but at night these planks were removed, to prevent people from coming by night and robbing one another. When the hollow that was dry had become a lake filled by the river, and the bridge was finished, she brought back the river to its ancient channel from the lake. And thus, the excavations having been turned into a marsh, appeared to answer the purpose for which it was made, and a bridge was built for the use of the inhabitants."*

At Birs Nimroud I was fortunate enough to discover the palace where Nabonidus was supposed to have been residing when Cyrus captured Babylon. It is on the same mound upon which the supposed Tower of Babel, or Belus, is built. It contained about eighty chambers and halls, but I found nothing in them, excepting, in four rooms, some remains of Babylonian antiquity, proving that the building was erected by Nebuchadnezzar. In the first hall opened were found broken pillars, capitals, and fragments of enamelled bricks, evidently belonging to the embellishments of the room, with cedar wood, which are now in the British Museum.

Soon after that I had to return to England, and left the overseers to go on with the work, but on going back there after some months, I found that they had nearly finished excavating the whole palace. As soon as I set my foot on the mound, a workman came running to inform me that they had just found some metal object, ornamented on the top, at the entrance of one of the rooms. On going to examine it, I found it placed on the threshold of what seemed to be the grand entrance to the temple. It is quite certain that this object had not been made originally for this purpose, and it must have been placed here in after-time. From its length and shape it looked as if it had been originally a leaf of a bronze gate, like those mentioned by Herodotus.† It must have been formerly double the length it is at present; and for the purpose of fitting it in this position, or for the sake of the value of the metal, those who placed it there had it cut in two, and disposed of the other half. Some gentlemen, however, think that it was originally a doorstep, and the cut at the end served as a socket; while others think it might

* *Clio*, i. 186.

† Book I., chap. 181. It may be that this kind of gate was alluded to in Isaiah xlv., where it was prophesied, "Thus saith the Lord to his anointed, to Cyrus, whose right hand I have holden to subdue nations before him, and I will loose the loins of kings to open before him the two-leaved gates, and the gates shall not be shut."

have been the side of a battering-ram. Nevertheless, I still maintain that, if it was not a leaf of a gate, it could have never been used for either of the above purposes. The most striking fact connected with it is the inscription on the ledge, which Assyrian scholars read as a dedication by Nebuchadnezzar to his god for his restoration to health, which shows that it could not have been intended to be walked upon, as it was dedicated for a sacred object. Moreover, when I examined it before it was removed, I found that it was not built into the original Babylonian doorway, but must have been placed there by less civilised occupiers of the palace, who had the passages narrowed, and fitted this object in the threshold between the stone pavement of the passage and the steps leading downwards towards the tower or temple. On passing out of this entrance towards the tower on which the temple of Belus was supposed to have been erected, we could not see any sign of building; but the whole mass afterwards excavated consisted of *débris* belonging to an ancient structure, evidently wilfully destroyed by a formidable enemy. To make myself sure, I had a large ditch excavated between the palace and the tower so as to be certain that we had got to the end of the building; and as I could not afford to dig the whole remaining space, I penetrated as far as the foundations by means of tunnelling—a distance of about eighty feet. I desisted from going any further from fear of accident, because, the nearer we approached the tower, the more it became dangerous to go on with the excavations, on account of the quantity of loose broken bricks that were mixed up with the earth.

About five hundred yards to the north-east of Birs Nimroud there is another large mound called Ibraheem-el-Khaleel, where the Arabs of that country believe Nimroud tried to throw Abraham into the fiery furnace. There I also carried on extensive explorations, and found a large collection of inscribed clay tablets; but these were found in the outskirts of the mound, and not in the building I discovered in it. This made me think that the *débris* in which they were found was thrown away from an old building which had been in existence before the new structure I discovered was erected, because I found on the western side of the mound, below the sanctum of Ibraheem-el-Khaleel, quite a new building, which could not have been inhabited, resembling very much the building I discovered in Tel-Ibraheem, or the supposed site of Cuthah. It might have been erected when Alexander the Great was trying to remove the rubbish from the temple of Belus, and it was abandoned when that great monarch met with his death.

The vitrified portion of the Tower of Belus has ever been a

great mystery to me, and although I have been trying for the last three years to find out, through scientific gentlemen in this country, the cause of the vitrification, I have as yet found no one who could explain the mystery satisfactorily. Every traveller who visited the place could not help noticing the almost supernatural sight, but not one of them could come to any tangible conclusion as to the cause. Benjamin, of Tudela, goes so far as to assert that the "heavenly fire which struck the tower split it to its very foundation;" and my late friend, Mr. Loftus, gives the opinion of a "talented companion," who originated the idea, when they examined the Birs Nimroud in company, that in order to render their edifices more durable, the Babylonians submitted them, when erected, to the heat of a furnace. The former authority does not tell us whether his assertion was based upon his own conjecture, or that he quoted a tradition which existed then in the country when he visited the town about seven hundred years ago. As for the opinion of the latter, it cannot hold water, because it is against common sense that a huge tower like that of Birs Nimroud could be subjected to artificial heat after it was built. The tower must have been originally at least 200 feet high; and to build a furnace to envelope it would be just like trying to cover a solid mass equal in size to the whole dome of Saint Paul's Cathedral with one huge furnace, and subjecting it to artificial heat for the purpose of vitrifying it! Indeed, there is no visible sign of vitrification on any part of the remaining edifice, but the huge vitrified boulders are scattered about the tower, and look as if they do not belong to the place at all. Some of these must be between ten and fifteen cubic feet square: and the vitrification is so complete throughout, that when I tried to have a large piece broken to bring to the British Museum, I failed to do so until I obtained the services of a competent mason, who managed to break me two pieces, after having blunted half-a-dozen of his iron tools.

It may not be out of place here to touch upon the history of the Tower of Babel and the confusion of tongues, mentioned in the eleventh chapter of Genesis, and see what Gentile historians and tradition say upon the subject. Hestæus says:—"The priests who escaped (the Deluge) took with them the implements of the worship of the Euyalion Jove, and came to Senaar, in Babylonia. But they were again driven from thence by the introduction of a diversity of tongues, upon which they founded colonies in various parts, settling in such situations as chance or the direction of God led them to occupy."

Alexander Polyhiston also mentions that "when all men

formerly spoke the same language, some among them undertook to erect a large and lofty tower in order to climb into heaven. But God (or gods) sending forth a whirlwind frustrated their design, and gave to each tribe a particular language of its own, which (confusion of tongues) is the reason that the name is called Babylon."

The most striking proof, in my mind, of the confusion of languages, and the dispersion of mankind after that event, is the widespread affinity existing in different parts of the world of Semitic derivation of words.

The learned Colonel Vallancy says, "that the descendants of Japhet peopled China as well as Tartary, we have no reason to doubt (though when they arrived in that country we cannot pretend to say), and that the language of the Chinese was pretty nearly related to the Hebrew and other tongues, which the learned consider as dialects of it, notwithstanding what has been advanced to the contrary, we own ourselves inclined to believe, Thomasinus, Massonius, Rudbeckius, and Pfefferus seem to have proved almost to demonstration."

Abbé Domenech, who was a missionary in the great deserts of North America, says, after seven years' experience, that "we should not, then, be surprised if the language of the American natives presents the strange phenomenon of a remarkable regularity and richness of expression amidst a great poverty of words. Some of the writers who have treated on this subject assure us that they have found Hebrew and Gaelic names among the idioms of the redskins. We believe the more readily in the accuracy of this statement, as it is a positive fact that many words, syllables, and sounds of these two languages are to be found in those Indian idioms that are most probably of Scythian origin."

Dr. Edwards, another scrutinizer, discovered a remarkable affinity between the Hebrew and the Mohican, one of the native languages of North America, in the use of pronouns as prefixes or affixes to verbs; and Adair, in the *History of the American Indians*, asserts that the natives of the New World are descendants of the Hebrews, and that a vast number of similar words are found among the American Indians and the Hebrews.

Dr. Glass identified many of the words and customs of the Sandwich Friendly Isles with those of Hebrew. Other travellers, Lord Kingsborough and Abbé Clavigero, also found many Hebrew roots and Hebrew customs among the Aborigines of Mexico.

It is supposed that the first language which was spoken

before the confounding of tongues was Aramiac, or what is commonly known as Chaldee, and that the Hebrew, Arabic, and Syriac, were off-shoots of that language, like Italian, Spanish, and Portuguese as being a corruption of Latin.

I must not trespass on your patience in making further quotations from the opinion of other travellers and writers about this topic; but I shall merely confine myself to giving you a few examples of some words in the English language, which have come to my observation, resembling Semitic meaning. Firstly, I must begin with the Arabic analogy, as follows:

Hand, يد *yad*; eye, عين *ain*; neck, عنق *anek*;
between, بين *ben*; crimson, قرمز *Kirmiz*; to cut, قطع *cuta*;
to drub, ضرب *durub*; house, حوش *housh*.

Next comes the Chaldee—

At, אד *ad*; cornet, כרן *coren*; cry, צעק *cra*; eye, עין *eyn*;
de, de, דה of (French); barn, בר *bar*, a son (old English), &c.

The following are English and Hebrew synonyms:—
Among, עם *am*; and, ו *ad*; cane, קנה *cana*; cumin, כמון *cumon*;
cutup, קצף *cusup*; fig, פ *fig*; fruit, פרי *fri*; and he, הוא *hoa*,
in all the Semitic languages. Also earth, papa, mama, and
a number of the numerals.*

The most quaint resemblance that I have seen between the English and Semitic languages is in the common phrase tally-ho; because לחלל *tally* in Chaldee means fox. When a fox-hunter, therefore, calls out “tally-ho,” it means, in Chaldee, the “fox-ho;” or, if this call was taken originally from the Arabic, it means “come here;” because “تعال *taal*” in the latter language means “come,” and “هون *hon*” † here. Perhaps these two words of taal-hon were corrupted originally to *tally-ho*: but, if this resemblance occurs only as a coincidence, it is certainly a very curious accident.

As regards prophecy and the divine promises made in the Old Testament to Abraham and to his seed in general, they have been wonderfully fulfilled. It is related in the third verse of the twelfth chapter of Genesis that God said to Abraham: “And I will bless them that bless thee, and curse him that curseth thee, and in thee shall all families of the earth be blessed.” In the eighteenth chapter of the same

* The Chaldee and Hebrew words are found in the *Englishman's Hebrew and Chaldee Concordance*.

† This word is a corruption of هنا *hinna*, as is used amongst some Arabic-speaking people in Mesopotamia.

Book the blessing is repeated, that *all the nations of the earth shall be blessed* in him. Has not this blessing been marvellously fulfilled to the letter in His offspring the Saviour of the world; and has not Christianity, with all the defects existing in the Church from the time of the Apostles until now, been a great blessing to all the world, whether through philanthropy, morality, or the spread of the Gospel? Mohammedanism would have been an utter failure had not its author taken the Bible as the basis of his pretended divine mission. Even the son of Hagar, Sarah's handmaid, was promised, through his father Abraham, great power and national aggrandisement, but that he would be a wild man, "his hand will be against every man, and every man's hand against him," as his descendants are now; and whether we look to the progeny of Abraham, spiritual as well as temporal, and whether through Isaac, Ishmael, or Esau, we find in the Jew, Christian, and Moslem, God's promised blessing, which can never fail.

That same God who appeared unto Abraham, and even unto Hagar, Sarah's handmaid, in the time of her distress, is still magnified and praised by hundreds of millions of the most prosperous, the most intelligent, and most powerful of the human race; and although some of them do not yet believe in our Saviour, and are still looking for His advent, and others do not acknowledge His divine nature, yet they all look upon the Messiah as a supernatural being.

There is another striking proof of the fulfilment of prophecy in the utter destruction and annihilation of the Assyrian and Babylonian monarchies for their rebellion and pride. God, through His omnipotent power, left no remnant of their sovereignty nor a vestige of their grandeur. To the Assyrian the decree from on high went forth: "O King of Assyria, thy nobles shall dwell in the dust; thy people is scattered upon the mountains, and no man gathereth them!" Where are those Assyrians now and their prowess? There is not a man living who can really say, I am a descendant of those ancient Assyrians, nor is there a trace of the good they had done on the earth. As for Babylon, it was sentenced to be utterly destroyed, and that awful divine edict was carried out to the letter by the Medo-Persian kings, and made that once great and famous city a duughill and a bye-word, as when God overthrew Sodom and Gomorrah! But the Persians whom God raised to chastise the rebellious nations have held their own up to to-day, because it was divinely decreed that they should conquer and be victorious; and in return for the victories which God bestowed upon them, they ordered the rebuilding of His temple at Jerusalem, and thus Persia has

remained an independent monarchy as it was then, and where God Jehovah is acknowledged as the only Lord and King with the revealed religion of the Jews and Christians as the base of their belief in Mohammed.

What shall I say more? Can we look back on the history of Egypt, of Tyre, and of Jerusalem, and not tremble at the awful denunciation of God against the wickedness of nations and their rulers, and see how all those who forgot their Creator and Divine Benefactor have been punished and forgotten by Him? He said it, and is still saying it: "Them that honour me I will honour, and they that despise me shall be lightly esteemed."

Amongst some new theories have been mooted that Abraham's native place was in Syria and not in Mesopotamia, and that Babel meant "the Gate of God," instead of what has hitherto been understood to be derived from the word confusion. The former is founded on the discovery of the name of "Ur" on a brick found in a mound called Magayir, on the western side of the Euphrates, about 180 miles below Baghdad; and the latter, because "Bab-el" meant "Gate of God" in the cuneiform writing! Both theories are mere conjecture, because there might have been two or three "Urs," in Chaldea and elsewhere, the same as Cush; and, with regard to the meaning of "Bab-El" in Assyrian, any one who understands Semitic languages would tell you that you might construe the rendering of certain words in quite opposite meaning.* But why should we adopt a new theory when we are plainly told in Holy Writ that Babel was called thus from the confusion of tongues, the derivation of which no one can deny.† As for Abraham having come from Magayir, or from that neighbourhood, it is a mere phantom, as we are plainly told in the Acts of the Apostles that he was called from Mesopotamia.‡ Moreover, we are told by Nicolas of Damascus,

* "Ajooz" عجوز—the common meaning of this word is old woman; but it has besides no less than 100 other significations, amongst which are, young women of delicate constitution, an old man, heaven, earth, sea, road, vanity, a kind of dart, a point of a sword, a kettle, a pot, &c. Then "Kadr," قدر making great, amazing, confusion, opportunity, cooking in a pot, measuring, fate, price, power, affluence, &c. Then the word "Bab," باب or the first word of Bab-el, means really a door, or a gate, also a chapter of a book, an affair, reason, manner, species, &c.

† Genesis xi. 9.

‡ In St. Stephen's apology before the High Priest he said that "the God of glory appeared unto our father Abraham, when he was in Mesopotamia, before he dwelt in Charran, and said unto him, Get thee out of thy country, and from thy kindred, and come into the land which I shall shew thee."

a Gentile historian, on the authority of Josephus, that Abraham came from the land of the Chaldeans, *above Babylon*.* Then, when Abraham commissioned his servant, Eliezar, of Damascus, to go to Mesopotamia to bring a wife unto Isaac, his son, he told him that he was not to take unto his son a wife of the daughters of the Canaanites, but to go to *his country and to his kindred*.† It must be remembered that when Eliezar was sent to the city of Nahor, Abraham's niece, Rebekah, was living with her brother, Laban, in Northern Mesopotamia, about 300 miles above Babylon; and if Abraham had come originally with his family from Southern Babylon, he would not have said to his servant, "go into my country."‡

Mr. Pinches, who, I am sorry to say, has not been able to attend my lecture this evening, coincides with me regarding the country of Abraham, and in support of my view he has supplied me with the following remarks:—

"There is certainly nothing to prove that the city of Uri, now represented by Mugayi, is identical with the *Ur Kasdim* of the Bible. It is well known that Babylonia bears, in the inscriptions, the names of Sumer and Akkad. Although it may not yet be quite proved, nevertheless it is very likely that (as is contended by several scholars) Sumer was the south, and Akkad the north, of Babylonia. Now the Akkadians, as Professor Friederich Delitzsch rightly conjectured some time ago, did not call their country Akkad, but *Ura* or *Uri*, and it is not unlikely that it is this district, and not the city of Uri, that we are to regard as the *Ur-Kasdim* of the Bible. The country called by the Assyrians and Babylonians *Kaldu* (Chaldea), and which is regarded as the same as the *Kasdim* of the Bible, by the common change of *s* into *l* before a dental, seems also to have been a district in the north of Babylonia (probably the country around Babylon itself), afterwards extended to embrace a larger tract. The compound *Ur-Kasdim* would, therefore, be very naturally used to distinguish Abraham's original home both from the northern *Ura* or *Akkad*, part of Armenia, and from the city of *Uri* or *Mugayi* in South Babylonia."

I have no doubt that most of you are aware that a good deal of discussion and disputes have taken place about the mention in the second chapter of Genesis of one of the four rivers of the Garden of Eden, called *Gihon*, wherein it states that it

* Josephus, *Antiquity of the Jews*, i. 7.

† Genesis xxiv. 4.

‡ It is also related in the fifth chapter of *Judith* that on *Holofernes*, the chief captain of the Assyrian army, asking the Moabite and Ammonite chieftains who the Israelites were, he was answered by *Achior*, the captain of all the sons of *Ammon*, that they were descended of the Chaldeans.

“compasseth the whole land of Ethiopia,” or Cush, and which gave a handle to sceptics to doubt the Word of God. As Cush was only known to historians to mean Ethiopia, and that Ethiopia was in Africa, they thought, therefore, that it was beyond a man’s comprehension to understand how a river, supposed to have sprung from the Assyrian or Armenian mountains, could run round Ethiopia, crossing the Arabian desert, passing through Egypt, and ascending mountains two and three thousand feet high! Here, again, scepticism has been defeated by the discovery of a cuneiform terra-cotta tablet, on which another Cush is mentioned as having been known to the ancients to exist in Cappadocia in Asia Minor. This tablet, which is in the British Museum, has been read by Mr. Pinches, and the following is the substance of his remarks upon it:—

“The question of the situation of the land of Kusâa, as well as that of the form of the name when used to denote the country itself, seems to be set at rest by one of the tablets from which the above list of names of towns is taken. This tablet, which is the first published on plate 53 of the work above referred to,* contains, in the second column of the obverse, the names of the cities and countries in the neighbourhood of the Taurus range of mountains, and includes (l. 13) the land of the Kûsu. It is evident, therefore, from the connexion in which it occurs, that we are to understand by this Cappadocia, and not Ethiopia. This identification sheds at once a new light on two important passages in the Book of Genesis, the first of which is in chapter ii., v. 3, where the river Gihon, which ‘encompasseth the whole land of Cush,’ is mentioned; and the other in chapter x., v. 8, where is recorded the fact that Cush begat Nimrod. Now, in both these passages it has been supposed by some scholars that the land of Cush here mentioned is the same as Ethiopia; but it seems to be much better to identify it in both cases with Cappadocia. The question of the position of Paradise is also connected with these identifications, on account of the removal of the river Gihon up thither.

“Another most interesting matter is the double name system thus brought to light: the Musri of the Black Obelisk (a tribe to the north of Assyria), and the Musri in Egypt, the Cush Cappadocia and the Cush Ethiopia, the Makan and Meluhha in Babylonia, and the districts of the same name in Egypt, all pointing to a connexion in the minds of the people

* The second volume of the *Cuneiform Inscriptions of Western Asia*.

of the ancient world, and opening out interesting ethnographical connexions.

“The question of the original home of the Akkadians is also affected thereby. Cappadocia has always been regarded as a country celebrated for its horses, and it is worthy of notice that the Akkadians nearly always call the horse by the name generally translated ‘animal of the east,’ but a more natural translation would be ‘animal of the country’; and as it seems that the country north of Assyria was also called Akkad, as well as the northern part of Babylonia, the neighbourhood of Cappadocia as the home of the Akkadian race may be regarded as a very possible explanation, and the fact of the cuneiform characters being in use there would, therefore, be no mystery.”

For the last two years we did not do much in Assyria in the way of new discoveries, on account of the antagonism of the Ottoman authorities, who have of late shown their unmistakable antipathy to anything touching the interests of England. Some say that this estrangement was caused by the policy the British Government assumed in the matter of Dulcigno and Thessaly; and others declare that some European intriguers have been at work to prevent us obtaining the renewal of our firman. However, let the case be as it may, it is to be hoped that the Sublime Porte will relent, and allow us to complete our researches in the sites we have already discovered, and in some of which we have been allowed to excavate, off and on, under three successive Sultans for the last thirty-eight years.

The CHAIRMAN (Rear-Admiral Henry D. Grant, C.B.).—I am sure I only speak the feeling of the meeting, in saying that we are unanimous in thanking Mr. Rassam for his very interesting paper. We should be glad to hear Dr. Delitzsch if he would kindly give us some of the results of his experience.

Dr. DELITZSCH.—All I can say is that we Assyriologists, and all who take an interest in Biblical research, cannot praise in terms too high the ability displayed by Mr. Rassam, and the results that have accrued to science by his persevering efforts in unravelling the history of mankind. The discoveries he has been enabled to make have been of the highest value to the student of Biblical history. I lay particular stress on his discovery of one of the most important Babylonian towns which we have looked for in vain for many centuries. The site of Babylon being known, it was not necessary to search for it. There were chiefly two Babylonian towns whose discovery was urgently required: they were Ur and Sepharwaim, both mentioned in the Old Testament. Ur was at length discovered, but Sepharwaim seemed to be lost altogether; yet it was a place most eagerly sought after, not only because it was the Sepharwaim of the Old Testament

—the Sepharwaim of the period before the Deluge—but also because some details of the history of Nebuchadnezzar and of Alexander the Great could not be understood without some knowledge as to the site of Sepharwaim. Now, however, Mr. Rassam has discovered it. His further discoveries made in the temple of the Sun-god at Sepharwaim (Aboo Habba) enable us to go back much further into the history of mankind than we could have done before. Mr. Rassam has found an inscription which gives us the date of one of the oldest known kings, Naramsin, son of Sargon the First. The inscription fixes the date of that king at 3,800 years before Christ.* It is remarkable that this is the same date given by Egyptologists to Menes, the first historical king of Egypt. We can now give almost the whole list of kings from that time down to Nebuchadnezzar and Alexander the Great. There are only, perhaps, twenty or thirty names wanting. I can only add on behalf of all my German Assyriological friends that we are greatly indebted to Mr. Rassam for the invaluable service he has rendered to science.

Mr. RASSAM.—Mr. Boscawen, who has not been able to attend this evening, has sent me a paper touching upon some parts of my lecture, but I fear it is too late to read it. It can, however, be added to the discussion.

The CHAIRMAN.—The deep importance of such discoveries as Mr. Rassam has made commends itself to every student of the Bible, because, although the truth itself does not want any light thrown upon it, as far as that truth is concerned; yet there are, nevertheless, passages somewhat obscure, and upon which, doubtless, great light has been thrown to-night. In the East I have frequently met Mahomedans who have tested the question with regard to the truth both of the Koran and the Scriptures, and who have pointed out the similarity of the two, as if the Koran were the older book of the two. I was astonished to find that Mussulman priest, with whom I discussed the respective merits of the two books, took great interest in the Scripture missions, and used especially to catechise the children in the Bible. I asked how it was that he who believed that the direct line of descent came from Ishmael and not from Isaac could look on the Bible as he did? He said he had studied both books, and he believed that Jesus Christ was a great man, but that Mahomet was a greater; but he thought that in the end the White Throne would rest in the Heavens, and that Mahomet would give way to Jesus Christ. This shows what extraordinary notions become established in people's minds without any foundation to build upon.

Dr. J. A. FRASER, I.G.H.—There is one point referred to in the paper which seems to have been felt as a difficulty, as well in these Oriental inquiries as in regard to what we sometimes see in our own land,—and

*This inscription is also referred to by Mr. Boscawen. Dr. Delitzsch did not read his promised paper—see next page—on his theory of the Chronology in question, upon which it is desirable there should be no hasty decision.—ED.

that is the occurrence of the vestiges of burnt buildings. We know that in many parts of Scotland and in Ireland, and, I think, in England also, there are found those well-known towers which bear upon them the undoubted marks of fire. We have had abundant theories as to how they have been produced, and it is curious to find the same thing cropping up in those distant lands. No one can tell how or why these indications have been produced, or whether intentionally or not. They are found abundantly in Scotland, whence I have specimens of perfectly calcined stonework ; not so hard as Mr. Rassam has described, but still showing evident signs of the action of great heat. It seemed to me, from those I examined, that it is generally the portions remaining above ground which most show the evidences of fire, and it is probably this fact which accounts for their preservation.

Mr. RASSAM.—I have communicated on this subject with Professor Symons, who informed me of the vitrifications in Scotland ; but there is no comparison between the two. The vitrifications in Scotland are not more than three-quarters of an inch deep, but those that are existing at Birs Nimroud are about 20 feet deep, and this makes the question the more difficult to solve. Some suppose this vitrification to have been the effect of lightning ; but that has been proved to be quite impossible, and I am supported by the opinion of scientific men in saying it could not have been so produced.

Rev. R. W. KENNION.—I think another difficulty has cropped up this evening. Dr. Delitzsch spoke of the first King of Babylon having lived more than 3,000 years before Christ ; but that differs very much from the ordinary chronology. Would those who are more learned than I in these matters take notice of this ? I know there are different systems of chronology ; but according to our usual chronology the Flood must have been considerably later. I should like to know how this difficulty is to be got over.

The CHAIRMAN.—Would Dr. Delitzsch kindly say a few words in explanation of the system of chronology on which his statement is based ? I think it would be interesting.

Dr. DELITZSCH.—It would take too much time to explain it now ; but I intend to read a paper on Babylonian and Assyrian chronology before another society next week. Perhaps, therefore, you will kindly dispense with my saying more at present.

Mr. D. HOWARD, V.P.I.C.—I consider Mr. Rassam's a most important paper. It is interesting to look back, as I do, to the days of my boyhood, when the early investigations were made of Birs Nimrud, and when we were getting a little doubtful whether there was any truth at all in the old historians, and many people began to doubt whether or not the histories of the Old Testament or of Berosus were like myths. Then were dug up those unpromising old mounds which gave the most minutely accurate confirmation of the truth of the Bible, and of the records since the Bible,

and enabled them to be pieced together and made to fit in as the evidence of two witnesses often does when we can get at the explanation, although we may have previously been puzzled by the divergencies. There are few more interesting studies in this age of unbelief and scepticism than these most wonderful confirmations of the minute accuracy of the histories given in the Old Testament. When Sepharvaim was missing it was left to Mr. Rassam to find out the lost city. Ur, of the Chaldeans, was also a myth, and it was for Mr. Rassam, again, to find out the truth with regard to it. I confess that most of us have felt great perplexity as to how the river could have wandered about in the South of Egypt; but we have the most simple explanation now offered,—so simple that the wonder is that we did not find it out ourselves. Indeed, there is no better test of true discovery than that it should be so very simple when we have it put before us. (Hear, hear.) We cannot, I think, too highly estimate the value of these discoveries, and although Mr. Rassam has said very little about the difficulties he has had to overcome, the more one knows about what he has achieved the more one values the indomitable perseverance which has resulted in the discoveries of which we have heard to-night. (Applause.)

Captain F. PETRIE (Hon. Secretary). The statement that England is not able to get a firman from the Sultan enabling Mr. Rassam to complete his discoveries is one which must have grated upon the ears of all present. Discoveries such as he has made are to be classed amongst the most important of the many of which Englishmen may well be proud; and yet, England, with her power in the East, and after all she has done in past years for the Porte, is unable to get from it the permission necessary to enable her scientific men to continue their investigations in one of the most interesting spots in the world. I venture to think that this Society would not be exceeding the limits of propriety, if, either in its corporate capacity, or through some of its leading members, it were to place before the Prime Minister those wishes which I am certain are felt by all scientific men upon the subject. (Hear, hear.)

Mr. W. GRIFFITH.—The contribution to Biblical history presented to us this evening is not only one full of interest, but, as we must all admit, it is one of the greatest value. There certainly was great difficulty in connection with the question of where the river Gihon was and what the word *Kashiven* meant; and, while we have received interesting testimony on these points, we have also received testimony as to the integrity of the Old Testament and the integrity of the translators, who have not attempted to veil their ignorance, but have done the best they could to preserve the original text in its entirety; and the more our knowledge throws its light on the text the more it is to be trusted and the better it stands the test of criticism. Mr. Rassam alluded to Noah as the name of the person who escaped the Flood. Any one who knows the history of the names of the East will not only recognise the accuracy of his description, but will admit that the form of name is usually emblematical. If Mr. Rassam could give us any further information about this person and the traditions relating to him, it

would be valuable. One interesting point on which Mr. Rassam has thrown some light is that respecting the names of the monarchs reigning in Babylon and Chaldea. Existing writings do not enable us to complete the list of monarchs of the early Syrian empire who reigned from *Ashur to Sardanapalus* in Nineveh. Diodorus Siculus gives an account of the revolution which deposed Sardanapalus and placed on the throne Pul, who invaded Judæa in the reign of Menahem (2 Kings xv. 19). From that time to the return from the Babylonian Captivity, the Biblical student can himself construct from the sacred books an historical harmony. But afterwards those who have read the Greek historians must have experienced some difficulty in identifying the Old Testament names, in Esther and in Daniel. Some of that difficulty has been removed by the statement of Mr. Rassam which makes Cyrus not the monarch, but the satrap of another monarch. Perhaps he would state whether there is any work in existence containing a catalogue of the monarchs, so that we may be able to identify not only Cyrus but also the others. I believe that Belshazzar's name occurs in the cuneiform writings. (Dr. DELITZSCH. Yes.) In conclusion, I can but say that the statement made by our Secretary must commend itself to all present. There is no doubt that the information given to us by the discoveries which have been made is most valuable, and it is certainly to be deprecated if persons in high power should abstain from using their influence to assist those who are labouring so well in so good a cause. It is to be regretted, when we are likely to make such good progress in the future, that the persons in authority should not do all in their power to help on a cause which is not only doing so much in the way of Biblical antiquity, but which will redound to the credit of the English nation.

The meeting was then adjourned.

APPENDIX BY W. ST. CHAD-BOSCAWEN.

The importance of the discoveries made by Mr. Rassam in the mounds of Abbo-Hubba, Tel-Ibrahim, Birs Nimrūd, and others, cannot be too highly estimated, and each day, as the inscribed records or cylinders yield up their secrets to skilled decipherers, the importance of these discoveries to all students of history, sacred or secular, becomes more and more manifest. In the mound of Abbo-Hubba, the explorer came upon all that remained of a city which can rival Thebes or Memphis in antiquity, and whose traditions extend back beyond the dividing stream of the Deluge. According to the Chaldean historian Berosus, the city had a long existence prior to the Deluge, and it was in the temple of "this city of the Sun" (*πολις ηλιου*) that Xisuthrus, by order of the god Chronos, buried the records of the "beginning, progress, and end of all things."* What actual degree of truth

* Cory, *Ancient Fragments*, pp. 30, 31-33.

there may be in the statement of the antediluvian existence of Sippara of the Sun we cannot tell ; but it is clear that its selection by Berosus as the seat of five of the ten antediluvian kings,* and the depository of the earliest chapters of the world's history, make it out as a city of great traditional antiquity in a land of ancient cities. Indeed, the discoveries of Mr. Rassam show that the city fulfilled in every way the requirements of Berosus. It was a city which, according to its own inscribed records, existed 3,750 years before the Christian era.† And it was the seat of government of one of the earliest of the Chaldean kings, Sargon of Agade, the Babylonian Romulus.‡ Its astronomical data, furnished by the inscriptions, point to an even more ancient date. At the remote period prior to B.C. 3750, at a time when Menes, B.C. 3892,§ was laying the foundation-stones of the Temple of Phtah, round which, in after time, grew up the mighty city of Men-nefer or Memphis, the Chaldean builder-king Zabur|| was laying the foundation-stones of the shrine of the Sun-god, which formed the germ of the city of Sippara, the Chaldean Heliopolis.

The ancient Akkadian name of the city was ZIMBIR, which was the pronunciation of the compound group, $\text{𒌷} \text{𒌷} \text{𒌷} \text{𒌷} \text{𒌷}$ - 𒌷 - 𒌷 , which is composed of the characters, 𒌷 UD = Sun + 𒌷 Kip = desert or plain, 𒌷 , NUN = great or wide. So that Zimbir of the Akkadians was "the city of the Sun in the great plain." The plain,—the EDIN of the Akkadians, and the TSERU of the Semites,—is clearly the 𒌷 of Wilstein, and the Dura of the Book of Daniel. It was this plain in the land of Shinar that was the site of the terrestrial paradise, and of the founding of the Tower of Babel. The inscriptions discovered on the spot show that the dual cities of Sippara were places of the highest importance in Babylonian history, and we may expect to find in the record chambers of these cities not the books of Noah, but records extending very far back to the threshold of history. It seems evident the two cities were really two quarters of the same city, as are London and Westminster. The one, and probably the most ancient, was called "Sippara of the Sun-god"; the other, Sippara of Anunituv ; and in each was a great temple to the presiding deity. The temple of the Sun-god was discovered by Mr. Rassam in 1880, and was called $\text{𒌷} \text{𒌷} \text{𒌷} \text{𒌷} \text{𒌷} \text{𒌷}$ 𒌷 $\text{𒌷} \text{𒌷} \text{𒌷}$, E-PARRA, "the Sun-house," or "the house of light." It was in this temple that Mr. Rassam found the important tablet giving the account of the restoration of the temple by Nabu-apla-iddin ("Nebo has given a son"), the contemporary of Assurnazirpal, king of Assyria (B.C. 885). It is very interesting to see how

* Almelon, Ammenon, Amegalarus, Daonus, Edorankhus.

† This date is founded on statement in a cylinder of Nabonidus which places Sargon 3,200 years prior to B.C. 550.

‡ See Smith, *Chaldean Genesis* (Sayce's Edition), p. 319 *et seq.*

§ The date, according to Lepsius.

|| In the copy of the cylinder of Sagga-ragtiyas, given by Nabonidus (W.A.I., i., pl. 69, line 29 *et seq.*).

remarkable a resemblance this temple, which was much more ancient than this date, bears to that of Solomon at Jerusalem. It consisted of two chambers,—the outer, the *ekallu* or “house,” the היכל or “holy place” of the Jewish temple; the inner, called *parraku*, the cella or veiled-off portion,—corresponding to the “holy of holies,” the קדש הקדשים of the Jews. In the outer chamber was the altar of sacrifice, which was very large. In the inner was the image of the Sun-god, dedicated by King Nabu-apla-iddin in gratitude for his aid in defeating the Sutu * or northern Elamite tribe. Having granted certain lands to the temple, the king also arranges for the provision of sacrifices in the temple. And from this and other inscriptions from Babylonia we find a very close agreement between the sacrificial codes of Babylonia and Assyria. The important passage in the tablet of Nabu-apla-iddin (Cols. IV. and V.) will become, along with the Phœnician inscriptions of Carthage and Marseilles, a great basis for the criticism of Hebrew Levitical law. The skin, the rump, shoulders, choice portions of the interior, and other portions were selected for the sacrifice, those mingled with wine, milk, honey, and fruits made the code of offerings in this temple. The Hebrew Sepharvaim (שֶׁפְּרַיִם) and the Babylonian Sippara are both dual forms, and indicate the double nature of the city, which is quite borne out by Mr. Rassam’s discoveries. Adjacent to the temple of the Sun-god there were found several chambers decorated in black and white, these were evidently part of the temple of the goddess Anat, whose attribute as Venus, the morning and evening star, would be symbolised by these colours. In one of the astronomical inscriptions, Venus, at the rising Sun, is Anat of Agade; Venus, at the setting Sun, is Anat of Erech. And Nabonidus, in the inscription discovered by Mr. Pinches, invokes the goddess as “she who with the rising and setting sun gladdens the rule of Nabonidus.”

It was this pair of deities, Anat, Anunitiv or Anatis, and Shamas, the Sun-god, that were worshipped by the Samaritans who were transported from Sepharvaim by Sargon (2 Kings xvii. 32). We are there told that the men of Sepharvaim made their children pass through the fire to Adrammelech and Anammelech. It is evident that we have here two forms of the goddess Anat, for we are told that she was regarded as both a god and a goddess. At sunrise she was masculine as the god Adar or Ninip, the Adrammelech of the Hebrew writer, while at sunset she was Anat or Anammelech, “the queen of heaven.” It was the very close resemblance between the external rituals of Sippara and those of the Jews that made the Samaritans so soon adopt the Jewish code, and it is possible that we may yet find many inscriptions there which will throw light upon the origin of this people, whose last representatives are to be found in the small congregation at Nablous. It is a most important fact that the two cities described by Mr. Rassam in this paper, as buried beneath the mounds of Abbo Hubba and

* These Sutu, sometimes called Šu, are the Shoa of the prophet Ezekiel (ch. xxiii. 23).

concubines of the king and his nobles would be present. It was during this feast that the advance guard of Cyrus, under Gobyras, entered the city *bala zaltuv*, "without fighting," and "Belshazzar was slain" (Daniel v. 30). Nabonidus, when captured, was brought from Borsippa to Babylon, and Cyrus himself entered Babylon in triumph on the 3rd day of the month Marchesvan,—that is, three months after the capture. *Ugbaru*, or Gobyras, who was governor of Gutium, or Kurdistan, chief of the army of Cyrus, was appointed by Cyrus to be *his governor* (pikhati-su)*, and other governors in Babylon he appointed, amongst whom, in all probability, were Daniel and his companions.

Passing now to the explorations carried out by Mr. Rassam on the ruins of Borsippa, in the mounds of the Birs Nimrud, and that of Ibrahim-el-Khaleel, we find that he has restored to us most important remains, and cleared up several obscure points, in sacred and secular history. The excavations carried out by Mr. Rassam in the Birs Nimrud reveal most probably the site of the great temple of Nebo, called Bit Zida (𒂗𒍪 𒍪𒌷 𒍪𒌷), "the house of Life," which was, however, distinct from the Birs Nimrud, which is evidently the "Temple of the Seven Spheres of Heaven and Earth,"—the ancient Tower of Babel. The ruined building found in excavating at Ibrahim-el-Khaleel is probably the palace of Borsippa destroyed when Nabonidus was captured, and partly rebuilt at a later period.

The identity of Borsippa, or Birs Nimrud, the tower of Nimrod, with the "Tower of Babel," seems now to be established on as firm a basis as we can ever expect it will.

The inscriptions show that "BAD-SIABA," the City or Fortress with the horned Tower, or BAR-SIBA, the "Altar of the Prince," was also called by Akkadians 𒂗𒍪 𒍪𒌷 𒍪𒌷 + Babilu II, "Babylon the Second," thus showing how the classical writers came to include it in Babylon, and to make the Euphrates pass through the city. The tower of Borsippa was therefore also the tower of Babel or Babylon, and the inscription on the Ballawat Gates (Trans. Bib. Arch., vol. vii., pp. 106-7), show that it was distinct from the Eternal House or Temple of Life, E-ZIDA, the Shrine of Nebo; for the king, Shalmaneser, says, "He went also to E-ZIDA, and the house of his oracle firmly he fixed." A few lines on we read, "the house of the gods, the tower of Borsippa, and E-ZIDA." This great tower, we are told by Nebuchadnezzar (W.A.I., vol. i., pl. 51, col. 1, 27), was called 𒂗𒍪 𒍪𒌷 𒍪𒌷 𒍪𒌷 — "Bit uru Sibbite Samie u irziti," "the house of the Seven Spheres of Heaven and Earth,"—the stage-tower (*Zikurat*) of

* Upon this evidence we must certainly identify Ugbaru or Gobyras, who was a Mede, with the Darius, the Mede, of Daniel (v. 31), who ruled in Babylon while Cyrus resided at Susa and Ecbatana. See Trans. Soc. Bib. Arch., vol. vii., part i., p. 166.

† W.A.I., vol. iv., pl. XX. 10, and vol. iii., pl. 4.

Borsippa. It had, according to Nebuehadnezzar, fallen into decay, and he thus speaks of it, "Concerning this temple of the Seven Spheres of Heaven and Earth, which a former king had made, and *forty-two cubits* had erected but had not completed its summit." From ancient days (*Yumi rekute*) it had decayed, and there was no exit for the waters (with) which the rain and storms had filled its interior. The brickwork of its casing had cracked, and the interior of its mass had poured out in heaps.* It is evident that this tower was regarded by Nebuchadnezzar as most ancient and long neglected, and fallen into decay. If we compare this statement with the fragmentary legend of the confusion of Babel, found on a tablet (K 3,657), we shall see that the identification of the Birs Nimroud with this tower is possible. From this tablet it appears that an ancient king, probably ETANNA—the Titan of the Greeks—caused the Babylonians to sin against "the father of the gods," by leading them to build a great tower. Small and great he mingled (*uballu*) on the mound. As they built by day the offended god threw down the work at night. At last as they persisted in the evil work, we are told that the great god "in his anger" poured out a secret decree; "to confuse their speech he set his face," and "to make hostility in their counsel." This important phrase, "to confuse their speech," *bällu tamaslie*, בלל תמשלי, is almost an exact counterpart of the Hebrew in Genesis xi. 7, "Come, we will go down and there confound their speech"; that is in Hebrew, ונגדלם שם שפתם. In Assyrian *maslu*, Hebrew *maslu*, *siptu*, the Hebrew שפט, have both the meaning of "speech," "sentence," or "repetition by lip." The gods then destroy the "tower by a whirlwind and storm," and "this sin of the Babylonians was to last like heaven and earth." It is evident from the fact that Merodach is entrusted with the punishment of the Babylonians who do this, that the tower was built outside Babylon proper, and most probably in Babylon the Second or Borsippa. The God of Heaven, Anu, is here called "the King of the Holy Mountain," this is the mountain of the gods on which the ark rested, and whose summit was the Olympus of Chaldean mythology. Like the Indian mountain of Meru, all the Babylonian stage-towers were built in imitation of it. The name given to it was "the Temple of the Seven Spheres of Heaven and Earth," as the Babylonians taught that there were seven cycles of Heaven and seven of the under world,—as the Mexicans taught there were nine such cycles, and each built their stage-towers according to this symbolism.

With regard to Ur of the Chaldees being identical with the ruins of Mughier, I think there can be very little doubt when we

* This passage was translated by Dr. Oppert in Smith's "Bible Dictionary" (p. 1,554), as "A former king built it, they reckon, 42 *ages*, but he did not complete its head. Since a remote time people abandoned it, without order expressing their words." As this fanciful translation is so often quoted, it is as well to correct it, and thus avoid a second Babel confusion.

ORDINARY MEETING, APRIL 2, 1883.

H. CADMAN JONES, ESQ. IN THE CHAIR.

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

MEMBER :—Rev. A. Jones, B.D., London.

ASSOCIATES :—Right Rev. J. Horden, B.D., Bishop of Moosonee, Canada ; Major-General R. S. Dobbs, Ireland ; T. Tighe Chapman, Esq., Ireland.

Also the presentation of the following works for the library :—

“Proceedings of the Royal Society.”	<i>From the same.</i>
Two Pamphlets by President Calloway, D.D.	”
Two „ „ Rev. A. Jones, B.D.	”

The following paper was then read by Mr. T. K. CALLARD, F.G.S., the author being unavoidably absent :—

THE ORIGIN OF MAN. By the Ven. JOHN W. BARDSLEY, M.A., Archdeacon of Warrington.

TO read a paper before the Victoria Institute, and especially on such a subject as “The Origin of Man,” would overwhelm me with confusion, were I not secure in the indulgence of my friends, the strength of my arguments, and that presence which the Master will vouchsafe to the least of them that put their trust in Him. May He vouchsafe to make my paper helpful to some in whose minds incipient misgivings, it may be, have found a place, whilst confident statements have been dinned into their ears in reference to “the origin of man,” which they themselves have had neither the time nor the opportunity to test. As far as is possible, I shall avoid loading my paper with extracts from philosophical treatises and the use of scientific formulæ. In the selection of the evidence to be adduced and in the principles to be laid down,

I have set before myself as a binding canon that in such studies we cannot accept facts too thankfully, test theories too rigorously, and arrive at conclusions too cautiously. At the outset let me remark, on the one hand, that the subject cannot be overrated in its importance, and, on the other hand, that, as our ignorance transcends our knowledge, so we must patiently yet confidently wait for the solution of some seeming difficulties. Its importance arises from the fact that the natural cosmogony of Genesis and the spiritual cosmogony of the Gospel are bound together by countless analogies. To cast aside the creation of Genesis would be to remove the foundation from our Creeds, and to tear down the doctrinal structure of our holy faith, besides destroying one of the greatest arguments for the observance of moral duties and of religious worship. The grounds for confidence in the future manifestation of perfect harmony between the teachings of science and the revelations of Scripture rest in the fact, that in the past their exquisite adjustments have been made more and more apparent as time has passed and light has been given. Sceptics, for example, have often made merry concerning the fancied inaccuracies by which Moses gave grapes to Egypt; Daniel, a Belshazzar, to be ruler of Babylon when the city was taken; St. Luke, a Proconsul instead of Proprætor to Cyprus; and the prophet an abundance of water to pour over the altar when the drought was great in the land; but the tombs of Egypt, the cylinders of Babylon, the coins of Cyprus, and the shells of the fount on Carmel have all risen from the ground to proclaim the sceptics wrong, the Scriptures right. From the experience of the past let us learn to tarry the Lord's leisure, for, though the explanation may be deferred, we may rest assured it will not ultimately fail. There are three topics in connexion with our subject on which errors prevail, in reference to which we shall do well to contrast the statements of the Word of Truth as affirming that the origin of man is a common origin, that the origin of man is comparatively modern, and that the origin of man is divine.

1. *The Common Origin of Man.*—Do the races of men, however distant and however diverse, possess one common nature, and own one common Father? If we appeal to the Scriptures, there is but one answer, and this openly declared and tacitly assumed: "And Adam called his wife's name Eve, because she was the mother of all living" (Gen. iii. 20); whilst, after the Deluge, the record of the generations of Noah concludes (Gen. x. 32): "These are the families of the sons of Noah after their generations in their nations, and by these

were the nations divided in the earth after the flood." The echoes of these statements were heard on Mars' Hill more than 2,000 years afterward by the philosophers who boasted themselves autochthons, whilst the Apostle proclaimed that "God, who made the world and all things therein, hath made of one blood all nations of men for to dwell on all the face of the earth" (Acts xvii. 24-26). This truth, however, not only stands out prominently in the pages of Revelation—it underlies the whole structure. Because men are of one blood, the nature which Jesus took and the blood which He shed can save and cleanse wherever men are found,—“As in Adam all die, even so in Christ shall all be made alive.” But the headship and federal character of the two Adams can have no existence unless this truth be received. The brotherhood of men and the universal redemption of Christ are bound up with it as social ethics and as Scripture truths. Had there not been a common source, there had not been a common sin and a common salvation. Those who have read a deeply suggestive sermon of Bishop Ellicott on “The Restitution” (in his little book on *The Destiny of the Creature*) will never forget how, having argued from the Mosaic statement that, whilst in creation the earth brought forth abundantly and the waters teemed with life, man, the lord and sovereign of all, came forth from the hands of his Maker the single representative of his race (single, I say, for the helpmeet is subsequently furnished, and that out of his own body), the Bishop goes on to speak of unities more mysterious and more comprehensive. In the fact of man being a personal being, in contradistinction to the collective races of lower animals, the Bishop finds the basis whereby he argues from the oneness of the race in creation and in the sin of one, that is Adam, to the oneness of the redemption and the restoration by the one, that is Christ Jesus. “The descent of all mankind from one pair,” says the Bishop of Lincoln, “what is it but a foreshadowing of the union of Christ with His Church, and of the spiritual derivation of all the faithful in every age and nation from that mystical union which is betwixt Christ and His Church?” If we would rightly divide the Word of Truth in reference to its central doctrinal teachings, we cannot but hold fast to its historical statements as to “the common origin of man.”

If, however, the question as to the common origin of the human race be proposed to some men of science, the reply will be far different. With Voltaire, some would say, “None but blind men can doubt that the whites, negroes, Albinos, Hottentots, Laplanders, Chinese, and Americans are entirely distinct races.” Some would adopt the language of Dr. Morton,

“ Our species had its origin not in one, but in several or in many creations; and these, diverging from their primitive centres, met and amalgamated in the progress of time, and have thus given rise to those intermediate links of organisation which now connect the extremes together.” “ Here,” he says, “ is the truth divested of mystery—a system that explains the otherwise unintelligible phenomena so remarkably stamped on the races of men.” It is this view, that there was no common central origin for men, but an indefinite number of separate creations from which the races of men have sprung, to which Agassiz gave the sanction of his name, subsequently seeking to prove that there are eight regions of the earth, each containing its own fauna and its own peculiar type of man, and that what are called human races, down to their specialisation as nations, are distinct primordial forms of the type of man.

In whatever terms those replies are couched, they contain statements which cannot in my judgment be reconciled with the statements of Scripture. “ The unity of mankind,” says the Duke of Argyll, “ is too deeply interwoven with the fundamental doctrines of Christianity, and is not easily separated from principles which are of high value in our understanding both of moral duty and of religious truth.” Amid this conflict of response there are certain facts which will occur to most of us in confirmation of the Scripture reply, affirming the common origin and unity of the species of man.

(a) Let me name the law of hybrids. It is a general principle that beings of distinct species, or descendants from stocks originally different, cannot produce a mixed race which shall have the power of continuing itself. Mules, for example, cannot continue the mongrel race. Were species capable of blending with one another indefinitely, they would be no longer recognised. The system of life would become an unintelligible chaos; the temple of nature would be fused over its whole surface and throughout its entire structure. It is, however, an admitted fact, that from the amalgamation of races most diverse, be they Caucasian, Mongolian, or African, offspring may arise and races be indefinitely prolonged; and from this fact of a common nature we are entitled to draw a proof that God has made of one blood all nations to dwell in all the face of the earth.

(b) And, further, we cannot but remember that, be the varieties between the different races of men as marked as they may, they are only external, and such as affect the hair, the skin, the skull. The colour of the skin is of all organisms the most liable to change; and, as regards the skull, greater

differences often exist between the skulls in one and the same race than between the skulls of different races on which stress is laid. In the species around us skulls of the wild boar and of the domestic swine differ as strikingly as do the skulls of the typical African and European. In the fierce bloodhound, trained to harry down the helpless slave, and the noble dog of St. Bernard, with its life-saving instincts, we see varieties in the same species as great as any that manifest themselves between any existing races of men, however diverse. In reference to structural and other differences between different varieties of man, we may say, with the Duke of Argyll, that "they are comparatively trifling, and that it may safely be affirmed that all the efforts of anatomists and physiologists, who have been most determined to magnify every point of variation, have utterly failed to render it impossible or improbable that all men have had a common ancestor."

Happily we can appeal to scientific men of the very highest attainments for more than a possibility, or even a probability, that the Scripture reply is on this point the Word of Truth. They declare that the bones in the skeletons of all men are the same in number, arrangement, and disposition; that the blood-vessels are the same in distribution; that the muscles—thousands in number—are the same in all; that the brain, the spinal marrow, the nervous system are the same in all; that the processes of respiration, digestion, secretion, and propagation are the same in all; and that a system of anatomy, compiled in Europe from an examination of the bodies of Europeans only, would be as applicable to Asia, Africa, America, and Australia, as in Europe itself, and that all mankind are of one and the same species. Delitzsch has well summed up their conclusions in the following words: "That the races of men are not species of one genus, but varieties of one species, is confirmed by the agreement in the physiological and pathological phenomena in them all, by the similarity in the anatomical structure, in the fundamental powers and traits of the mind, in the limits to the duration of life, in the normal temperature of the body, in the average rate of pulsation, in the duration of pregnancy, and in the unrestricted fruitfulness of marriages between the different races." The words with which Prichard—no ordinary man, for Dr. W. B. Carpenter says of him, "Prichard was a physiologist among physiologists, a philologist among philologists, a scholar among scholars"—the words with which he concludes his great work on "*The Natural History of Man*" will be in the memory of all. Having, according to the strict rule of scientific scrutiny,

closed his eyes to all extrinsic evidence and abstracted his mind from all considerations not derived from the matters of fact which are immediately on the question, he affirms: "The differences of men are not distinguished from each other by strongly marked uniform and permanent distinctions, as are the several species belonging to any given tribes of animals. All the diversities which exist are variable, and pass into each other by insensible gradations, and there is, moreover, scarcely an instance in which the actual transition cannot be proved to have taken place." And again: "We contemplate among all the diversified tribes who are endowed with reason and speech the same internal feelings, appetences, aversions; the same inward convictions, the same sentiments of subjection to invisible powers, and more or less fully developed accountableness or responsibility to unseen avengers of wrong and agents of retributive justice, from whose tribunal men cannot even by death escape. We find everywhere the same susceptibility of admitting the cultivation of these universal endowments, of opening the eyes of the mind to the more clear and luminous views which Christianity unfolds, of becoming moulded to the institutions of religion and of civilised life; in a word, the same inward and mental nature is to be recognised in all the races of men. When we compare this fact with the observations which have been heretofore fully established as to the specific instincts and separate physical endowments of all the distinct tribes of sentient beings in the universe, we are entitled to draw confidently the conclusion that all human races are of one species and one family."

I do not think it necessary to continue these evidences in support of the Scriptural statement; but, were it needful, I might appeal to those who have studied deeply the traditions, the calendars, the mental and moral affinities of the different races which have peopled, and do now people, the world, and from each and all the verdict will be in favour of the common origin of man. Were our meeting one for dialectical sport, and not for reverent inquiry as to "What saith the Word of Truth?" it would afford amusement to bring forth the representatives of certain scientific theories, and then, amid the din and dust of the arena, to look down from the unshaken vantage-ground whilst they buffeted and vanquished each other. In this way we might appeal to Lyell in favour of the common origin from a single pair,—“a doctrine,” he says, “against which there appears to me to be no sound objection”; or to Darwin himself; for not only may we gather the probability from his works, wherein he demonstrates that there may be produced within the limits of one admitted

species of animals, by artificial selection and hereditary transmission of peculiarities, diversities infinitely greater than those existing between the highest and lowest races of mankind; but, for example, in his work on "The Expression of the Emotions in Man and other Animals," he says, "All the chief expressions exhibited by man are the same throughout the world. This fact is interesting, as it affords a new argument in favour of the several races being descended from a single parent stock." And again: "If we bear in mind the numerous points of structure, having no relation to expression, in which all the races of man clearly agree, and then add to them the numerous points, some of the highest importance and many of the most trifling value, on which the movements of expression directly or indirectly depend, it seems to me improbable in the highest degree that so much similarity, or rather identity, of structure could have been acquired by independent means, as must have been the case if the races of man are descended from several aboriginally distinct species. It is far more probable that the many points of close similarity in the various races are due to inheritance from a single parent form."

I must not close this part of my subject, however, without indicating briefly the intensely interesting support which is being rendered to the cause of the Word of Truth, not only on the common origin but also the common language of man, by the science of comparative philology. Time was when from the apparently different species of language the strongest arguments were brought against the common origin of man. It is from that same quarter the doctrine is now receiving its most weighty support. Great authorities like Dr. Latham, regarding it now as a matter of fact that all languages had a common origin, argue therefrom the original unity of man. In his interesting work on "The Origin of Nations," Canon Rawlinson, speaking of the 10th of Genesis, a chapter written 3,000 years ago by a Jew, for Jews, to explain the interconnexion of races, regards it as one of the proudest boasts of the nineteenth century that its inductive science has arrived at almost exactly the same conclusion which Moses, writing 1,500 years before the Christian era, laid down dogmatically as simple historical fact. Max Müller, having affirmed that the evidence of language is irrefragable, and is the only evidence worth listening to with regard to ante-historical periods—the times when Greece was not yet peopled by Greeks, nor India by Hindoos—adds: "Yet before these times there was a period when the ancestors of the Celts, the Germans, the Slavonians, the Greeks and

Italians, the Persians and Hindoos, were living together beneath the same roof." "Many words," says he, "still live in India and in England that have witnessed the first separation of the northern and southern Aryans, and these are witnesses not to be shaken by any cross-examination. The terms for 'God,' for 'house,' for 'father,' 'mother,' 'son,' 'daughter,' for 'dog' and 'cow,' for 'heart' and 'tears,' for 'axe' and 'tree,' identical in all the Indo-European idioms, are like the watchwords of soldiers. We challenge the seeming stranger, and whether he answer with the lips of a Greek, a German, or an Indian, we recognise him as one of ourselves, and there is not an English jury nowadays which, after examining the hoary documents of language, would reject the claim of a common descent and a spiritual relationship between Hindoo, Greek, and Teuton." Bunsen has shown the Asiatic origin of all the North-American Indians, and of Africa Latham has said: "That the uniformity of languages throughout Africa is greater than it is either in Asia or in Europe, I have not the slightest hesitation in committing myself." For these philological arguments each day additional evidence is found, not merely by the correlation of words, but in the grammatical structure,—the bones and sinews which retain their shape and signification with such marvellous persistency. The closest and most distinct affinities have been discovered between the languages of the South Indian Tamil country and the languages of the Finns and Lapps of Northern Europe and the Agrians of Liberia. "Thus," says Dr. Caldwell, "the pre-Aryan inhabitants of the Deccan have been proved by their language alone, in the silence of history, in the absence of all ordinary probabilities, to be allied to the tribes that appear to have overspread Europe before the arrival of the Goths and of the Pelasgi, and even before the arrival of the Celts." Well may he add, "What a confirmation of the statement that 'God hath made of one blood all nations of men to dwell upon the face of the whole earth'!" Surely, brethren, we may not only with confidence rightly divide the Word of Truth concerning the common origin of man, but with thankfulness for the researches of those who, from a scientific point of view alone, have arrived at the conclusion that in the beginning men were of one language and of one speech, and that of one family of man the whole earth was overspread.

2. *The Modern Origin of Man.*—Here, be it observed, the question before us is the origin of man, not that of the earth. That enormous periods have elapsed since the earth's foundations first were laid I cannot but regard as for ever settled.

Among the benefits which science has rendered there have been none greater than the light it has thrown upon some parts of the sacred record which are found to anticipate (when rightly questioned) on this point the discoveries of science. That the fossils which seem to testify of ages long past, and of progressive development, should have had such features of antiquity stamped upon them by the God of truth, though by Him created in a literal day, is a theory which, constructed as it may have been by some timid believer, is utterly abhorrent, as I venture to think, to a right dividing of the word of truth. Happily, there is one aspect of the modern introduction of man upon the earth in which well-nigh all will be agreed. If we lay aside that chronology which is measured by years, and consult that which consists of the sequence of events, we shall find that the fundamental truth of man's origin, as recorded in Genesis, viz., that he is the climax, the consummation and crown of God's creation, is the testimony which geology has always given. Of all the creatures that have been formed to live, it testifies that man is the latest form. "No geological fact," says Professor Dawson, "can now be more firmly established than the ascending progression of animal life, whereby from the early invertebrates of the Eozoic and Primordial series we pass upward through the dynasties of fishes, and reptiles, and brute mammals, to the reign of man. In this great series man is obviously the last term. And when we inquire at what point he was introduced the answer must be, in the latter part of the Kainozoic or Tertiary period, which is the latest of the whole. Not only have we the negative fact of the absence of his remains from all the earlier Tertiary formations, but the positive fact that all the mammalia of these earlier ages are now extinct, and that man could not have survived the changes of condition which destroyed them and introduced the species now our contemporaries." In this confirmation from science of the exact position of man in the order of God's creation, as recorded by Genesis, we may well rejoice. When, however, we turn to that chronology which is measured by years, if God's Word on this point be the Word of Truth, we cannot but recognise that much erroneous teaching prevails.

To the question, When did man appear on the earth? the Word of Truth gives no exact date; for I need not remind my brethren that the marginal 4,004 is of no binding authority, and is but the result of one among the 180 systems of chronology which have been broached as to the period which elapsed between Adam and the birth of Christ. Of all these systems, the lowest numbers about 3,500 years, the highest about

7,000. A whole library has been written concerning the longer and shorter Hebrew chronologies, and now probably the balance of opinion will be on the side of Canon Rawlinson, when, in *Aids to Faith*, he argues in favour of the Septuagint version, in preference to the Hebrew text, and thus adds six centuries to the generally received period which elapsed between the creation of Adam and the Deluge. The corruptions which have crept into the text must have taken place since the time of Josephus, when the Septuagint translation and the Hebrew were in accord. The present discrepancies affect, however, not the facts of the narrative, but the number of years; and, with an ample margin for all these discrepancies, it will not be possible, by any arrangement of Bible dates, to consider the creation of our first father as an event more remote from us than 7,000 or 8,000 years. This reply, however, which Scripture constructively renders, is far different from that which many men of science have proposed, and especially those who have been among the foremost defenders of the common origin of man; and in their divergence concerning the date of man's origin we have, it has been said, one of the questions which stand in the way of an *entente cordiale* between science and religion. When, however, we ask these men of science for their answer, we find scarcely two alike. Bunsen, with his study of Egyptian history, pleads for 20,000 years before Christ. Wallace, in his book on *Natural Selection*, says: "We can with tolerable certainty affirm that man must have inhabited the earth a thousand centuries ago." Sir Charles Lyell asks for "a vast series of antecedent ages"—"periods of incalculable length, which figures cannot enable us to appreciate"; whilst Waitz, in his learned work on the *Anthropology of Nations*, allows us the choice between thirty-five thousand million and nine million years as the period of man's existence upon the earth. When we seek to test these varied dates, we shall have the more reason to affirm that no weapon framed against the Word of Truth can ever prosper. The speculations of Bunsen need not detain us. Rawlinson, in *Aids to Faith*, and Archdeacon Pratt, in his valuable treatise, *Scripture and Science not at Variance*, have shown their foundations to be upon the shifting sands of unreliable scraps of Greek chronology and the deceptive deposits of Nile mud. To arguments in favour of the vast ages which some have required for the development of physical differences, and the creation of languages in the races of men, the following reply from a paper by Professor Dawson may be new, and will not fail to interest. Referring to such facts as that the negro is as much a negro now as in the days when

the Egyptian monuments were reared, and that the fair hair and blue eyes of the Germanic races were contrasted with the dark hair and dark eyes of the South Italian beauty, when Juvenal wrote, as much as now, and to the arguments based thereon, for vast periods wherein physical changes could have been developed, he adds, "A new law, however, is coming into view—it is, that species when first introduced have an innate power of expansion, which enables them rapidly to extend themselves to the limits of their geographical range, and also to reach the limits of their divergence into races. These limits once reached, the races run on in parallel lines until they one by one run out and disappear. According to this law the most aberrant races of men might be developed in a few centuries, after which divergence would cease, and the several lines of variation would remain permanent, at least so long as the conditions remained under which they originated. This new law is coming more distinctly into view, and will probably altogether remove one of the imagined necessities of a great antiquity of man. It may prove also to be applicable to language as well as to physical characters."

It is, however, in geology and the existence of human remains in the earth's crust that the advocates of high antiquity for man find, as they suppose, their strongest proofs. The argument has been thus fairly stated:—"The modern doctrine of man's high antiquity rests mainly on two premises, though these are supplemented by other presumptions of a secondary kind. First, certain flints from Brixham Cave, the valley of the Somme, and caverns in Belgium, are affirmed to have been plainly fashioned into tools, spears, or hatchets by the hands of savage men. And, next, the beds of gravel or stalagmite where they were found are said to have been deposited many myriads of years ago." Now, in reference to these two premises, if either fail, the conclusion is rendered invalid.

(a) As to the first, viz., the artificial character of the so-called flint implements,—whilst on the one hand there are those who do not scruple to declare that "a flint flake is to an antiquary as sure a trace of man as the footprint in the sand was to Robinson Crusoe," and, again, that "the flint hatchets of Amiens and Abbeville seem to the writer as clearly works of art as any Sheffield whittle"; on the other hand, there are experts who can find no evidence in support of such an opinion, but who, on the contrary, regard the evidence that the fractured flints are formed by natural causes to be abundant and conclusive. They point to the fact that, if flint nodules be thrown into such a machine as Blake's stone-breaker, flakes will come out in splinters as perfect as any now referred to human

workmanship, and entitled spearheads, arrowheads, and knives ; and that by similar pressure such forces of nature as the planing, rasping, and crushing power of a deep mantle of land ice pushing its tortuous way to the sea would produce all the forms of flakes and cores that we actually find. They point again to the fact that these so-called tools are found in such abundance in some districts that, if the theory be maintained that they are implements lost by hunters, the ratio of lost axes to the savage population must have been as six millions to one. They point once more to the fact that with these implements found in the drift no relics of man are found—not a shred of his clothing, not a fragment of his pottery, not a trace of his abode, not a vestige of his habits and pursuits, not a bone of his frame ; and therefore that it would not be easy to find a case in which so large a superstructure had been built on so slender a foundation.

(b) As, however, there are those who contend that some at least among these flints have been formed by man, we will concede the first premiss, and admit for argument's sake that they are artificial, and further also admit that they are coëval with the drift in which they are imbedded. The second premiss, however—viz., that myriads of ages have elapsed since the deposit of the drift—is scientifically unproven. If by the term "drift" we indicate all those deposits of gravel and mud which have taken place since the glacial period, and which cover what may be called the human period, we shall find the utmost divergence of opinion as to the time in question. Sir Charles Lyell contends that the glacial period must be reckoned at 800,000 years ago. Sir John Lubbock is contented with 200,000, M. Adhemar with 11,120, whilst Professor Andrewes contends the ice age ended barely 8,000 years ago. And, as the answers are unsatisfactory, so the modes of computation and the evidences adduced are superficial. The application of the law of averages as applied by Lyell has been admirably exposed by Professor Birks in his pamphlet on "Modern Geogonies," and a folio might be filled with the histories of the discoveries that have covered the finders with ridicule. The human jaw of Abbeville was, Dr. Carpenter bears witness, a successful "plant." The pottery found by Horner in the Nile deposit, and on which an extended chronology was founded admitting no error, no fraud, was proved of no geological value, when Roman pottery was found at even lower depths. That the remains of man have been found with the bones of extinct animals is readily admitted ; but "this does not seem," says Prestwich, "to necessitate the carrying of man back in past time so much as the bringing forward of

the extinct animals toward our own time." That systems should be built up in contradiction to the Word of Truth on evidence such as this warrants the application of Archbishop Whately's stern rebuke in a similar case:—"A theory supported altogether by groundless conjectures and inconclusive reasonings, this procedure may be put forward as science, but it is a science which is neither Aristotelian nor Baconian, for it consists in simply begging the question." Shall we not protest when, upon such evidence as this, we find our popular manuals, our newspaper writers, our encyclopædia compilers, flooding the minds of the young and of the uninstructed with the assumption of conclusions on man's high antiquity which are absolutely unproven?

Assuredly, when we seek to divide the Word of Truth aright, we may confidently proclaim the Bible teaching of man's modern origin, since science itself assures us, by the mouth of Cuvier, that man's traditions and historical consciousness in no nation go further back than two or three thousand years before Christ, and since geologists of the first rank declare that "the annals of Genesis afford time for all the geological and palæontological sequence so far as the flint-tool makers are concerned."

III. *The Divine Origin of Man.*—I hasten, in the third and last place, to contrast some prevalent errors in reference to the cause of man's origin with the statements of the Word of Truth. In Scripture it is clearly asserted, not only that God made man, but that it is by Him our souls are maintained in life. The passages will at once occur to all our minds. St. Paul's words to the Corinthians, "A man indeed ought not to cover his head, forasmuch as he is the image and glory of God"; "The first Adam was made a living soul"; or in the Epistle to the Hebrews, where the Apostle adduces words spoken originally of the first Adam, "Thou madest him a little lower than the angels; thou crownest him with glory and honour, and didst set him over the works of thy hands." Two things seem explicitly laid down in these passages—first, that man's body did not grow and was not progressively developed, but was formed from the dust by the immediate operation of God; and, secondly, that that life which constituted him a man, a living creature bearing the image of God, was breathed into him by God. When we turn, however, to some popular teachers of the present day, we are met with theories to account for man's origin which may be resolved into two great classes, those of spontaneous generation and those of development.

The doctrine of spontaneous generation is a revival of the speculations of Greek and Roman philosophers, and

is undoubtedly held by a large class of naturalists at the present time. Professor Huxley has thrown over the theory the sanction of his name, though unable to admit its truth as a scientific fact. If it were possible to look back far enough, he would expect to see the evolution of living protoplasm from not living matter. Though declaring that spontaneous generation has never been proved, he adds, "I must carefully guard myself against the supposition that I intend to suggest that no such thing as abiogenesis has ever taken place in the past or ever will take place in the future with organic chemistry, molecular physics, and physiology, yet in their infancy and every day making prodigious strides. I think it would be the height of presumption for any man to say that the conditions under which matter assumes the properties we call 'vital' may not some day be artificially brought together." Strauss suggests that man originated as—according to his idea—the tapeworm, which is often some 20 feet long, does, by independent origination from mere matter without the intervention of a living being. To all this it must be replied that science knows nothing of such origination, but that, on the other hand, *omne vivum ex vivo* is an established law. Moreover, it must not be forgotten that these theorists have to beg the existence of matter. If matter be not eternal, it must have had a Creator. Whence, then, these atoms indivisible and indivisible? Whence the law by which they gather in harmonious forms? Whence the motion by which they are constrained? It was for lack of a lever that Archimedes failed to overturn the world, and we too must give the materialists the physical basis with which they would overthrow the revelations of the Word of Truth. If ever it were possible to summon these atoms to proclaim the secret of their origin, their reply would be, "It is He that hath made us and not we ourselves;" for, as Sir John Herschel has said, they would have "all the appearances of manufactured articles."

The great point of difference between these views and those of which Darwin may be taken as the exponent is, that whereas they have to assume the existence of dead matter, he goes further, and asks for some living cell or germ into which the principle of life has been infused by some creative act, but at this stage he would dispense with Divine intervention, leaving to God the part, if I may adopt a political phrase, of "masterly inactivity," whilst by the operation of two principles, called natural and sexual selection, there came into existence the world of animals and plants—"all the organic beings which have ever lived on this earth

may be descended from some one primordial form." If we appeal to Darwin for man's direct descent, we are told that "the first ancestors were ascidian tadpoles, themselves the parents of a group of fishes as lowly organised as the lancelet, and that from them have been evolved the new and the old world monkeys, and from the latter, at a remote period, man, the wonder and glory of the universe, proceeded." One of Darwin's leading disciples as positively assigns the successive stages. Man was originally an oyster or clam, from which he has progressed to his present condition in the following way:—"The oyster produced a tadpole which produced a quadruped which produced a baboon which produced an ourang-outang which produced a negro who produced a white man." For the possibility of such theories it will be well to remember that the advocates have not only to assume the existence of matter, but of life. Whence came that vital power which quickened into life that first primordial germ? Exact natural science must confess not only her ignorance but her impotence to explain the origin of the first living organism from any of the natural forces with which she is acquainted. Liebig confidently said, "Chemistry will never succeed in exhibiting in her laboratory a cell, a muscular fibre, a nerve—in a word, one of those really organic parts of an organism which are endowed with vital properties." To what straits such advocates are driven it will be seen, when we remember how Sir William Thompson, as President of the British Association in 1871, suggested that the seeds necessary to supply the vital life in plants might in the first instance have reached our earth by aerolites projected from some distant planet or other cosmical body. Such a solution would merely transfer the mystery, not explain it, and that so eminent a scientific investigator should frame such an hypothesis to lend a helping hand to Darwinian views is, as Professor Challis remarks, not only an evidence of weakness, but it shows also wherein the theory is weak. Let it further be borne in mind that the advocates of the views known as Darwinian have to assume the intervals of hundreds, if not thousands, of millions of years for these developments to have matured the present results we see around us. With the bank of eternity at command, all things seem possible to them. It is, however, one of the first fatal objections to such views that the time they require science itself cannot concede.

If we take Sir William Thompson as our guide, we must limit the existence of our earth to one hundred million years. But, more recently still, Professor Tait, in his *Recent Researches in Physical Science*, speaking of the law of the

Dissipation of Energy, discovered by Sir Wm. Thompson, and quoting his three lines of argument, urges "ten million years at the utmost we can give to geologists for their speculations as to the history even of the lowest order of fossils, and for all the changes that have taken place on the earth's surface since vegetable life, of the lowest known form, was capable of existing there." And, further, he adds, "This discovery enables us distinctly to say that the present order of things has not been evolved through infinite past time by the agency of laws now at work, but must have had a distinct beginning—a state beyond which we are utterly unable to penetrate; a state which must have been produced by other than the now visibly acting causes."

There are three additional points which I would raise against these views before I draw my paper to a close.

And, *first*, when we compare man with the savage progenitors from whom he is developed, we find that his development has taken that form which would be most disadvantageous in the struggle for life, according to the theory of natural selection. By no one has this point been put more admirably than by the Duke of Argyll. "The direction," says he, "in which the human frame diverges from the structure of the brute is in the direction of greater physical helplessness and weakness; but this is not the direction in which the blind agencies of natural selection could ever work. The unclothed and unprotected condition of the human body, its comparative slowness of foot, the absence of teeth adapted for prehension or for defence, the same want of power for similar purposes in the hands and fingers, the bluntness of the sense of smell,—all these are features which stand in strict and harmonious relation to the mental powers of man. But, apart from these, they would place him at an immense disadvantage in the struggle for existence. These powers when possessed could not be modified in the direction of greater weakness without inevitable destruction, until first, by the gift of reason and of mental capacities of contrivance, there had been established an adequate preparation for the change. The loss of speech or of climbing powers which is involved in the fore-arms becoming useless for locomotion could not be incurred with safety until the brain was ready to direct a hand. The foot could not be allowed to part with its prehensile power until the powers of reason and reflection had been provided to justify as it now explains the erect position and the upward gaze. If man's frame was once more bestial, it may have been better adapted for a more bestial existence; but it is impossible to conceive how it could ever have emerged from

that existence by virtue of natural selection. Man must have had human proportions of mind before he could afford to lose bestial proportions of body." In this line of argument we have a weapon which yields a fatal thrust to the theory of natural selection.

Secondly. The most ancient remains of man, as a matter of fact, manifest no approximation to our simious ancestors. Such as man now is, such he seems always to have been. The fossil man of Mentone, for example, tells of a man six feet high and of vast muscular powers. His skull might have contained the brain of a Darwin. Such a man, if he were to rise up again among us, might, of course, be a savage, but he would be a noble savage, with all our capacity for culture, and with no more affinity to an ape than any one present. Professor Dawson has shown in a remarkable way that, whilst on the one hand no new species of mammals have been introduced since the post-glacial period, there still exist among us 57 distinct species that inhabited Europe in that post-glacial period. They exist unchanged, and not one can be shown to have been modified into a new form, though some of them have been obliged, by changes of temperature and other conditions, to remove into distant and now widely separated regions. Whatever the period that has elapsed since the glacial age, whatever the duration of man on the earth, there have been these 57 lines of species—a series of lines manifesting no tendency, however far back they may be traced, to converge, but strictly parallel throughout. What conclusions can be drawn from such a fact but one utterly fatal to the doctrine of development? It is facts like this that led Huxley to confess that the first traces of the primordial stock whence man has proceeded need no longer be sought by those who entertain any form of the doctrine of progressive development in the newest tertiaries; and, says he, they may be looked for in an epoch more distant from the age of those tertiaries than that is from us. For that search we may leave our Darwinian friends without any misgivings.

And, *thirdly*, it has been strikingly shown by Mr. Ackland that the system breaks down when tested by the law of probabilities. "In order that any variation may be perpetuated and increased, the pairing of similarly affected individuals is necessary, and this must be repeated again and again, and with every repetition of the process the probabilities against it would rapidly increase. Thus, supposing that in the first generation the proportion of favourable conditions were such that of those animals that paired there were four of each sex that had them to three that wanted them, the chances that any

given pair were alike in possessing them would be represented by two to one against it. In the next generation it would be eight to one, and so on. But, next, we have to do, not with one series of changes only, but with a vast number of different series going on in different directions. If we are to have a large variety of animals produced from a common stock, all the probabilities must be combined against the separate variations, not by addition, but by multiplication, so that the probabilities against the production of all those separate forms become enormous." Applying this principle to one of Darwin's illustrations—the fertilisation of orchids by means of insects—Mr. Ackland proceeds to show that the variation in the insects and flowers must take place at the same time and at the same place, or no result will follow to the insect, while the new variety of orchid must perish for want of an insect to fertilise it. "It is this," says he, "which makes the supposition of unlimited time almost useless, because, just in proportion as the time is increased, the probability of two independent events happening simultaneously is diminished." Finally tested in this way, Mr. Ackland concludes that the theory completely breaks down. The theory, then, is untenable when tested by scientific tests, as it is also irreconcilable with the Word of Truth; for, although, as a theory, it does not discard a Creator in the first instance, it does withdraw Him at the first conceivable opportunity. The statement that God made the plants and animals after their own kind is one that Darwin considers will ere long be regarded as "a curious illustration of the blunders of preconceived opinion. These authors," says he, "seem no more startled at a miraculous act of creation than at an ordinary birth." The true tendency of Darwin's views has been more clearly seen by some of his followers than by himself. "The first living germ granted," says Carl Vogt, "the process of evolution will account for all we see. Man is not a special creation produced in a different way and distinct from other animals endowed with an individual soul, and animated by the breath of God; on the contrary, man is only the highest product of the progressive evolution of animal life springing from the group of apes next below him. The theory," says he, "is one which turns the Creator out of doors, and does not leave the smallest room for the agency of such a being."

Happily the theory which is thus opposed to the distinct teaching of the Word of Truth is one that meets with no quarter in some of the highest courts of science. Nay, it is the exclamation of one already quoted, the Duke of Argyll, that the difficulties of Darwinism are not theological, but scientific.

The theory is one which relies to some extent expressly on "unknown agencies," and is absolutely unsatisfactory as an explanation of difficulties it seeks to solve. "If the theory of development can be shown to involve difficulties of conception which are quite as great as those which it professes to remove, then it ceases to have any standing ground at all; for an hypothesis which, to avoid an alternative supposed to be inconceivable, adopts another alternative encompassed by many difficulties quite as great, is not entitled even to provisional acceptance." Wallace, although advocating the doctrine itself, argues that it is not applicable to man, and that it cannot account for his physical organisation, his mental powers, and moral nature. Huxley, whilst undertaking to show that the anatomical differences between man and the chimpanzee are not such in kind or degree as to justify their classification in separate orders, does this, however, on the condition that he may omit mind from his phenomena, admitting that, if this be taken into account, then the difference is so wide that it cannot be measured, an enormous gulf, and thus practically gives up the question. By German men of science of the first rank the theory has been pronounced to consist of "bold flights and arbitrary assertions." By Agassiz it has been said that "the theory is a scientific blunder, untrue in its facts, unscientific in its method, and ruinous in its tendency." "Everywhere," says Professor Phillips, "we are required to look somewhere else by the hypothesis; which may fairly be interpreted to signify that the hypothesis everywhere fails in the first and most important step. How is it conceivable that the second stage should be everywhere preserved, but the first nowhere?" The mind revolts against the theory when once it has been fully considered. There would be something grotesque, were it not painfully saddening, in that ingenuity which proposes to fill the gap which exists between the higher religious and moral sentiments of man and the instinctive affections of the brutes by that miserable ape, which, when crossed in love or when pining in cold or hunger, is imagined by Lubbock to have conceived for the first time in its poor addled pate the dread of evil to come, and so became the father of theology. Between man and the brutes there is a great gulf fixed, one which seems, however, to swallow up all those who seek to cross it by theories of their own. It is only when we rise on the wings of faith and accept the teachings of the Word of Truth that we rise to nobler themes, and an all-sufficient Cause, as we tell our descent, and add, "which was the son of Adam, which was the son of God." It is no legend, but the grand old revelation of Genesis that satisfies

all our legitimate desires after the mystery of life in the words,—“The Lord God formed man out of the dust of the ground and breathed into his nostrils the breath of life.”

The CHAIRMAN (Mr. H. Cadman Jones).—I have now to return the thanks of the meeting to Archdeacon Bardsley for his admirable paper, and to Mr. Callard for so kindly reading it. I am sorry to begin by adverse criticism, but I must own that it takes a little too much of a theological turn. It is the object of this Society to see whether science does not really harmonise with, instead of conflict with, anything the Bible says; but, in entering on this investigation, it is necessary to be very accurate in laying down what the Bible really does say on any scientific question. The old instance of the case of Galileo is so familiar to all that one need hardly cite it. It was considered that his teaching contradicted the Scriptures, but there is not a person in this room who would not agree with me in saying that, in spite of all the decrees of the Pope and Reverend Fathers, the earth does move. I should be glad if any one whose studies have lain in that direction would say something about the discrepancies in the Hebrew and the Septuagint chronology, and as to how far we may consider the Scriptures really furnish materials for laying down a complete system of dates. The writer of this paper evidently appears to think the Scriptures do; that there is a difference between the periods which must be allowed according to the different modes of computation of dates; but still materials are furnished which do give some limits with regard to the period that can be allowed between Adam and the Deluge. It is very desirable that something should be said on this subject, because what takes place in our meetings here goes out to the world, and I think mischief may be done if it should go forth uncontradicted that the Scriptures make statements which, it may turn out on investigation, are not necessarily meant by them. Perhaps, also, for popular readers it might be desirable that we should have rather fuller information on the subject of Max Müller's argument, as referred to on page 261, because I think that those who have any acquaintance with comparative philology, which I myself have not, would find a difficulty in discovering that some of the words there alluded to are identical in all European languages. I myself plead ignorance on the subject, but it certainly does not occur to me that the word “tree” can, by any analogy, be the same as the Latin word for “tree,” which is a word in another Indo-European language. Again, I do not see what analogy there is between the word “dog” and the Latin “*canis*,” and so on in many other cases. I think that when statements of this kind are going out, although based upon the authority of Professor Max Müller, in a work intended to be perused by the general public, it would be but proper that there should be some kind of explanation to show that they are well founded.

Prof. S. E. O'DELL.—So far as I can perceive, I do not think that the Scripture references could have been evaded. It seems to me that they

have been brought forward for the purpose of showing that science, to a very great extent, agrees with those Scripture quotations. Those questions have not been given here in a dogmatical manner for scientists to accept, because they are believed to be inspired ; but to show that they agree with what is held by a great number of eminent scientists. During the last three Sundays, I have had the pleasure of listening to three sermons that have been preached by Dr. Benjamin Ward Richardson, F.R.S., who is acknowledged to be an eminent scientific man, and one who has studied the subject of evolution. Speaking on that subject, he ended one of his addresses by saying, "This much, at least, I do believe, that I am a living soul." So far, then, we may perceive that he did not derive anything from the doctrine of evolution, which is opposed to that belief. He made another observation which I think is worthy of remark, seeing that he is a man of science of whom most of us know something : he said "If I believed science to be opposed to religion, I would give up all my scientific attainments, and would become the poorest minister of the poorest pulpit."* (Applause.)

Mr. HASTINGS C. DENT.—May I be allowed to mention one or two things that have occurred to me in connexion with this admirable paper ? On the second page the writer says, "I have set before myself as a binding canon, that in such studies we cannot accept facts too thankfully, test theories too rigorously, and arrive at conclusions too cautiously." I think that that is a very important point, and one that should always be remembered, because the evolutionists bring forward probabilities, speculations, and hypotheses of every conceivable description. They prepare papers and lectures, of which we recently had an example, in which "ifs" and "may-bes" are advanced before long into "must-bes" and certainties. (Hear, hear.) On the fourth page there are some remarks on the immutability of species. This is a point which I consider one of great importance, and one which certainly appears to be, if anything can be, completely proved. For instance, we have in the Silurian rocks certain species and genera of crustaceans, which are represented by trilobites and ostropods.

* Baron F. von Mueller, K.C.M.G., M.D., F.R.S., recently—September, 1882—concluded a lecture on the *Flora of Australia* with these words, to which he calls my attention.—ED. "Why should that Divine Power, which the most extreme scepticism must acknowledge as the beginning of all beginning, be enarrowed, according to the glimpses of poor mortal souls in this our atom of world of worlds, to operations such as only be within mortal grasp ? Why should any of us endeavour to reduce, what must be eternally sublime beyond all human conception, to simple formulas or calculable processes ? Sad would it be, were the final results of scientific striving to culminate in disputing away that consoling and trust-inspiring and elevating blessing which any mind imbued with piety must derive from the contemplation of Nature's wonders ; it is thus that through worldly revelation we are allowed to perceive, though slight it may be, some of that grandeur of supernatural supremacy, which happily for human existence is in its Godly fulness denied to mortal eye !"

The trilobites do not exist now, but they are represented by microscopical forms. The ostropods continue perfectly immutable and absolutely the same down to the present day. Here, therefore, we have those particular forms maintaining their distinguishing characteristics down to the present time,—the highest, the lowest, and the intermediate forms and genera remaining perfectly distinct. On page 265 there is a reference to the period that has elapsed between the glacial epoch and the present time; Sir Charles Lyell, it is stated, contended “that the glacial period must be reckoned as occurring 800,000 years ago. Sir John Lubbock is contented with 200,000, M. Adhemar with 11,120, whilst Professor Andrewes contends that the ice ended barely 8,000 years ago.” On the mountains of Scaw Fell, Snowdon, and several others in our own lake district, besides those of the Ben MacDhui series, we have traces of Alpine flora life, which represent the glacial epoch. The *salix herbacea*, one of the smallest willows that exist and which only grows to the height of from one inch to three or four inches, is there found. Now, supposing this to have so continued for 8,000 years, it would afford additional proof of the immutability of species, by the fact that it has not been improved off the face of the earth, or developed into a larger form of plant. On page 267 we have the serious point of spontaneous generation discussed, and Professor Huxley is referred to as having “thrown over the theory the sanction of his name, although unable to admit its truth as a scientific fact.” It might be desirable to state that Professor Huxley simply allowed it as a probability in past times,—that originally there must have been spontaneous generation,—in order to get over the idea of creation, although he does not think it possible to prove that this spontaneous generation now takes place. So it is with most of those who contend for this theory; they use it simply for the purpose of putting the idea of the Creator further and further from our minds. I think the writer very properly sums up the evolution question in the words of Agassiz:—“The theory is a scientific blunder, untrue in its facts, unscientific in its method, and ruinous in its tendency.”

Surg-General C. GORDON, C.B.—On the fourth page of the paper allusion is made to the law of hybrids. As far as my inquiries have gone, there is no instance of two distinct races of persons producing a third race, having the properties and qualities in equal proportions of each of the progenitive races. The product possesses the characteristics of one or the other in a predominant degree; but in no instance with which I am acquainted do they possess the properties of the two parents in equal proportions. Of course, when several races become mixed as we ourselves have been, the remark I have just made requires to be modified. On the next page there is a remark with reference to the modification that takes place in the case of dogs. Those modifications are familiar to all of us, but what seems to me to be very peculiar is that the argument which has so many illustrations with regard to dogs is not applicable with regard to man,—that is to say, the dog, which is allowed here to have arisen from one original description, becomes modified into “the fierce bloodhound which is trained to harry down the

helpless slave, and the noble dog of St. Bernard with its life-saving instincts." Many scientists, who willingly accept this principle, refuse to apply it to man. They say that mankind, instead of coming from one stock, has had so many different origins. I am of opinion, however, that the arguments used in the one case ought to be used in the other, or not at all. On the page following there is a point to which I should be inclined to take special exception. The writer says, "We find everywhere the same susceptibility of admitting the cultivation of these universal endowments." According to my experience of different nations,—and I have seen a good many,—their turn of thought is as distinct as their external characteristics; and I think that, perhaps, some mistakes may have arisen from the application to other races of those particular trains of thought which are suitable to ourselves under the peculiar circumstances in which we were situated. Therefore, I should be inclined to think that this paragraph as it stands has several exceptions in our experience of races and peoples. There is another point I have noted on page 267, which refers to the views expressed by an eminent authority,—Professor Huxley. With all due respect to so high an authority, it seems to me that the purport of the paragraph the writer has quoted is simply that the doctrines laid down are inexplicable. In one passage we are told, "If matter be not eternal, it must have had a Creator." As has already been stated by a gentleman who has preceded me, such an assertion only tends to throw the ultimate causation further and further back. At the bottom of the same page the question of selection is raised. The theory is a very difficult one. Various kinds of selection are alluded to; but the selection seems to have taken place absolutely before there was any creature to select from. The creatures who selected each other must have attained their special characteristics before the selection took place, or how could they have made the selection? Like many others, I have studied the Darwinian theory, and tried to think it out; but it seems to me that the principle laid down with regard to that theory fades away, and gives place to another theory. If we say it means progressive development we find ourselves in contact with creatures that are retrogressive. If we admit the principle which is laid down, it indicates progression, but we find many creatures existing through geological stratum after stratum from the most distant geological epochs, where we should naturally infer that everything would be shown to have progressed, instead of what we really do find, namely, that many of those creatures remain to the present day exactly as they were even in the Silurian ages. (Hear, hear.)

Mr. T. K. CALLARD, F.G.S.—In reading this paper to you, I hope I have conveyed the full meaning of its author. There are some parts of the paper with which I do not quite agree; but, taking it as a whole, I think it an admirable production, and I very much enjoyed reading it. The author says on pages 262 and 265, where he refers to the question of the antiquity of man and the origin of the human race, that these things are very closely allied. Of course, if there were no antiquity of man, evolution could not stand for twenty-four hours; therefore we have to look clearly

before we make concessions as to man's extreme antiquity, because that is a step in the direction of the Darwinian doctrine. Speaking of flint implements, Mr. Bardsley says, "As, however, there are those who contend that some at least among these flints have been formed by man, we will concede the first premiss, and admit, for argument's sake, that they are artificial." Now, I am not prepared to go with the author to the extent of conceding that these things are artificial. I contend, as I have done all along, that those so-called implements which were first presented to our notice were natural formations; but that afterwards there come to be presented a class of implements which, when you look at them, seem to alter your hypothesis. I have had some presented to me of such a character that I should not dare to say that they were not artificial, but in that case there is another way of accounting for them, and that is that those better class of implements are forgeries. Often when you go to a museum and see a number of these things, you say, "I am doubtful about this, and about that; but, in the case of this particular implement, there can be no doubt whatever." You say, when you put the three together, "Although, when I take them separately, I am not satisfied, yet when I take them collectively I cannot escape the conviction that man has been here." Last autumn I was in the Valley of the Somme with Doctor Southall, who had come over for the purpose of sifting this question; and in our presence some of these flint implements were manufactured from the gravels in the Somme valley. We met with an English gentleman who had been there for twenty years, and went with him to the gravel beds. There were men digging among the gravel, and putting aside those pieces which they supposed to be implements made by man. They showed them to us, and we said we were not satisfied about some of them, as we could not see the evidence of human workmanship. The gentleman who was with us said to one of the workmen, "You can make these gentlemen an implement if they wish for it, can you not?" "Oh! yes," replied the man, "if none of the other workmen are looking on, I will;" and, no one being near, he took up a flint, and without any hammer, but simply by using another stone, in less than five minutes manufactured the implement, which I now produce. Doctor Southall said, "I should like one too"; and in a few minutes the same man made another implement of the same character. (Laughter.) "Well," I said, "I am quite certain that that is not the first by some hundreds that you have made, or you would not be able to produce them with so much dexterity." The man laughed; and then we tried to make some implements, but found we could not do it, the fact being that we were not experts, and the workman was. "But," said the man, "I don't see that that affects the question which you are considering. Anybody who knows anything about these implements, looking at this stone, would know that it was recently made. You can always tell when a flint has been freshly broken, and it would take thousands of years to make this look like the one I have just shown you." I could not understand how the older-looking stone got the appearance it bore unless it was by

friction in the gravel, and therefore I spent some time that evening in applying the friction in question to the newly made implement. On the following day we went to the gravels about twenty-eight miles from St. Acheul, where M. Boucher de Perthes obtained his collection of implements. We asked to see what stones they had, and they showed us a few. We did not consider them very convincing; but taking the flint, which I have already shown you, out of my pocket, I said, "What do you think that is?" "Oh," said the man to whom I showed it, "it is undoubtedly a Paleolithic implement." I said, "How old do you think it is?" "Oh!" he replied, "thousands and thousands of years." "What leads you to think so?" I asked. "I can tell at once that that is thousands and thousands of years old," he replied. "Well," I said, "I saw it made only twenty-four hours ago." The man laughed, and passed it round to the other workmen. However, there is the fact that they had mistaken this newly made implement for a real Paleolithic stone. When I came home, I put it by the side of another flint, which about four years ago was sold to me as a genuine Paleolithic implement. I compared the two, and said, "Is the older one of natural formation?" It puzzled me, for the new one was apparently brother to it, and it struck me that the man who made the one could have made the other. Therefore, I recommend any one, in deciding a question of this kind, to be very careful how he attributes the good implements to Paleolithic workmanship. I could go one step further, but in doing so I must withhold names. Some of these flints I had with me at a meeting of the Geological Society, and one of the experts on this very question asked to look at them. He said, "You have got some treasures there, Mr. Callard." I replied, "Yes, I have been in the Somme, and brought home some specimens." "Yes," he said, "and very good specimens, too." I asked him, "Do you think they are the work of man?" and added, "You know there have been such things as forgeries; are you sure that this is not a forgery?" He looked again, and said, "There is no forgery here; they are genuine Paleolithic implements." "Well," I replied, "I could not have a much higher authority than yourself." He answered, "I think I know as much about flint implements as any one living." There being some other geologists present, I did not like publicly to point out his mistake, but subsequently I wrote him a letter, telling him the fact. He replied that it was most extraordinary that he should have been taken in by a St. Acheul forgery, adding, "It shows the danger of giving an opinion by artificial light, and after one has dined." (Laughter.) He made a joke of it; but it is more than a joke, especially when we remember how we have been led step by step in this doctrine of evolution, and that those flint implements have been used to back the doctrine up. We ought, I say, to be upon our guard, in visiting such a Museum as that of M. Boucher de Perthes. He is now dead, but I remember once, when visiting that Museum, I asked the person representing him, if he would point out to me the implements which M. de Perthes had, with his own hand, taken out of the gravels. He said, "I cannot do

that ; but there are some that have his own handwriting on them, and I suppose he took those out himself." I looked at them and said, "They are not so good as the others ; those that have something like authority about them are the more doubtful-looking ones" ; but when I came to those which the men had brought to him, and which he had purchased, all doubt vanished ; there was no question but that men had made them. Now, I would have you bear this in mind ; when you come to those implements which are so convincing that any reasonable person would say, "Man made this," you should ask the question, "What evidence is there that they are ancient?" While Doctor Southall was with me we wished thoroughly to investigate this question. We had to consider certain implements that are found in the Valley of the Axe ; we went to the Axe gravels, and spent some time there. We found certain forms approximating to those we had seen before ;—some of them have been on this table sent here by Mr. Whitley, but we were doubtful about them. I said at the time, "They are like the Acheul flints ; but there is nothing about them that nature could not have done."—Mr. Whitley joined us when we went to Exeter, and there we saw the finest specimens they had. The Curator of the Museum had been invited to meet us for the purpose of showing us the specimens. Doctor Southall was with me, and when he saw some of the flints he said, "I am convinced that those are not forgeries, and that the hand of man has been at work upon them." He handed one to me, and another to Mr. Whitley ; we both examined them, and felt we must be prepared to withdraw what we had hitherto said, if those were really Paleolithic implements from the Exeter gravels. I said, however, "There are a few questions I wish to ask." We first of all put certain of the implements aside as doubtful ; there remained about twenty-five which we all agreed were artificial. I said, "Can you tell me whether any geologist found any one of these twenty-five, because we know that geologists have been down to these pits?" The Curator's answer was, "No geologist found any of them." "But," I asked, "when geologists come down here, do they never find any good implements?" "No, they never have found one like these." I said, "There is Mr. ———, who is a good judge of implements ; did he ever find one?" "No," he replied, "nothing like these." I said, "It is a curious thing that the men who are competent to judge of these implements have never found any. How did you get these specimens?" His answer was, "They were brought in by the workmen." "What," I asked, "induced the workmen to bring them?" He replied, "Well, we pay them from 5s. up to a guinea each for them." I thought the man who made the flint I have shown you would have been very glad of such a customer. "But," said the Curator, "you don't mean to say you doubt them?" I said, "I should not like to be so hard as to say that. Can I purchase any implements about here?" He answered, "I don't think you can, as they don't find them now." "How long," I asked, "have they ceased to find them? Do you still buy them?" He said, "No ; because we have got enough." "Then, since you ceased to buy them, the men have ceased to find them?" "Well, was the answer,

“strangely enough, they have.” “Well,” I said to Dr. Southall, “please take note of these questions and answers.” I do not wish to lay an undue stress on all this, but we are bound to look at it as reasonable men, and my firm conviction is, that out of the thousand flint implements in M. Boucher de Perthes’ Museum nine hundred at least are forgeries, and the rest doubtful. When you come to other museums in different parts of the country, and see numbers of implements with M. Boucher de Perthes’ name upon them, one would naturally suppose that that proved the authenticity of the flints ; but, from what I have told you, you will see that it is nothing of the kind. I am not doubting M. Boucher de Perthes ; I am merely representing that he has been taken in. I have never been able to find one of those unquestionably humanly formed paleolithic implements, nor have I been able to find a man of authority who has taken one of them out of the gravel himself. Perhaps some gentleman present may have been more fortunate than I, and it may be too much to suppose that all these implements, we have in such numbers, have been forged. About nineteen years ago a geologist of Cambridge, who was determined that he would not be taken in by the workmen, went out with a pick-axe to work by himself. He searched for three days and found five implements. This would have been conclusive ; but, in the note he sent along with the implements, he stated in a postscript : “ I am thoroughly convinced that every one had been put there for me to find.” Those five implements were washed, and it was found that each of them had been covered with ochre to give the proper appearance. It does not follow that because there have been these deceptions there has been deception in every case. Still, I say, there is enough to make us cautious, and not be too ready to admit that the flints are artificial, unless we know they are modern, and in that case there need be no question about them. There is one other point I would refer to. The subject of the paper is “ The Origin of Man.” Was man created, or was he developed ? At a recent meeting a very learned paper was read in which a Mr. ———, the author, clearly defended the hypothesis that man was developed ; but to make it less unpalatable he put it that this was done “ under control,” to show that it was not an atheistical question with him. He thought there was God in it. I urged upon that occasion that it was not possible that man could be descended from the anthropoid ape, as Mr. ——— contended ; that if man came from the anthropoid ape that animal must have produced man. Man, by the admission of all geologists, is post-Glacial ; it is also acknowledged that there has not been time since the Glacial epoch in which the ape could have become man. Therefore, if man was descended from the ape, it must have been from some ape which immediately preceded him ; consequently, we are driven to the conclusion that, if man descended from the ape, the ape must have lived through the Glacial period. I tried to show that that was impossible, and gave evidence from Darwin himself, from Thomas Belt, and from Wallace, of the existence of a cold climate, even up to the Equator—so cold that the glaciers had

come down in that part of the world as low as in the Chamounix Valley. I pointed out that no ape could live for a single winter in the Chamounix Valley, and the reply was that in the Miocene period there have been found, in Arctic regions, fossils and plants of tropical growth, and the argument was that there might have been some warm spots in which our ancestor, the ape, might have been screened from the cold, and so have survived. I should have thought that if you could prove Glacial cold at the Equator in America you would find the same in Africa; I wish to be clear on this point. The anthropoid ape which is nearest to man is either the gorilla or the chimpanzee; and, if man is descended from the ape, it must be from something like one or other of these animals. Du Chaillu, who discovered the gorilla and chimpanzee, found their habitat within two or three degrees of the Equator, south latitude, and it is there only that they are found. If you can get evidence that there was anything like glacial cold near the Equator in Africa, as has been proved with regard to America, then I think you have settled the point that our ancestor the ape could not have lived there. I have got here a few lines of Du Chaillu's which I should like to read. He says:—"Not far from Makenga there was a remarkable and very large boulder of granite perched by itself at the top of a hill. It must have been transported there by some external force, but what that was I cannot undertake to say. I thought it possible that it might have been a true boulder, transported by a glacier, like those so abundant in northern latitudes. Whilst I am on the subject of boulders and signs of glaciers I may as well mention that when crossing the hilly country from Obindjé to Ashera'-land my attention was drawn to distinct traces of grooves on the surface of several of the blocks of granite which there laid strewed about on the tops and declivities of the hills. I am aware how preposterous it seems to suppose that the same movements of ice, which have modified the surface of land in northern countries, can have taken place here under the Equator, but I think it only proper to relate what I saw with my own eyes." I thank him for relating this; at that time he was not prepared to think that the glacial cold had come down so far, but he was certain it was proved that it did in South America.—It is in accordance with analogy to believe that this was the explanation he thought of, but did not like to put into print, although he has left it for us to consider to-night. If this were the case, no ape could have possibly lived there; and, therefore, no ape was living when man was first created.

The meeting was then adjourned.

ORDINARY MEETING, JANUARY 21, 1884.

THE RIGHT HON. A. S. AYRTON, IN THE CHAIR.

The following paper was read by the author :—

HOW DID THE WORLD EVOLVE ITSELF? By
SIR EDMUND BECKETT, Bart., LL.D., Q.C.

I AM asked—probably on account of my little book “On the Origin of the Laws of Nature”*—to write a Paper on what may be called “Undesigned Cosmogony,” or the production of the world and all that is therein without the “Intelligent Author” that even Hume believed in, though he believed little or no more about Him. I there discussed that alternative to Creation which is commonly called Materialism, or the “potentiality of self-existing matter,” or “self-existing energy” and automatic Laws of Nature; which all practically come to the same thing, however their advocates may try to evade it—viz., that the ultimate atoms of Matter resolved for themselves by universal suffrage from the beginning of all things how they would act for ever in all possible circumstances, distributing themselves first into groups of the sixty-three elements, or whatever may be their number, and somehow acquiring the multitude of properties respectively belonging to them.

Laws of nature are only laws of motion for every kind of atom in all possible circumstances; and they differ from the three mathematical “axioms or laws of motion” established by Newton, in that those are necessary *à priori* truths,† but the laws of natural motions, or of nature, are statements of

* S.P.C.K., 2nd Ed., 1880.

† See page 294.

our experience, and proper inferences from it; and for anything we could tell *à priori* they might all have been different. Laws of Nature are not Axioms. That great saying of Sir J. Herschel's should never be forgotten, that a sufficiently clever man shut up by himself might conceivably reason out all mathematical truth, up to the highest that will ever be reached; but the cleverest man that ever lived could not divine *à priori* how a lump of sugar would behave when put into a cup of tea. There must also be laws of nature of which we yet know nothing more than that they are wanted to explain some phenomena of which we know no cause. A constant phenomenon can only be regarded as itself a law of nature, until some cause behind it is discovered, which then takes its place. Some physiological phenomena are variable and uncertain, such as the different effects of the same food and medicines on different persons, though they are all doubtless in conformity with some law. The still more precarious phenomena of mesmerism can neither be ignored or got rid of by any rational hypothesis, however often they are tainted with fraud; or of occasional apparitions, and perhaps a few kinds of divination, which are all beyond the reach of any law that is yet known or imagined. All that is quite apart from Miracles, of which I have nothing to say here, especially as I have treated of them in a lately-published S.P.C.K. tract, called "A Review of Hume and Huxley on Miracles."

The argument of the "Origin of Laws of Nature" is, that the only alternatives for cosmogony are, (1) a single Creator who made and maintains the laws of nature; and (2) as many creators as the atoms of the universe, all agreeing how they would behave, and always keeping their resolutions; and they must also have had foresight enough to agree on the laws of nature, or of their respective motions, that would produce all the actual results. As that alternative is hardly possible for any rational man to accept,* it necessarily follows that between those two the other is the true one, viz., that there was one Creator; and a Creator omnipotent enough to make all the laws of nature must, *à fortiori*,

* And yet I see, from Mr. Goldwin Smith's article on Mr. Leslie Stephen and Herbert Spencer in the *Contemporary Review* of last December, that some philosopher, whom he does not name, has accepted this "pan-atomic" theory as the only logical alternative to a Creator. So far that philosopher is quite right, and it is satisfactory to see it acknowledged. [Nevertheless, a newspaper critic of this lecture said it was absurd to state such an alternative: so much he knows about it.]

The two
Alternatives
of Cosmo-
gony.

have had the much smaller and approximately human power of calculating or foreseeing their consequences. A power that makes laws of action, foreseeing all the consequences, does *ipso facto* design them.

Nobody has ever attempted to show any fallacy in that argument; and, if it cannot be refuted, it is conclusive on both points, *i.e.*, that there is a Creator, and that he designed everything, and did not blindly start some laws of nature or forces, and leave them to act as they might, and that we merely have the accidental results which have survived; for I need hardly remind you that so-called accidents play a very large part in the only rival theories of cosmogony that are now in fashion, all going under the name of Evolution of one kind or another.

I now propose to go further, and to take up the question of apparent design at some later stages of the universe, and to see how much of it can be accounted for without a vast deal more of creative action than merely starting some kind of force. Many persons fancy that it is quite enough to call any common growth Evolution, and then "spontaneous evolution," and then take that for a proof that everything can come, and has come, by spontaneous evolution from some unknown kind of self-existing matter, with no properties or qualities: which is all a mass of bad logic and absurdity.

For, first, it is a mere perversion of words to call growth Evolution, while it means the increase of some seed or egg without any visible external addition, such as one has to make in order to increase any dead thing. Secondly, it is not true, if it means that the additions to the body are evolved from it as mere changes; for they are added to it by sundry processes, which the writer who is called "the chief apostle of Evolution" pronounces mysterious, and confesses that he is "in the dark" about them, which is an odd way of commending a new philosophy and "unification of all knowledge." Thirdly, whether mysterious or not, each process must have some cause, as much as every other motion in the world. If that cause is a known physical force or attraction, there must still be a prime cause behind it to settle its direction and its intensity and to make it continue to act. Calling it spontaneous is simply saying you know nothing about it, and it is evident nonsense to call that an explanation, or to call growth Evolution; for it is in fact attraction of a very peculiar kind, with selection of the particles to be attracted, and a different selection for every different animal and vegetable.

And further, if growth of offspring exactly like the parents could properly be called by some such name, that would be no reason for applying it to new growths of a different kind, which the automatic evolutionists really want. Every new organ, or ever so small a rudiment of one, is extraordinary at first, and a special cause is wanted to produce—and that is to create it. That cause may be a law of nature beyond our knowledge, but it wanted making and maintaining no less than any other that we do know.

Darwin's theory of "biological evolution" is this, in his own closing words of the *Origin of Species*: "I view all beings, not as special creations, but as lineal descendants of some few which lived long before the first bed of the Cambrian system was deposited. . . . There is grandeur in this view of life, with its several powers having been originally breathed by the Creator into a few forms, or into one, and that while this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are, evolved." In short, the ultimate difference between that and the old theory is, that Darwin allows only small changes (which are all no less creations than if an elephant suddenly came out of an egg, or out of the earth), while the old theory allowed creations of any size at once.

The only answer that I have seen to the proposition that small changes require a creative power just as much as large one is the assertion that some changes are always necessarily taking place from the change of circumstances, and that those only survive, or are continued, which are adapted to the new circumstances, while the others die out. But all that involves a variety of causes, of which the evolutionists give us none. They have to explain why any suitable change is ever produced by altered circumstances, such as climate for instance; and, indeed, why any change at all should happen of itself. Adaptation means the creation of suitable changes, none the less because some others that are not suitable are produced also, only to perish in "the waste of nature."

It seems to be admitted too that changes which can hardly be called small sometimes appear quite suddenly; I understand, though I do not remember the passage, that Darwin himself mentions that one branch of a peach-tree occasionally produces nectarines, and that there is no intermediate fruit known. Certainly each of them is a perfect fruit of its kind, and neither can be pronounced superior to the other. And yet they are very different.

Means the
Creation
of small
Changes.

If a child can be born with six fingers, or a "calculating boy," who sees by instinct results which would take a long time to calculate, or men of prodigious strength or genius, from parents who had no such powers, it is plain that entirely new organs and powers can be produced at once, that is, "created," without passing through infinitely small stages of development. Therefore there is some power at work which has made laws of nature beyond our knowledge, capable of producing new creatures, whether fruits, organs, animals, or functions and instincts, complete in themselves, and superior to their parents. If that is not design, what would be?

Nor can the evolutionists account for the still earlier process of any kind of generation without some creative power to produce it. That also they quietly slide over as if its commonness was sufficient to have begun it. And so they do with all the phenomena of "cross-fertilisation," as if it were a self-evident truth or axiom (like "two straight lines cannot enclose a space"), that touching what is called a female seed of one thing with the male seed of another, not too different, must produce offspring more or less like them both. (I use the word "seed" here in its most primitive sense, not that of finished seeds or eggs.) If we are to assume such "mysteries" as these to be necessary truths or automatic processes requiring no designing power to produce them, we might just as well assume the automatic existence of everything at first, with automatic powers of creating their successors; for generation is creation, whether of like or unlike successors.

The old notion of a vast multitude of special creations or complete specimens and parents of new species, from time to time, obviously implies a much lower order of creative design than that which ordained, once for all, the machinery which we call laws of nature, capable of going on from the beginning to the end of time, working out "beautiful and wonderful forms," with some apparently self-acting apparatus for always adapting (which is changing) them, according to all the changing circumstances that arise. This too the evolutionists of all kinds quietly slip over, as if adaptation needed no cause and no explanation because it is done gradually and almost imperceptibly. So quietly does the great machine work, that it appears to go of itself, even while it is turning out prodigious changes. And because it works so smoothly, and never requires meddling with to make it do something new, we are asked to believe that it goes of itself, and made itself, and with no design of producing any particular results. Some go so far as to say that it could not help making itself; for that

all the laws of nature are necessary, self-existent forces, or all came because they could not help it from one force in no particular direction, whose only function is "persistence."

In fact, that is expressly the Spencerian theory of evolution, which claims to include the Darwinian, not to contradict it. Darwin founded all his conclusions (whether they are all right or not) on the largest induction from facts that he could make; and perhaps no philosopher ever took more pains to investigate them in so many directions throughout nature. The other kind of evolutionary philosophy is entirely different in its mode of proceeding; and all its conclusions simply come to this: that the law of nature which its discoverers from a vast number of experiments call the Conservation or Correlation of forces, or the constancy of the sum of all the forces in the universe, is re-named by Mr. Spencer "The Persistence of force" (which omits Transformation or Correlation), and then pronounced to be the sole fundamental, self-existent, necessary thing or truth; except that he is obliged also to assume some unknown kind of homogeneous universal matter with no properties besides: and these two between them have made all things by the processes which he designates as we shall see. We are allowed, and indeed invited, to put behind Persistent Force something else, which is called the Absolute, Unconditioned, Unknowable, and Unknowing, "universal Immanence," which never did, or does, anything but maintain or start indestructible force. Consequently, for all practical purposes, "the Unknown Reality which works in us," of which matter and motion and force are "the symbols," simply *is* indestructible force: a set of remarkable discoveries indeed—that force is a symbol of force, and that motion is caused by force, and that matter is only cognisable by its properties or forces. And yet his primeval matter was homogeneous, and therefore had to acquire, and therefore did acquire, all its heterogeneous properties somehow from the action of some one force upon it.

Moreover, the only true Religion consists in acknowledging—first, this new kind of Unknowable; and secondly, the impossibility of knowing any more about it. Every religion that professes to know anything more is, *ipso facto*, "irreligious and absurd" (p. 100). Yet that is just what is professed by every religion that is or ever has been, however else they differ. Nay, Mr. Spencer himself is as irreligious and absurd in that respect as the believers in Jupiter or Mormon or Mumbo Jumbo; for he professes to know all the functions of his Supreme Reality and Power—viz., that it "works in us," and made and

And the only
true Reli-
gion.

maintains, and practically is, persistent or indestructible but transformable Force, and nothing else. We profess to know no more of our Supreme Power than it has told us. Mr. Spencer professes to know everything by the light of his own intellect. Which, then, is the most "irreligious and absurd," according to his own dictum?

The religious or ethical parts of the Spencerian Philosophy have been discussed by former writers and speakers in this Society. For that reason, and also because this particular question of design in creation involves no metaphysics (which only mean interminable discussion), I shall confine myself to the theory of undesigned cosmogony propounded in those "First Principles of Synthetic Philosophy or Unified Knowledge," which I have already described almost in the author's words, only rather more briefly. Whether one of his admirers in a scientific journal is right or not in pronouncing his "work of the calibre of that which Newton did, though it as far surpasses that in vastness of performance as the railway surpasses the sedan chair," he does unquestionably far surpass Newton in vastness of language, both as to quantity and quality. We shall presently see also the real nature of the "clearness of thought and of expression" which it is equally the fashion of his admirers to glorify.

[Other critics find it easier to say that I impute to him opinions which are not his, than to explain how they differ. They evidently do not understand, if they have really read, my arguments; and I doubt very much if anybody understands his. I give them in his own words wherever I can, and it is not necessary to profess to understand what you are demonstrating to be absurd. Nothing can be more futile than for writers ignorant of science, and especially of mathematics, to set up for either defenders or improvers of Spencerian natural philosophy.]

Though it is his philosophy and not his style that we are concerned with here, they are inseparable in this respect, that he claims the right to call everything by new names, and to use old ones in any sense he pleases, and for just as long as he pleases, without prejudice to the right of tacitly resuming the old senses, or intending his readers to do so, whenever he finds it convenient. Thus nobody must suppose that his "Differentiation and Integration," which are the chief agents of Evolution with him, have any kind of relation to their well-known meaning in the only science in which they have hitherto been used. Mathematical "differentiation" means infinitely small variations according to known laws, and

"integration" is the mode of summing them up between any prescribed limits. But with Mr. Spencer, and the automatic school generally, "differentiation" is the functionary always at hand to account for any kind of change that is wanted, large or small, normal or abnormal, and indeed generally the latter. And they always assume that any change they want can come of itself, and requires neither cause nor explanation. He never condescends to define his "differentiation" at all; which again is an odd way of dealing with an old word plainly intended to be used in a new sense, in a new system of Philosophy which is to be the "unification of all knowledge," whatever that means.

I see that another writer, quite as strong an evolutionist as Mr. Spencer, and much more really philosophical in his mode of reasoning, thinks much as I do of his habit of making definitions to suit his own objects, and then arguing from them as if they were generally accepted. At p. 257 of *Mental Evolution of Animals*, Mr. Romanes says: "The fact that he (Spencer) defines or 'describes' instinct as *compound reflex action* does not carry any proof that his doctrine is correct. To call a spade a club, and then argue that, because it is a club, it cannot be a spade, is futile." All these inventors of new meanings of words resume the old ones whenever they choose, and in that way can prove anything. It requires some experience and attention always to detect the fallacy. I have exposed one or two notable instances of it in my aforesaid *Review of Huxley on Miracles*.

The nearest approach to a definition of integration is this, at p. 281 of the last edition:—"The change from a diffused imperceptible state to a concentrated perceptible state is an integration of matter and dissipation of motion." But what is an imperceptible state of matter? Imperceptible to whom? Does it merely mean diffused too thin for our eyes to see it without, or with, some scientific help? And what has our power of seeing it to do with its integration? That must be something absolute. And why need it involve dissipation of motion? The particles of the thinnest nebula need have no motion at all until gravity is turned in, though the particles of gas kept gaseous by heat have. They may be actually gaining motion only by integration under gravity, which in plain English means no more than "condensation"; and the "imperceptible" means nothing at all.

That is an initial specimen of Spencerian lucidity of thought and diction. But a more important one is the "final formula," or definition of Evolution itself, after 396 pages of preparation

“Indefinite
Incoherent
Homogeneity.”

and successive amendments; and that is not final or complete after all, as we shall see. However this is it, solemnly printed in italics, as such a fundamental truth deserves:—“*Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite, incoherent homogeneity to a definite, coherent heterogeneity; and during which the retained motion undergoes a parallel transformation.*” This, then, is the true solution of the problem of cosmogony; or rather it would be, but for the troublesome circumstance that Evolution practically never is “simple,” but always more or less “compound”; from which circumstance he admits that “complexity arises.” But, complex or not, we must face the reality. It is no use dwelling on an imaginary and abstract *simplicity* such as this, delightful as it might be. Unfortunately the chapter on “Simple and Compound Evolution” goes no nearer to a definition of them than telling us that, “when it is integration of matter and dissipation of motion only, it remains simple, and when it is *something more* it becomes compound” (p. 304); and it always is something more. On the whole, we learn (p. 330) that compound Evolution involves both integration and its opposite, going on together; and so that “final formula,” for practical use in cosmogony, has to be modified accordingly: only he never does modify it accordingly into any *perfect* form, beyond its “final” one. Therefore we must try to understand a little more about “indefinite incoherent homogeneity.”

First we find, then, that the primeval homogeneous mass or nebula, which it suits Mr. Spencer to start with, must not be infinite; because then the self-existent gravity, which he is obliged to introduce (p. 224) instead of his indefinite persistent force, could never move a single atom, as it would act in all directions equally. Therefore the primitive, indefinite, homogeneous mass has to be finite; and an infinite one is summarily disposed of in his usual way, by being pronounced “unthinkable”; which word he invents as something stronger than “inconceivable” or “impossible.” One would have thought infinity of space a good deal more conceivable than space bounded by nothing; nor is it easy to think why the primeval homogeneous matter should come to a sudden stop at some boundary, on the other side of which is nothing.

Moreover, a homogeneous anything is necessarily definite in substance too, whether we know what the substance is or not. Again, though he is pleased to call it incoherent, it was held together by gravity, without which, he says, matter is unthinkable, and it is his one actual initial force; and it is all

that holds fluids together now. Probably "the attraction of cohesion" of solids is some other force, which also Mr. Spencer has got to invent or account for by his universal solvent, the conservation of force, and the cohesion represents the heat that is requisite to dissolve it. But no one could possibly divine *à priori* how much more heat would be required to dissolve iron than lead, and lead than ice. Therefore these are laws of nature demonstrable only by experience, and requiring creation and maintenance, and not necessary truths independent of experience.

"Parallel Transformation of retained Motion."

Next for the "definite coherent heterogeneity." Coherence we have already seen to be merely a word of degree, depending upon the amount of "integration" or condensation that has taken place, up to date, as they say. There has been no such thing in nature, since gravity came in, as absolute incoherence,—though there may be a good deal of it in "synthetic philosophy." Again, if homogeneity must be a definite something, as it plainly must, heterogeneity can be no more definite, and unfortunately it can be much less. For heterogeneous things—even solid, and fluid ones still more, and gaseous above all—may be so intermixed and varied in density that the composition may be more properly called indefinite than definite. Therefore it turns out that all those fine adjectives mean just nothing, except that "definite and indefinite" ought to be reversed, if used at all. And, then, what is a "parallel transformation of retained motion" which is undissipated by integration? I look in vain through the Spencerian pages for an answer. It certainly never is parallel to its former direction after transformation. So there we must leave it, and "dissipation of motion" too, with the remarks I made on it just now as a necessary companion of integration, whereas it may just be the contrary.

What, then, remains of that portentous formula, the final and complete expression of the "Evolution of the Cosmos" out of self-existent matter by persistent force? Mr. Spencer, in his new Appendix, rebukes some great mathematicians for making fun of it without any serious argument, and says that they have not perceived, poor ignorant creatures as they are, that "language of the highest abstractness is necessary" to express such transcendental truths. I have not done that, tempting as it may be. But I have shown that every important word in it is either unmeaning or wrong, and ought to be reversed or combined with its opposite.

I am not reviewing Mr. Spencer's book generally: that has been done at greater length in the *Edinburgh Review* of

Other processes of
Spencerian
Evolution.

this month (January 1884). My only object here is to exhibit the impossibility and absurdity of his new alternative to the old theory of a Creator ordaining and maintaining laws of nature; which he calls "the carpenter theory of creation, (p. 120) maintained only in the pride of ignorance," of which I shall say a little more at the end. I might be content with this exposure of his final formula or definition of Evolution. But, if I stopped here, perhaps his disciples would say that it is a mere verbal question, and that they can afford to give up his definition of Evolution, unless we can also refute the processes by which he has satisfied them that the world was evolved by persistent force. I do not expect to convince them of anything. But perhaps I may some other people, who are only waiting to see if his other automatic processes are admitted to be possible results of the conservation of force, now that it is admitted to be true, not indeed as an axiom transcending demonstration and underlying experience, but as a law of nature proved by experience.

His various automatic processes, with their wonderful designations, are all proved to the satisfaction of his admirers by a peculiar kind of logic, which consists in giving some specimens of each of them, and then pronouncing them universal, and then "necessary corollaries of persistent force," sometimes adding that every body will (or ought to) *see it*. Whenever any "minor incident forces" are wanted, viz., such trifles as gravity, electricity, heat, crystallisation, and all the chemical and vital forces, they are instantaneously generated by Mr. Spencer's word, that matter is unthinkable without them. These processes of Spencerian Evolution are not only the integration and disintegration, differentiation and redistribution, dissipation and retention, which we have made acquaintance with already, but some more, viz., the Instability of the homogeneous, the Rhythm of all motion, Segregation, Multiplication of effects, Equilibration, and finally Dissolution (only that also is not final, any more than the "final formula" of Evolution), besides a few promiscuous phenomena, hardly to be called processes or causes. There is a chapter on "The Direction of Motion," which begins with the important admission that "the absolute cause of changes, no matter what may be their special nature, is . . . incomprehensible." What are we to think of a philosopher who professes to "unify all knowledge," and to deduce everything from a single indestructible force in no known direction, and then tells us that the initial change in every direction is incomprehensible—without a Creator? for it is absurd to say they are in-

comprehensible with one, except as to his *modus operandi*, which we have nothing to do with here—only with his existence. Mr. Spencer's "Postulates."

It may be thought of little consequence whether he is right or wrong in saying that the conservation of force is not an experimental law of nature, but a necessary truth or axiom "transcending demonstration and underlying experience by being the basis of it"—and the only one; for he expressly denies that all the commonly received axioms are self-evident or necessary truths (179 n.). But it is of more consequence than it looks; for, if the conservation of force is really a self-evident truth, it is not a law of nature which required making by the only power that can make them. As a matter of fact, it has been established by a long series of experiments by real philosophers, who knew very well that it could only be an inductive truth, and not a deductive one, if true at all. Mr. Spencer has never discovered one single fact or law of nature, or a new cause or effect of any kind. He merely takes the correlation, or conservation, or indestructibility of force as he found it, gives it a new name, and dogmatically asserts that it is a necessary and self-evident truth prior to all experience, and that from it all the laws of nature come.

For some reason of his own too, or perhaps only from a determination to have a phraseology as well as a religion of his own, he is pleased to call necessary or self-evident truths *postulates*, instead of axioms, which have always hitherto meant quite different things. The reason he gives for himself and Professor Huxley inventing the term "persistence of force" instead of "conservation," as everybody else calls it (if not correlation), is that "conservation implies a conserver," which he therefore denies, although he over and over again assigns that as the only function of the power which it is the only business of religion to acknowledge. "Correlation," at any rate, does not imply a correlator; but that was old, and "Persistence" is new. And this is the way he sets to work to show that it is the one necessary truth:—"All reasoned-out conclusions must rest on some *postulate*. We cannot go on merging derivative truths in those wider and wider truths from which they are derived without reaching at last a widest truth which can be merged in no other, or derived from no other. And whoever contemplates the relation in which it stands to the truths of science in general will see that this truth transcending demonstration is the 'persistence of force'" (192 c.). Is it possible that Mr. Spencer does not himself see, but only expects unbelievers in a Creator but believers in him not to

The Mean-
ing of "Ax-
ioms."

see, that any other proposition, not obviously false, might be substituted with equal logic for "persistence of force" in that sentence? What would he say if we substituted the "existence of a Creator" for it? Yet that is a vast deal more self-evident than the conservation of force.

Perhaps he or his followers may say that it is the very nature of axioms or self-evident truths not to be demonstrable by reasoning. And yet I see that one of them, the editor of *Knowledge*, in a depreciatory notice of the article on the Spencerian philosophy in the last *Edinburgh Review*, gives exactly the opposite definition of an axiom. He says that "in its proper sense it means a fact or law established by experience, and known to be worthy ($\alpha\lambda\iota\omicron\varsigma$) of acceptance": a truly fortunate pair of "proper meanings"! For (1) all truths are worthy to be received, and yet there are an infinity of truths for one axiom. And (2) so far from $\alpha\lambda\iota\omicron\varsigma$, or axiom (which are the same word in Greek and English writing), according to dictionaries and Aristotle, the great authority on such matters, always meant in philosophy "a self-evident truth, or basis of demonstration, or a truth which cannot be made plainer by demonstration"; in short, the very opposite of what requires experience to prove it. Euclid's axioms meant the same, and so did Newton's "Axioms or Laws of Motion," though he illustrated them by a few experiences and experiments, which alone were quite inadequate to prove them, if they had been at all doubtful in themselves. It is impossible to conceive action and reaction not being equal and opposite. And if bodies did not persist in the same direction and velocity, or rest, unless some new force disturbs them, to which side could they turn, and why should they either retard or accelerate themselves? The second law would require more discussion than this third and first; but I have no doubt Newton thought that also self-evident. If he did not, I have only to say that he was wrong, according to established use in Greek and English, to call his Laws of Motion "Axioms." Indeed they never are so called now, but always simply "The Laws of Motion," either for shortness or to avoid the ambiguity. But that is a mere verbal question.

I suppose that even Spencerian disciples will admit that something more than mere assertion is requisite to establish a new axiom; especially when a series of eminent philosophers had been for years trying to prove the thing in question by elaborate experiments, and have at last succeeded, so far as any law of nature can be said to be absolutely proved. Real axioms

are not proved by experiments, unless you choose to invent a new definition of them, like the editor of *Knowledge*, or Mr. Spencer, to which Mr. Romanes's remark would then apply. And let us see one or two specimens of this self-evident truth, which Herschel's "sufficiently clever man shut up by himself" ought to have been able to divine, if it is a real axiom, but not otherwise. When two equal lumps of clay hung close together as pendulums meet with equal velocity, they simply stop. All their motion appears to be lost; and the cleverest man in the world would have said that it is, and must be, until something more was known. No one could possibly have guessed that in those two dead, still, and cold-looking lumps a set of invisible vibrations would be set up, which we call heat, now that we have learnt by other experiments, and not by divination, what heat is; though to be sure Newton did divine that, but it had yet to be proved.

Conservation of Force is not an Axiom.

A synthetic philosopher sees somebody else turning a glass wheel under the friction of a piece of silk, evidently with more resistance than if the silk were cotton. The philosopher is asked to divine, without any information from experience, what becomes of all the force that the man has to exert beyond the ordinary friction. Does Mr. Spencer think he could have divined by any *à priori* process that a wire would carry that apparently lost force invisibly to the other side of the world, and there write sentences, illuminate a room (if the machine is big enough), perform chemical operations, melt steel, and grow peaches faster than the sun alone? If his philosophy is right, he ought to be able to divine all this, and every natural phenomenon in the world, without a single experiment. So far from that, he does not pretend to show how any single transformation could have been divined *à priori*, or deduced from his own assumed divination of the persistence of force. Yet his disciples are silly enough to believe that he has deduced and proved them all; which would indeed have "surpassed Newton in the vastness of the performance."

He thinks he gives a further proof of its axiomatic character by saying that Newton's "Axioms or Laws of Motion" involve it, which Newton certainly did not know—nor anybody else. Of course they are *consistent* with it, because both are true; but that is another thing. He forgets too that he denies all other "axioms" to be axiomatic except his own. Then, if Newton's depend on his (which they do not the least), they cannot prove it. If they are really axioms prior to his, and prove it (which also they do not), then his is not the one

Abstract
Force in no
Direction.

transcendental truth, "the ultimate of ultimates," but sinks into a mere consequence of Newton's laws; like the elliptic orbits of the planets, which are a necessary consequence of gravity and of whatever gave them their initial impulse; which also Mr. Spencer thinks he can dispense with, though he several times rightly says that a single uniform force of that kind could only produce uniform motion in one direction—*i.e.* towards the centre of gravity of the universe (287 and 481).

Therefore he has failed utterly on his very first proposition, and his whole case is gone. For, even if he could prove that everything may follow from the conservation of force, yet, until he proves that to be an *à priori* necessity, and not a law of nature which required a prime cause to make and to maintain it, his philosophy is nowhere, and can only be reconciled with truth and common sense in the same way as he "reconciles" religion with science.

Moreover, he seems to forget that force must act in some particular direction or directions before it can "persist" or be transformed into any other directions and kinds of force. Abstract force in no particular direction is nonsense. And indeed, as soon as he begins the real business of cosmogony, he does begin with the definite force of universal attraction commonly called gravity, and it is material to see how he generates and deals with it. Many philosophers, from Newton downwards, have tried in vain to discover a physical cause of gravity, acting equally through a vacuum and the densest matter, according to the well-known law of distance, and with the standard intensity, which could by no conceivable possibility be ascertained except from experience,—a fact which Mr. Spencer entirely ignores. They have all been wasting their time even more than the explorers of the conservation of force did in not waiting for Mr. Spencer, who does the whole job for them in three lines:—"Matter cannot be conceived except as manifesting forces of attraction and repulsion. . . . By a higher abstraction results the conception of attractive and repulsive forces pervading space" (p. 224). And that is all: not the smallest scrap of a reason why there should be any attractive or repulsive forces, and what; or why the atoms of the universe should not have existed for any length of time in a state of perfect indifference as to approaching each other. Of course he allows atoms, ever so diffused, to be matter (224). He is continually saying that he has shown each force in succession to be a "corollary," or some other kind of offshoot, of his persistent force, which we now find to be gravity—or

nothing. But all that he really does tell us of their generation is this comprehensive dictum :—“The genesis of heat, which *must* accompany augmentation of density” (only in some cases it perversely does not, as he himself elsewhere mentions) “is a consequence of another order. . . . At a later stage light, as well as heat, *will be* generated. Thus, without dwelling on the *likelihood* of chemical combinations and electrical disturbances, it is sufficiently *manifest* that, supposing matter to have originally existed in a diffused state [the homogeneous definite nebulous mass before described], the once uniform force which [beginning how and when?] caused its aggregation *must* have become gradually divided into different forces” (435); which is exactly what one force acting on homogeneous matter never could be, as he has himself several times indirectly admitted.

“Transformation of Forces a profound Mystery.”

But suppose for a moment that it could, and even *must*: what reason is that for concluding that the one initial force must divide itself into just the attractions of various kinds, and a few repulsions, heat, electricity, and all the chemical and organic forces requisite to generate the world? Mr. Spencer has not a word of reason to give for any one of these “mysterious transformations,” and indeed admits that he is entirely “in the dark” about them, as we shall see presently. And yet he coolly pronounces all these “wills” and “musts” and “likelihoods”—an entirely new agent in natural philosophy—“*deductions*” from his one axiom, and announces at the beginning of Chapter 14 that he is now going to “verify deduction by *induction*”; which means a natural selection of such specimens as suit his views of all his various processes of evolution, “abandoning” all that do not, and then pronouncing the induction sufficient and complete (379).

If anything could make all this more ludicrous, he has done it by solemnly pronouncing “the transformation of the physical forces into each other profound mysteries,” which “it is impossible to fathom” (p. 217). We are saved all trouble of refuting his impossible proposition that any primeval uniform force (which turns out to be self-existent gravity) could ever transform a homogeneous mass into a number of heterogeneous ones, by his saying himself that “where the only forces at work are those directly tending to produce aggregation or diffusion [of which latter force he has yet told us nothing] the whole history of an aggregate will comprise no more than the approaches of its components towards their common centre, and their recessions from it” (p. 287). And again :—“Like units subject to a uniform force capable of producing

Mr. Spencer's Self-existing Flocculi.

motion in them will be moved to like degrees in the same direction" (p. 481); which of course is quite true; and consequently all the assumptions, that one initial force acting on homogeneous matter would or could divide itself and the matter into different kinds of forces and matter, are mere nonsense, and have been refuted by himself.

Yet, in the face of those two true statements of the only possible effects of a uniform force acting on homogeneous matter, either all in parallel lines or all towards one centre of gravity, he coolly says that "the first stage of nebular condensation would be the precipitation into *flocculi* of denser matter previously diffused through a rarer medium" (p. 225). But how did the denser matter get previously diffused through a rarer medium in a homogeneous mass? And previously to what? We begin with the homogeneous mass, which is also inconceivable (he says) without gravity. Then the first stage necessarily must be (as he rightly said in the other place) motion of all the atoms in like degrees towards the centre; that is, the density must have increased in uniform spherical shells. How, then, was the precipitation or diffusion of denser matter through the rarer medium to begin? In all this reasoning of his, every cart and its horse are made to change places just as they are wanted. Flocculi are the denser matter, and yet the denser matter could not possibly get into flocculi or clouds, which are (relatively to the rest) lumps, under the action of gravity or uniform compression. But flocculi are wanted, and therefore flocculi must come. The Spencerian philosophy can make greater things than these come when they are called.

The next thing to be conjured into automatic existence is the spirality of the contracting nebula of homogeneous matter, and that feat is performed thus: "The tractive forces which would of themselves carry the matter in a straight line to the centre of gravity are opposed by the resistant forces of the medium through which it is drawn. The direction of movement must be the resultant of these, which, in consequence of the unsymmetrical form of the flocculus, must be a curve, directed, not to the centre of gravity, but towards one side of it" (p. 228). But towards which side? And which of all the infinity of axes through the centre of gravity is to be the axis of rotation? And how are all the flocculi throughout the universe to conspire to send resultants of gravity from every direction all into one direction round one axis when it has been discovered? And how did any unsymmetrical flocculus begin by means of uniform attraction moving homogeneous

units to like degrees in a homogeneous mass? Mr. Spencer himself says (of course in another place—p. 223) that “the Absolute Cause of changes, no matter what may be their special natures, is incomprehensible.” Here he means it to be comprehensible, and a necessary result of one initial force on one homogeneous mass. No doubt we might use the same words, only we should mean by them that the cause of all apparently automatic changes is the will of a Creator, who is incomprehensible beyond what he has told us of himself. But Mr. Spencer “abandons” him for a variety of incomprehensibles of his own, which can do nothing, and are nothing but mere words expressing that he knows nothing of any of those processes which he dogmatically calls corollaries of persistent force.

“The
Rhythm of
Motion.”

Hitherto he has been inventing processes, not one of which could take place spontaneously under the universal laws of motion. Next we have some maxims, of the kind which he is pleased to call postulates; not that it signifies much what they are called. The first that I will notice is what he calls “the Instability of the Homogeneous,” and sets up as an automatic cause of other incomprehensible changes. Of course the homogeneous will be unstable whenever new heterogeneous forces act upon it; but he has got to generate them yet; which he here professes to do by stating their effect after they are generated: another transposition of horse and cart, or cause and effect, and another contradiction of his own true axiom, that “like (or homogeneous) units subject to a uniform force will be moved to like degrees in the same direction.”

His assertion that “all motion is rhythmical,” *i.e.*, periodic or vibratory, “if antagonistic forces act, a postulate which is necessitated by the form of our experience” (which, I suppose, means in English that they always do), is simply wrong both ways—*i.e.*, as a self-evident or *à priori* truth, and as an experimental law of nature. The vibrations of heat and sound and electricity are undoubtedly automatic in the sense that we know no cause for them but the will of whatever power made the laws of nature; but that has nothing upon earth to do with their being “necessary” or divivable *à priori*; and they are a very small fraction of all the motions of the universe. So far as we know, the universe could exist without electricity: at any rate no human being could have divined it. And what are the *antagonistic* forces in all these cases? Plenty of other motions, but not all, are in some sense periodic, when there are known causes for it in accordance with the laws of motion: that is, their rhythm is a

"Annual
Trips a Co-
rollary of
Persistent
Force."

consequence of them, and not an independent cause, which Mr. Spencer wants. And, as for any of those rhythmical motions being "inevitable corollaries from the persistence of force," just let him give us what he conceives to be a mathematical deduction of them from that alone; and I remind him again that their being *consistent* with it is worth nothing, because all truths are consistent with each other, but they do not therefore all prove each other.

It would be more tedious than useful to go through Mr. Spencer's descriptions of his other self-acting functionaries named above. In every case his mode of argument is the same as I have described already. The Multiplication of Effects is illustrated by the fact that "classes who before could not afford it now take annual trips to the sea; visit their distant relations; make tours," and so on (455); and then he says that "for symmetry's sake it is proper briefly to point out"—that is, to *say*—"that the Multiplication of Effects is also a corollary of the" correlation or conservation of forces. He might as well say the multiplication table is. It does not need twenty-eight pages to prove that effects accumulate by multiplication, which is all that these pages practically come to; nor are we much nearer the solution of the problem of the prime cause of all things by being told such things as that. Indeed in that very chapter we learn the disappointing news that, after all these wonderful phrases and new names for old processes, we are as far off as ever from any solution of that problem. For he says, at p. 444, that "we are still in the dark respecting those mysterious properties which make the germ, when subject to fit influences, undergo the special changes beginning (and continuing) these transformations." And also, at p. 217, that "they are not profounder mysteries than the transformation of physical forces into each other"; which actually is the one "self-evident truth or meaning" of persistence or conservation of force. Perhaps Mr. Spencer, or one of his admirers who think they understand his Philosophy, will condescend to explain some day how profound mysteries of experience can be necessary results and corollaries of a self-evident truth, which was itself only discovered by a long course of experimental investigation; and then how all knowledge is unified by telling us that all these things are unfathomable, and that the philosopher is hopelessly in the dark about them.

Tempting as it is to go on with the exposure of such mischievous and absurd *paradogmatism*, of which more may be seen in the *Edinburgh Review*, I will confine myself to

one more specimen, in quite a different direction. Thus far we have been learning the history of all things from the imperceptible. But our philosopher is a prophet too, and can even deduce other worlds of happiness and perfection from persistent force. He tells us how Evolution must proceed through "Equilibration" to final Dissolution and Omnipresent Death (514); and then suddenly cheers up, three pages further on, with the prophetic vision that "Evolution *can* only end in the establishment of the greatest perfection and universal happiness." And this is a piece of genuine inspiration, for he does not even profess to give a word of reason for it. The little that he does say about the scientific future points entirely the other way. For the only possible revival that he contemplates after omnipresent death is the chance of a future collision of some pair of wandering stars, which may generate another indefinite or definite nebula; and then all the same processes may start again. But why that future nebula is to reach any more perfection or happiness than this, or its inhabitants to make any greater "advance towards harmony between man's mental nature and the conditions of his existence," or even why there must be men at all there instead of some other kind of final products of Evolution—is all left in the region of the unfathomable, except to the prophet to whom it has been revealed. It certainly is hard upon his disciples to have to be content with his assurance that a future life of happiness and harmony and perfection is in store for somebody else, but only omnipresent and eternal death for them. That, however, is the common creed of evolutionary cosmogonists and disbelievers in the eternal life that we believe in.

Spencerian
Future Hap-
piness and
Perfection.

PART II.

The only
Two Alterna-
tives.

I think we have had enough of Mr. Spencer for the present, and we can reflect for ourselves on the phenomenon of the intellect of this scientific and conceited age accepting such attempts to find a substitute for the belief of all mankind (until lately), that nothing can have made itself or anything superior to itself; that manifest and admitted contrivances cannot have come without a contriver of them for the purpose which they serve, and of the means of producing them; and that it is little short of lunacy to talk of intelligence being generated out of self-existing matter with no properties by self-existing gravity—if such a force could be. We have now seen that nothing is too absurd, and no reasoning too ludicrous, to be swallowed by those who have abandoned that once universal creed among all people capable of thinking of more than their appetites. I now propose to add a few words on the inference of creative design backwards, from things manifestly being what they would have been if they were designed by an inventor and a power infinitely superior to ourselves.

Some anti-creationists deny that they are, and say that they could themselves have made some things better, though they prudently abstain from saying how, beyond repeating the general proposition that an omnipotent Creator ought, in their opinion, to have made a perfect world, with no evil in it. That proposition also I have discussed elsewhere, and of course do not pretend to explain why we have to wait for perfection in another world. All that has nothing to do with the alternatives of design or no design in this. For again it is necessary to remind people that they have to choose between two only possible alternatives, according to the balance of probabilities. There is no middle way, between the world and all that is in it having been either designed or not designed; and therefore we *ipso facto* believe, and cannot but believe, one just so far as we disbelieve the other. A man may not have made up his mind which to believe, but that man's opinion is worth nothing. In fact he has none; or an Agnostic must be wrong, whether theists or atheists are right.

Therefore, also, a man who denies design, but cannot state any other rational mode of generating the universe, condemns himself. For unquestionably a designing Creator could produce the universe, and therefore must have done it, if

nothing else did; and that something else must be capable of rational and intelligible description and proof of its capacity for doing the business before we need attend to it. We have seen that the "Apostle of Evolution" cannot make his scheme, or force, or whatever he likes to call his self-acting machinery, take a single step towards doing the business, without calling in other forces, of which every one required creating by some "immaterial Reality" or power strong enough to influence all the matter in the universe. And it would be absurd to talk of such a power doing all that without designing it, or making laws of nature in a hap-hazard, blundering sort of way.

Guessing
what a Creator
would do
is useless.

Indeed it is one of the characteristics of the laws of nature that they have no mistakes, and never want amending, as all human laws do constantly. You may say that they sometimes produce failures—imperfect or defective creatures below their normal type, and some too bad to live. But that is only the old argument again in other words, that an omnipotent Creator would have made everything perfect. But, granting that opinion to be *à priori* probable, or worth something in the balancing of probabilities, it comes to very little when weighed against the innumerable facts which tend to prove design; for it is only one guess against the necessary inference from those facts. Moreover, occasional failures in individuals no more prove bad design than occasional failures in any machine or fabric prove it to have been ill-designed, though it may have been ill-made. Where is the contrivance in all nature which we could improve, consistently with the general laws of nature, which laws no one can be so absurd as to fancy that he could mend, or guess at the consequences of any attempt to do so?

Allowing as much gradual improvement as you like by biological Evolution, or the creation of small—or large—changes adapted to changing circumstances, each creature has somehow come to be as well contrived as possible for its own work. And I suppose we may say the same of every organ for the time, though they may have improved in time, owing to causes which are the very things that want explaining, either by a creative power or by whatever else unbelievers in one can invent, without merely calling them "unfathomable mysteries": which only means that they require a Creator.

Professor Clifford perhaps set the fashion of saying that the human eye is so far from being the wonderful and perfect instrument that Paley and others had made out, that it is full of defects. I never could find that he had invented a superior

Helmholtz
on the De-
fects of the
Eye.

eye himself, which a man who says all that ought to do. But I do find this in Helmholtz's *Scientific Lectures* (p. 227), part of which probably was Clifford's authority. After a detailed explanation of the ocular contrivances, he said:—"The eye has every possible defect that can be found in an optical instrument, and even some that are peculiar to itself; *but* they are all so counteracted that the inexactness of the images very little exceeds the limits which are set to the delicacy of sensation by the dimensions of the retinal cones [*i.e.*, no more would be any use]. The adaptation of the eye to its functions is therefore most complete, and is seen in the very limits set to its defects. The result, which *may* have been reached by innumerable generations under the Darwinian law of inheritance, coincides with what the wisest wisdom may have devised beforehand." I leave that to speak for itself.

I read a paper lately by Professor Attfeld, trying to account for the rise of sap in trees far above the known limits of either atmospheric pressure of 32 ft. for water, or of capillary attraction. His explanation may be right or wrong. If wrong, we still know nothing of the matter; but, if right, it means that he has only now discovered the contrivance which has been doing its work perfectly as long as trees have lived upon the earth, and which the spontaneous Evolutionists expect us to believe made itself, without design anywhere. Whether it did so gradually or at once, it equally required inventing and preparing for and developing, like the steam-engine or the telephone. Philosophers have been trying to invent it, or rather to explain the invention with the puzzle itself open before them, and have not been able to do it with all their intelligence; and yet we are to believe that it invented itself with none; and that electric eels invented and made themselves ages before any electrical machine was invented by "the highest intelligence" of the anti-creationists; which also made itself out of dead atoms by persistent force.

In like manner there is every now and then a discussion carried on for months in the scientific papers about how birds fly; from which it is evident that nobody quite knows. Yet, either the birds have always known how to make themselves wings and feathers to fly away with, or some one else knew and invented feathers for them, one of the most wonderful natural contrivances. Has any Evolutionist ever pretended to guess how they came? They deny that feathers were ever designed for flying, or eyes for seeing: they both went on growing, with obstinate prophetic instinct that the time would come when they would give the *à priori* inconceivable

power of making solid bodies travel with immense velocity over the lightest known kind of matter; and that eyes would give a new sense altogether, and therefore quite inconceivable beforehand except by a Creator.

Useless
Organs both
wax and
wane.

Yet one of the fundamental maxims of all the Evolutionists is, that organs do not grow and improve, but decay, when there is nothing for them to do. Mr. Romanes says, in *Mental Evolution*, p. 89, "blind fishes which live in the dark have lost their eyes from disuse"; yet other fishes, while blind, grew eyes spontaneously! If light makes eyes, how does it go to work? Organs only grow and improve by "natural" or "sexual selection"; which means preference for the useful over the useless, or the beautiful over the ugly, or the strong over the weak. But what was the use, or beauty, or strength, of a rudimentary feather—or a rudimentary anything? On this point their theory is suicidal; for if rudimentary organs could begin before they were of any use, or if rudimentary creatures could start them with a view to future use ages afterwards, that is *ipso facto* design of a very high order. Evolutionists constantly talk of animals and plants *doing* this and that, and growing all sorts of organs to produce such and such effects. If they are challenged to say what they mean, they answer that they only mean it figuratively. But their way is to use it without any explanation, and to get it carelessly accepted as common language of science, and so people are dexterously led to forget that, if it means anything, it means that all these things have been carefully designed. If that fallacy is pointed out, they say we ought to know, without continual repetition, that "natural selection" does it all. So you have only to make out that some contrivance will be wanted some day, either for the benefit of an animal or plant itself, or for some other, as horses are for men, and then they are sure to invent it and to develop it for themselves; and all this in the face of another part of the Evolution theory, that unused organs die out, and are *not* "naturally selected" to be continued and improved.

Another thing which the Evolutionists have been challenged to account for without creative design is the beauty of nature. All that they have ever been able to invent a plausible theory for is the improvement of the colours of some flowers by insects, and of animals by their own sense of beauty in sexual selection, which is assumed to agree with our sense of beauty. Considering what an enormous quantity of the face of nature these two hypotheses leave uncovered, it is

What made
the Beauty of
Nature?

hardly worth while to criticise them ; for a theory that only explains a few phenomena out of an immense class is no theory at all, or cannot be the right one. It may be some subordinate branch of the true theory, but it is thereby proved not to be the fundamental one. Nevertheless, there is really very little evidence of animals being influenced by sexual selection of beauty, though there is some ; and more as to strength where males have to fight for females. Even among men and women there is less than might have been expected. Nor is there much evidence, if any, that bees prefer what we think pretty flowers to plain ones in looking for honey. Of course they look for those which they know by instinct or experience to have the most or best honey. And it is singular that some of their most favourite flowers have very dull colours, notwithstanding the ages that they have been, according to this theory, improving them. I wrote this several years ago, and no Evolutionist has condescended to answer it, so far as I know ; nor the remarks of the late Professor Mozley, and my further ones on the general beauty of nature in phenomena beyond the possibility of evolution, including a great deal that remains latent until we bring it to light, either by simple discovery or as the result of some such process as cutting or polishing, which does not make, but only reveals, already existing beauties. The automatic cosmogonists believe they made themselves, but they never tell us how ; nor how the infinite variety of nature came, which is a striking contrast to the dead monotony and repetition that all human ornamentation soon runs into. At the same time the ugliness and offensiveness of internal animal organs which are not intended to be seen, and of all fæces, which are evidently intended to be got rid of, are instances of design by contrast with the beauty of most visible things, which again cannot be explained either by habit or by any process that can be called selection.

I only touch on all these points very briefly, and omit some others altogether, because I have treated of them elsewhere. It must be borne in mind throughout that the Evolutionists' argument about change of circumstances producing all necessary changes of structure, and advance of intellectual and other powers, from the lowest up to the highest, is no solution, but begs the whole question of the possibility of the smallest advance making itself, either to adapt itself to new circumstances, or to improve beauty, or to lay the foundation for future organs or powers which will be useless until they are complete. The very idea of power making or

developing itself is contrary to all modern science, and would not be listened to for a moment in any but the hazy regions of automatic cosmogony, for which any hypothesis seems good enough.

Incomplete
Machinery is
useless.

There are other kinds of natural contrivances towards which surrounding circumstances could do nothing, if they ever could without some creative power moving to meet them—viz., those which must either be complete or nothing. There are cases, properly insisted on by Paley, and never answered, of holes being made in certain bones for arteries to pass through, and of sinews passed through loops in others like cords through a pulley to change their direction. It is plain that those must be all or nothing, and could not come gradually. And animals that live by gnawing and biting hard things, such as the rodents and elephants, have their teeth continually growing, which no others have. What conceivable automatic process could have caused that, and that the teeth should not only grow, but be in alternate hard and soft slices vertically, so as to keep the grinding teeth always rough, and the gnawing teeth sharp, and yet not too thin? There are innumerable other questions like these, to which the Evolutionists never attempt any answer.

If they ask how we account for some useless latent organs, or visible traces of them, we answer that, if they are waiting to be developed into useful ones, that is the clearest possible proof of design, and that accounts for them; and, if they are dying out because they are no longer wanted, we have no more to say than that it seems to be a law of nature that they should: so, at least, the Darwinians say, though traces of some useless organs have remained for as long as we know anything of the animals. But, assuming that law to be as true as they like, it is itself a very striking proof of design, that living organs should increase with use while dead machines only wear out. Wooden legs do not get larger or stronger by use, but the contrary, while live ones do, up to a certain point. That is no more accounted for by its commonness than all generation is, or the general likeness of offspring to parents, and occasional advance upon them. All these would appear miraculous or impossible to that imaginary philosopher of Herschel's shut up by himself to divine laws of nature, which is the position assumed by one who would logically deduce them from any real axiom that he chooses to start with. Mr. Spencer professes to have done it, and we see with what success; he cannot stir a step anywhere without assuming the result that he professes to deduce, and a

Seed-pro-
jecting
Plants.

quantity of other things besides ; nor does he even attempt an explanation of how any elements of oxygen, hydrogen, &c., got themselves made out of homogeneous atoms.

It would make this paper far too long if I began describing specimens of evident contrivance in nature, and therefore I will content myself with referring to the latest scientific notice of a particular group of them in a paper by Sir J. Lubbock, in the Royal Institution Proceedings of 1882, on the curious contrivances for projecting the seeds of various plants far enough, and sometimes for performing other feats, to make them grow, which he says he could not believe himself until he saw them. In my *Origin of Laws of Nature* I cited another of his observations, of the modes in which certain plants "protect themselves" from the ants who would steal their honey from the bees. What kind of natural selection or other automatic process can conceivably have had anything to do with such contrivances as those? Such outstanding problems ought to make us more suspicious of the very doubtful solutions of some others, such as the two famous mathematical problems of bee-cells, especially in the face of the difficulty that no working bee had working parents to transmit their experience to her: remembering also that a new instinct or genius sometimes appears suddenly, as in the "calculating boys" spoken of before. And, though we see that acquired experience can be transmitted through parents to a certain extent, that is itself quite as incomprehensible as Mr. Spencer admits all other natural processes to be. It would have been pronounced impossible *à priori* that a microscopic germ or seed should have the power of attracting and assimilating other particles of matter into a compound possessing some of the acquired knowledge and all the other powers of the parents of that seed. That is the primary problem to be solved, whether for bees or flowers, or anything else which is supposed to improve in successive generations ; and the secondary one is the power of making variations ever so little better than before.

Until some theory can be invented to account for all those stages of evolution from a microscopic particle, including its own generation, up to a philosopher, by any conceivable self-existing forces out of homogeneous self-existing matter, and also for the production of all natural beauty—not merely a little of it—all the phrases that have been invented pretending to account for these things are nothing more than words. Natural selections, sexual selections, survivals of the fittest, atavisms, heredities, and I don't know how many more, may all be

true as facts or processes, and may do what they can. But the Evolutionists are at an immeasurable distance yet from showing that they can do everything. It is entirely bad logic to assume that they can do a bit more than we can prove. And, if we could prove them to be capable of doing even such inconceivable things as producing the general beauty of nature and starting generation, the theory of spontaneous cosmogony would still be nowhere, until we could prove for them that all the necessary forces started themselves and maintain themselves, and all their powers of transformation, according to the ascertained laws of conservation of force.

“The Carpenter Theory of Creation.”

Therefore, whichever end we begin at in our reasoning, whether at Mr. Spencer’s “Unknowable and Persistent Force,” or the latest phenomena of the present world, we are equally landed in some confessedly “incomprehensible” process, or one for which no possible physical cause can be discovered or invented, or suggested in intelligible language with any rational probability. What does that mean, except that the final cause or agent must be above physical, or supernatural, or, at any rate, what Newton called “immaterial”? Indeed Mr. Spencer calls his Prime Cause an “immaterial Reality,” which is practically the same thing, bearing in mind that he will never use other people’s phrases. Only he denies that his immaterial agent does anything except maintain indestructible force and “work in us,” whatever he means by that. Whether he means anything or nothing, both those phrases leave the problem of cosmogony as unexplained and as incomprehensible as if he had simply and dogmatically said, “The world made itself by persistent force, and that is all we know about it, and therefore there was, and is, and can be, no designing Creator.”

I promised to say a word before I finished about his nickname of the “carpenter theory of creation” for ours, which is no doubt calculated to please those who do not want to see through its absurdity, or to remember that carpenters neither make nor alter the nature of their materials, and much less produce their results by making general laws for causing bits of wood to grow of themselves into chairs and tables, besides other very obvious differences below the notice of a synthetic unifier of all knowledge. And, if the nickname were as good as it is bad, it is only the Spencerian appropriation of the epithet “anthropomorphic,” which had often been applied before by Materialists to the creative theory. To say nothing of its being wrong etymologically (for no theory imputes the *form* of man to God), it practically means this: Men

have some intelligence, foresight, and inventive power, and some gradually increasing scientific and mathematical knowledge. Our Creator has infinitely more of all those things, and omnipotence besides. Therefore the creative theory assumes a God like men.

If such nonsense wants making more evident by illustration, here is one: Frogs have some intelligence, foresight, locomotive power, and will and knowledge how to maintain themselves and their species, to avoid certain dangers, and generally to gain the objects of their life. Therefore attributing those same powers in a much higher degree, with many others, to man, is a *batrachomorph* theory of human nature. That is just as good logic as the other, and as the Spencerian philosophy of creation from beginning to end. It is no answer to say that there is no doubt about the existence of some human faculties of the same kind as those of many animals, and of others much higher, while the existence of a Creator with any faculties like ours, and superior ones, is doubted, and cannot be absolutely proved. Those who talk in this way ask us to accept their dictum as self-evident that a Creator cannot have such faculties, and pretend to help it by inventing an absurd nickname or two. Such arguing is not argument, but mere assumption. And if the old theory of a designed creation is only maintained "in the pride of ignorance," as Mr. Spencer says), I suppose the rejection of it for undesigned and "unfathomable mysteries" of self-transforming forces and self-generated properties of matter, and of effects without causes, is the modesty of omniscience.

I end by saying that I do not know, or know of, a single man of real scientific reputation or mathematical ability who has committed himself to any specific approval of Mr. Spencer's "natural philosophy," which he has himself explained his book of *First Principles of Synthetic Philosophy* to mean. General laudation of him as a great evolutionist by automatic cosmogony is good for nothing, and commits such admirers to nothing involving their own reputation. Too many of them have an evident reason for not choosing to expose his bad reasoning as I have done, though I dare say they could have done it better. Ignorant people naturally take for granted that his scientific reasoning is generally accepted by competent judges, whereas it is nothing of the kind.

The CHAIRMAN (the Right Hon. A. S. Ayrton)—I am sure we have all heard with the greatest pleasure the able paper just read. It is now left for the consideration of those present whose minds and studies have

been peculiarly directed to the subject-matter of which it treats, and I have no doubt you will be glad to hear such observations as they may be disposed to make. I trust that any one who may be induced to discuss this subject will confine his remarks within the four corners of the matter dealt with by the author, in order that we may not drift into a wide and unlimited debate on the very large and general questions which might be raised upon it. It would be well, also, to bear in mind that my friend Sir Edmund Beckett has merely taken up the gauntlet thrown down by a writer calling himself a veteran of natural science and a philosopher; and therefore it is desirable that the discussion should be carried on upon the footing of a controversy raised on the same basis; that is to say, we ought not to-night to meet what I may term the temporal view of the matter by theological propositions. What is required is that we should controvert what is asserted on the same platform as that which has been chosen by those who make the disputed assertions. If we can join issue on that ground, I think the result will be more instructive than it would otherwise prove, and will tend more to serve the purpose for which, doubtless, this paper has been written.

Capt. F. PETRIE (Hon. Secretary).—Before the discussion begins I have to mention that the Council invited Mr. Herbert Spencer to be present this evening; he has replied thanking the Council, and stating that the condition of his health had for some time deprived him of the opportunity of accepting such invitations.

Mr. E. CLARKE, Q.C., M.P.—I had not the smallest idea, when I accepted the very kind invitation of your honorary secretary to attend this evening and listen to the paper just read, that that would involve my being called upon to say anything on a subject which my studies have not given me so great an opportunity as those of Sir Edmund Beckett of dealing with deep questions of great importance such as that upon which he has read so admirable a paper. I may say, however, that I have listened with great delight to the reading of this paper, because, believing strongly, as I do, in the great truths which this Institute has been founded to maintain, I was very pleased to know that one of the keenest intellects amongst our living lawyers had been directed to the study of this subject, and that Sir Edmund Beckett had been induced to give you a paper thereon. For my part, it is impossible that I should make a speech on the subject opened up this evening. I might possibly do so were I at issue with Sir Edmund Beckett on any of the points upon which he has touched in his paper. In that case I should not be reluctant, however weakly and however feebly I might acquit myself, to enter into the conflict and fight the lecturer upon our points of variance; however, not only do I agree with him in all his conclusions, but, admiring as I do, the way in which he has put those conclusions before the meeting, I can only acknowledge the compliment paid me by inviting me here, and

await the opportunity, if I have it given me by-and-by, of following in his footsteps.

Mr. W. P. JAMES.—I do not rise for the purpose of criticising Sir Edmund Beckett's paper, which must have been an intellectual treat to everybody, not only on account of the ability it displays, and the polished irony which pervades it, but also because of the extreme ease with which the writer has demolished his opponent. There is one point upon which I should particularly like to say a few words, and that is with regard to the arrogance with which it is the custom for Haeckel and his school to speak of their views as an advance on the old philosophy. I merely wish to show, on the contrary, that if we consider the history of philosophy among the Greeks, the views of Haeckel and his followers, instead of being an advance on those of the ancients, evince a distinct retrogression. Those scientific journals which take their cue from this extreme section of Free Thought are very fond of speaking of the Argument from Design as if it were something quite obsolete, old-fashioned, grandmotherly, and antediluvian. In opposition to this doctrine, theories of material development or Monism are referred to as an immense advance, as the last expression of the culture of the nineteenth century. Now, if we take the course of Greek philosophy as a guide, we can see at once that this assertion is the exact opposite of the truth; and Greek philosophy is a very convenient guide for this reason, that it had no official connexion with religion; or, rather, the Greek religion was bound up with no theory of creation; so that the Greek mind enjoyed the utmost freedom in dealing with all these questions. This being so, when we go backwards and trace the whole development of Greek philosophy, we see that it began with a series of wild theories of evolution, and ended in a sober doctrine of design. The passage from a scheme which recognises Purpose in Nature, which contends for design, to a monistic or materialistic theory of evolution, is, in fact, a distinct retrogression—a going back from the position taken up by Aristotle, Plato, and Socrates—to the infantile guesses of Empedocles, Heraclitus, Anaximander, and Thales. Such was the historical development of thought in Greece where the human intellect could move with the utmost conceivable freedom, and where the popular religion had no official doctrine about creation. Greek philosophy began, as I have said, with theories of evolution or development of the wildest and crudest kind—theories setting forth that there was in the universe but one original substance, which substance was acted on by forces, and produced all the phenomena of Nature. Thales held that all had been evolved from water; Anaximander, that the world sprang from the infinite; Heraclitus, that everything had its origin in ethereal fire; Empedocles, that the universe was the product of the four elements, under the influence of two forces—love and hate, or, in other words, attraction and repulsion. The first person to bring in the notion of intelligence, or, as Aristotle put it, “to speak like a sober man among the drunken,” was Anaxagoras. It is true that Pythagoras, also, had recognised that

the Universe showed Order, and had called it for that reason *Kosmos*. The first person again, to state the argument from design, as we know it, was Socrates, as he is reported by Xenophon—a more trustworthy authority for some purposes than Plato, because in Plato's eloquent and imaginative writings we never know whether we have the real Socrates or simply the mouth-piece of Platonic speculations. The opinions of Socrates on this point are to be found in the first book, fourth chapter, and again in the fourth book, third chapter, of the *Memorabilia*, a little treatise written in the purest Attic and full of practical wisdom. The argument was afterwards repeated by Plato, with a great deal of detail, in two works, in the *Timæus* and in the tenth book of the *Laws*. Besides Plato, Aristotle, the keenest, most searching, most all-embracing intellect of antiquity, distinctly rested in a teleological view of the universe. His statements of his views on this subject are only to be found in isolated passages, as they appear in his extant works; but it would seem, from a fragment translated by Cicero, that in one of his lost dialogues he had treated of design at great length and with much fulness and eloquence. Such is the history of Greek philosophy upon this subject—that is to say, from a crude origin, and from wild theories of evolution and development, it rose to the reasonable conclusion that the universe bears traces of intelligence and design; so that, when Haeckel and his imitators in England have the arrogance to speak of their monistic theory as an advance on all previous theories, they simply show their total ignorance of ancient philosophy. In doing this they evince not an advance, but distinct retrogression; they are going back from the sober conclusions of the splendid maturity of Greek speculation to the fanciful dreams of its childhood. (Applause.)

Mr. D. HOWARD (Vice-Pres. Chem. Inst.).—It is difficult to attempt to make a speech on a paper one so cordially agrees with, and of which one cannot speak too highly. It has been a very keen enjoyment to me to hear the theories dealt with by the author subjected to critical examination with all the dialectic skill of a trained and accomplished debater. I cannot help thinking that, with all their faults, the ancients had one wise method; they did submit their views to public discussion. It would be well if some of the moderns did the same. I was asked by a student the other day, "What is the use of teaching medical men logic?" I replied, that when he had seen more of scientific men he would not ask that question; but, rather, why did not they learn more? The paper read to-night has brought before us, in an admirable manner, the terrible confusion that exists among scientific men between deduction and induction—between what are spoken of as necessary truths and those truths that are proved by experiment. All I can say on the matter is, that to me nothing is more startling than to find that most difficult induction, which was the result of many years of patient labour—the correlation of physical forces—treated as a self-evident truth. This is one of the most amazing things we can possibly hear; and one can only lament the excessive density of one's own brain in never having seen the

necessity of that truth without experience, and wonder that any one could profess to have evolved such a truth from his own consciousness. The fact is, that so far from physical science, as we understand it, being the result of deductions from necessary truths, it is but the result of patient inductions from a life-long study of Nature; and this is, in itself, a strong argument for design. In the latter part of the paper, which deals more briefly than we might have wished, with the "argument from design," it is very pleasant to find this old argument made by skilful hands more strong than ever. It is gratifying to see that it is not to be regarded as worn out; that, although the old illustrations may be partially worn out, the argument itself is as forcible as ever. Nay, more, the very shifts its opponents are put to—the extraordinary logical, or rather, illogical manœuvres they perform in order to evade the crushing force of this "argument from design" is, in itself, a proof that it is as strong as ever. With regard to the question of evolution, I may express a hope that you will keep clearly in your minds the distinctions made in this paper between the many senses in which the word "evolution" is used. That some form of evolution may explain some of the phenomena of nature is a thing which many may grant; that it will explain all, it would require a bold mind to maintain; but we get into hopeless confusion between evolution in a logical and in a material sense—evolution of ideas and evolution by natural selection—evolution caused by an external power and that which is self-acting. In studying this hopeless confusion of thought I have often wondered whether any living lawyer could make sense of these dicta; and I am very glad to find that so able a representative of the law as Sir Edmund Beckett has, equally with myself, failed to make sense of them.

REV. R. THORNTON, D.D., V.P.—I rise, not to take part in the discussion, for I find we have not been able to discuss the able paper before us. Mr. Herbert Spencer is, unfortunately, absent, owing to indisposition, and consequently there has been practically no discussion of the questions raised by the paper in regard to Mr. Spencer's theory. I have risen for the purpose of asking those present to express their thanks to our Chairman for presiding on this occasion, and to the learned author of the paper for the very admirable specimen of his talents which he has put before us. I think the Victoria Institute has cause to be thankful to both these gentlemen, especially for the reason that there is a little bit of unfair suspicion in the minds of certain persons that there has been, perhaps, a little too much clericalism in this Society. We are not, as some have hinted, a mere assembly of divines, or of *quasi-divines*, whose object is to debate important scientific truths in purely theological fashion, and to decide them, as we clergymen are too apt to decide questions, in our "coward's castle." I am very glad to see one distinguished layman occupying the chair here to-night, and another distinguished layman defending the truths of Christianity—for they are truths of Christianity which the author of the paper has been defending, although he has defended them from the secular side. What we want is a scientific annihilation of *pseudo science*, in

the interests of religion; not a religious statement, such as anybody can make, that the discoveries of *pseudo* science are not in accord with our theology. We have heard with great gratification from the author of the paper that we are not, after all, to give up the old account that God made everything, one with another, and that He made nothing amiss. Mr. Herbert Spencer and his school come forward and say: "*Veteres avias tibi de pulmone revello*. I will teach you something better and grander. It is not true that in the beginning God created the heavens and the earth. There never was a beginning or a creation." When any one asks, "What was there, then?" Mr. Herbert Spencer tells us there was a "differentiation" and an "integration," and that these produced everything by "coherence" of the "homogeneous" or "heterogeneous," and by the "rhythmical motion" which he asserts has the power of production. Then, if you suggest any other mode of explaining the way in which things came into being, that is said to be entirely "unthinkable," and when you maintain anything which is "unthinkable" you know what to expect. That is the way in which we are treated by these philosophers. Having been accustomed, as a plain Englishman, to the use of words in their original and true sense, and having also been in the habit of cautioning my pupils against using words out of their right sense, I have been greatly puzzled by the diction of this Spencerian philosophy. But we have, fortunately, had the advantage of securing on our side on the present occasion an able lawyer, who has called the Spencerian witnesses up and cross-examined them. He has put it thus: "You say 'differentiation' and 'integration' have produced these results. What do you mean? What is signified by the words 'integration,' and 'coherence,' and 'evolution'?" And I think I may say, in point of fact, the witnesses he has interrogated have entirely broken down. I have now only to ask the meeting to return its cordial thanks to the Chairman for presiding, and to Sir Edmund Beckett for his admirable paper.

The CHAIRMAN.—As it is now so late, I do not propose to add more than a few words to what has already been said; but I may say that I think Mr. Herbert Spencer is to be credited with having distinguished himself immensely by an enormous evolution of words. In this he is pre-eminent; but I hope that both his philosophy and his words will die out, and that, at no distant day, the whole thing will be forgotten. At the same time, I am delighted to put the vote of thanks to our able lecturer, who has afforded us so much gratification this evening, and who has done so much to exhibit these Spencerian words in a fitting, proper, and true light, and to show that they really resolve themselves, in the end, into nothing but contradiction, and are but a sorry substitute for those substantial ideas which are to be found in plain English. It has struck me as astonishing, in reading these writings, how many words have been invented and employed to express the old idea of "growth." Everybody understands what that word means, but yet it has been mystified in all sorts of ways. If you put to yourselves this simple question, "How can there be growth, in the sense of reproduction, without

design before the reproduction commenced?" what is the obvious answer? If the thing itself can grow, how can the parent get the idea of making a new production, unless through a scheme of design commensurate with the beginning of species, and going on until it comes to an end? There is the evidence of design in the beginning—there is no break in it; and, if there be only that design governing the whole system of reproduction, it is manifest that new species could not be produced; that is to say, it could not in itself invent the growth of anything else; for, even if it had its own evolution, that evolution must come to an end with itself. It cannot regulate, after it is dead and buried, the evolution of something else; and, consequently, if anything else came without pre-ordained design, it would be an especially wonderful proceeding, because there would be no connecting link. The more you examine this, the more do you bring home to your mind the conviction that there must be design regulating continuity of life and species. It is very interesting, I think, when persons of great intellect and knowledge arrive at different ideas, to ask yourselves the question, "How does the difference begin? Where did it begin?" And the way in which it began is this: a certain class of philosophers took a very narrow view of what is called "species." They gave to species very definite limits, and these defined limits arose out of what is called the science of natural history, that is the classification of living creatures according to some selected feature, and from this a very narrow view of species was arrived at. Then, things are discovered which do not consist with the view that has been adopted, and hence there is contention through which some new fantasy arises. But the source of error appears to be, that the definition of species is much larger and more complicated than you will find in any book of natural history. It is not a thing that has a certain head or tail which makes it easy to grasp; on the contrary, it is a very complicated thing, and the definition of it consists in a great number of conditions peculiar to its own species. Moreover, every species is not exact in its reproduction and continuity. It is in the nature of species that it should be liable and subject to natural and external influences which will produce divergencies, both internal and external, and yet not destroy the characteristics which constitute the species itself. This may arise from climate and from a great many other things; but divergence is in the nature of every species, because we find no such thing as complete exactness in life. No two things are ever found exactly alike. If you examine a tree, you will see that no two of its leaves are exactly similar, and yet each has the characteristics of the parent plant on which it grows. The whole condition of nature is marked by variation, within certain limits and subordinated to certain rules applicable to species; but, nevertheless, there is continuity of the species itself; and, if you take a large and comprehensive view, you will find that the whole of Darwin's writings are confined to the development of the one principle raised in the book I first read—his *Origin of Species*. I remember saying to myself, "This man is really a very clever and skilful observer; but he does not seem to have a large

faculty of reason." It reminds me of what was written by a great philosopher of ancient times, "It is the business of specialists to collect all the facts ; but it is that of true philosophy to arrive at just conclusions." Now, Darwin, as a specialist, collected an infinite number of facts, but he entirely failed to arrive at true, philosophical, and practical conclusions upon those facts. Curiously enough, the other day I asked a lawyer—because lawyers are very apt to look at facts with the eye of reason, by which facts are tried—"Did you ever read Darwin's book?" His reply was, "I read his *Origin of Species*, and when I had gone through it I wondered how a man could collect so many interesting facts and fall into so many fallacies." This tends to show that, if we get a clear insight into the character of the erroneous deduction that misled Darwin in composing his book, it would be easy to refute the conclusions he has expressed on the subject of evolution, in the sense in which I may venture to condemn it, namely atheistic evolution ; because theistic evolution is a mere speculation as to how the Divine Creator proceeded in the work of creation. Any writer may create a theory of his own on this subject, because nobody knows anything for certain about it ; but this is quite a different proposition. I think, therefore, that the more this subject is examined by the aid of the evidence presented to our senses in the light of nature, the less shall we be disposed to realise Darwin's views ; the more surely shall we be brought to the conclusion that creation must have been by species, and that man, who is the highest type, was created in all his perfection, as far as that perfection has been exhibited ; while, if there be variation, it is rather according to the law of species permitting a depreciation under certain circumstances, the man, whom we may call the worst made, being only a bad example of what the best originally was. I now ask you to give your thanks to the lecturer.

The vote was accorded amid applause.

Sir E. BECKETT.—I have nothing to add to what I have already said, except to acknowledge the vote of thanks you have just accorded to me. I am sorry we have had no real discussion to-night ; but, at any rate, I did my best to produce one by giving this paper to a very clever friend of mine—one of the most scientific men I know, whom I often consult on mathematical difficulties, and who, I am sorry to say, is not a believer in Revelation. He said to me, "I cannot say that I have a word to utter against your paper, except as to two sentences which assume a Revelation:" which I showed him that they do not. I thought this a great concession to be made by a man of that kind.

The meeting was then adjourned.