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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 *primâ 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 protozöon : where does man come in ? But I have never yet obtained any answer to that question. (Hear, hear.) The supposition is, that the original protozöon, 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

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* "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

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* "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."

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* The theory is a scientific blunder, untrue in its facts, unscientific in its method, and ruinous in its tendency.—*Agassiz.*