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ORDINARY MEETING.*

WALTER KIDD, ESQ., M.D., F.L.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following paper was read by the Author :—

QUESTIONS INVOLVED IN EVOLUTION FROM A GEOLOGICAL POINT OF VIEW. By Rev. G. F. WHIDBORNE, M.A., F.G.S.

CONTENTS.

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* January 21st, 1901.

(8) The occurrence of characteristic fossils.
(9) The rareness of evidence of centripetal action.
(10) The "unknown quantity" of growth in embryology.
(11) The complexity of the embryonic cell.
(12) The presence of parents in embryology.

6. Extreme Evolution impossible as the unaided cause of the present cosmos.
   (1) It cannot explain the origin of primæval protoplasm.
   (2) It cannot explain its potency to evolve.
   (3) It cannot explain the influence of environment.
   (4) It is mathematically incompetent to explain the present cosmos.
7. Therefore it must be governed by an outside Creative and Directing Power, and thus would actually be an argument for Theism.
8. Theism being therefore regarded as its basis, the question becomes one of pure scientific research ; the weight and scope of evidence to it.
9. The bearing on it of the tendency in the human mind to seek after unity in the essence of things.
10. The risk of mistaking mere similitude for relationship.
11. The question of the evolution of the material organism may after all be dominated by higher attributes of life which it cannot itself reach.

1. IN the present state of scientific thought it may be deemed heretical to raise any demur to Evolution. The great theorem is now so generally regarded as a proved fact, so widely assumed to be incontrovertible, that even to discuss its validity sounds almost like rebellion against the scientific dogmatism of the twentieth century. If this be so, I am content to be ranked as unscientific. For, admitting to the full the true force of the crowding arguments and innumerable facts adduced in its favour, I cannot shut my eyes to difficulties not yet, I think, explained away, and liable, I fancy, to gather strength as days go by, and scientific knowledge is still more increased.

2. The doctrine of Evolution (considered only as applied to life) can be held in many various degrees of strength. The full and extreme view would trace all living things, including man, to some simple cell-mass or protoplasm,* some primordial vitality, of which little can be predicated, except (1) that it was living matter, (2) that it had somehow the potentiality

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* The term *Protoplasm* is only used in this paper in the general sense, and not in rivalry or contradistinction to *Bioplasm*.

of almost limitless development, and (3) that its origin has hitherto been utterly unexplained. But short of this it is possible to hold the doctrine in many less degrees, until we come down to that which at all events is a fact of common knowledge—the production under human agency of quasi-permanent varieties within a species. If this last be called evolution, we must all perforce be evolutionists! But the climbing of a molehill does not guarantee the ascent of Mount Blanc. There is no slight difference between this minimum and the maximum of the theory; and the question is how far from the minimum to the maximum we are led by Nature. Whether the chain of life is one and unbroken throughout, or is composed after all of various series which though corresponding in character are distinct from each other;—whether in short the fragmentary groups of links which scientific research has joined together betoken one single gigantic chain, or only a greater or less number of short independent chains, is a problem which requires not hypotheses, but actual facts, for its satisfactory solution.

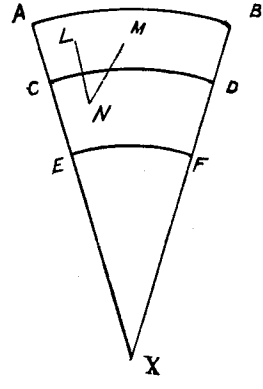
3. Now, it is hard to know what is really to be understood by the word "Evolution." There is a danger that its acceptance as a term for a principle *de minimis* unconsciously entails its acceptance as the assertion of a fact *de maximis*. It is a convenient word, a clear expression—so convenient and so clear that it fits on at once, and accurately, to several deep and different ideas, and is in fact commonly and logically used for most of them; and it is by no means certain whether thereby much is not frequently taken for granted, which, if each separate idea could be expressed by a separate word, would be found to require elaborate proof. Perhaps in this paper it may be permitted to use the word "Evolution" for the process in the abstract; to call the extreme historical form of the theory "extreme evolution"; and to call its less extreme forms "partial evolution." This may I fear be clumsy, and perhaps ineffective; but I do not myself happen to know terms which distinguish these distinct and different meanings of the word, the confusion of which can only be confusing.

4. To my own mind Extreme Evolution is not a question affecting religious faith; and that for this following reason—that it is so utterly impossible that it could have been the life-history of existing nature, except it was altogether under the guidance of a governing power outside itself, that it

almost more forcibly predicates Theism, than does any other method by which it is conceivable that the present state of nature could have been effected. This point I propose to consider more at large further on. At present I only premise that from a Christian standpoint I am prepared, freely and fearlessly, to accept extreme evolution as a probability, if its probability be proved, or as an established fact if it can be established as a fact. My only practical difficulties are upon the scientific side.

5. I will begin by stating some of these difficulties to extreme evolution in itself (as apart from the postponed question whether it be automatic or controlled). I know that Embryology brings many and great arguments to bear upon it which I am not at all competent to weigh in detail. With the exception therefore of some general remarks upon them, I will treat the matter only from the sides of practical geology and elementary mathematics.

5 (1). The first difficulty may be simply illustrated by a diagram. Existing life consists of a number of animal and vegetable species, vastly numerous but not infinite. It is possible to imagine a far vaster number of other possible forms; and as a matter of fact, even now, unknown existing species are being constantly discovered, yet without appreciably increasing the ratio of existent to non-existent but possible species. Let, therefore, existing nature be represented by



the arc of a circle, AB, whose centre, X, shall, on the assumption of extreme evolution, represent primordial protoplasm. It is the method of the extreme evolutionist to trace back the various forms of life from the circumference to the

centre, helped on by data from intervening arcs, CD, EF, etc., representing various geological ages; and certainly very often surprising and fascinating results are thus obtained. Certain chains, for instance, LN, MN, appearing to result in common ancestry, are brought to light, and these are regarded, therefore, as proofs of extreme evolution.

But the difficulty lies in the fact, that this process of investigation is backward. It does not take into account that in the action of evolution during any one geologic age the limitations now seen in the subsequent ages were non-existent. It is one thing to draw lines backward from a definite arc and thereby to find the centre; it is a totally different thing to start from the centre and by the sole action of evolution to produce lines which shall happen to impinge upon this definite arc. The first process is limited by the existing arc; the other process is entirely independent of it. What has really happened in nature according to the theory of extreme evolution is not that a given assemblage of forms have worked backwards to an original unity, but that primæval protoplasm has started from the beginning, and through the ages has gone on developing, until from its free action has resulted existing nature and nothing else. Of course it may be said that the evolutionist *does* trace development forward as well as backward; but the crux is that in the argument the present age is accepted as definite, and thus practically becomes the basis on which that argument is built. The real question to be solved is not "Can existing nature be traced back to one protoplasm?" but "Could primæval protoplasm by its free development produce existing nature; and, if so, why did it produce that and nothing else?" Looked at thus, such theories as "natural selection" and "survival of the fittest" do not seem to lead us very far towards a solution; because the proofs of them adduced either more or less assume the goal to which the starting-point is directed, or else imply, but do not acknowledge, some independent force working from without, and thereby modifying the action of evolution by an ungauged element not of its nature.

5 (2). Another and somewhat kindred difficulty arises from the fact of the existence of Species at all. Whatever value we may attach to species, whether we estimate them as persistent or mutable, the fact of their existence is one of the most notable and widespread phenomena of nature, and one which has to be reckoned with by evolutionists. What

are species—not as regards their outside limits, but as regards their essence? They are assemblages of vast multitudes of similar beings, lasting certainly for very many generations, sometimes even for geological periods, which, though constantly, it may be, subject to small individual variations, yet remain so essentially alike, that they must be regarded throughout the term of their existence as one and the same kind of animal—such that the action of evolution must on the whole be said to be either arrested or imperceptible within them. Granted that evolution may be traceable in their varieties or in their connections with kindred species, yet, to say the least, their existence at all means nothing else than the constant retardation of evolutionary action. It asserts that evolution at most can only act by steps and not continuously. But this cannot be the ideal of evolution! If that were the sole agent in the advance of nature, it seems only conceivable that it should act so equably and uniformly, that the whole advance should be by infinitesimal variation all through; that in the present nature there should exist no specific persistence of forms and no specific limits except those caused by accidental breaks or failures, which, in their turn, should always tend to eradicate themselves again; that within any one species development should be so constantly and uniformly going on, as, normally and continuously, to expand its amount of variation without splitting it up by new specific limits. In fact evolution ought *a priori* to be supposed to produce the obliteration, not the multiplication, of species.

5 (2β). Further the existence of set species is a phenomenon not only of the recent period, but of all known geological ages. We acknowledge fully the imperfection of the Geological Record, but at least it is congruous with the better known Recent Period in the nature of its specific limitations. No doubt fossil species are occasionally found in a state of disintegration: occasionally too this state tends to their splitting into sections which may in cases be traceable as the ancestry of distinct species in a subsequent age. Thus far, it may be granted, there is some amount of evidence for evolutionary change. But all this is a very small exception (as far as is hitherto known) compared with the stability of the species at any known geological level. The general rule is to find kindred species, rich in individuals, contemporary in one age or consecutive in more than one,

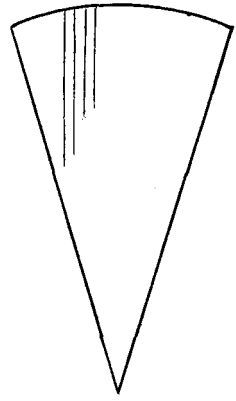
which, in spite of their resemblance, are so distinct that their individuals can rarely be confused. It has to be remembered too that fine specific distinctions scientifically drawn have often in nature no more than varietal force, and that if by the conjunction of such forms the number of acknowledged species were reduced, the ratio of known instances of transgression of specific limits would be very much more than proportionally lessened. It has to be remembered too that the actual tracing of a being from one species to another is a very different thing to the tracing of it from one genus to another, and that extreme evolution no less demands the latter (and much more) than it does the former. On the other hand, one has only to collect a few ordinary species *en masse* to realize how strong, in spite of individual variability, specific unity generally is. When, for instance, *Atrypa reticularis* may be collected in vast multitudes from England, Germany, America, China, Australia and the Arctic regions, and from the Silurian and Devonian; when it varies so greatly within itself that two specimens are rarely facsimiles, and yet has so strong an individuality that there is as a rule little difficulty in recognizing it; and when there appears to be absolutely no trace of anything like it in the Carboniferous age*; it can only be said that specific stability is sometimes a very formidable opponent to the play of evolution.

It may be remarked, by the way, that the force of one of the supposed motors of evolution—viz., Sexual Selection—must evidently be in the main against, and not for, variation, being of necessity an antidote to individual variability.

5 (3). A kindred difficulty arises, when we attempt to trace the genealogy of species through successive ages. Here too we find much evidence in favour of evolutionary action. We find sometimes two species in consecutive ages, distinctly different, and yet so similar that it is natural to suppose that the one has descended from the other, although the actual linking may be rarely observed. But we may often go very much further; we often trace such nearly similar forms on through many ages, and then their very connection becomes as much an argument for the limitation, as for the existence, of variation. From first to last their variation hardly exceeds generic

* Unless shells described by Professor Herrick from a "Devonian facies of the Waverley or earliest Carboniferous fauna of Ohio" be an exception.

bounds:—for instance, *Lingula* of the Recent compares with *Lingulella* of the Cambrian, *Rhynchonella* of the Recent with *Rhynchonella* of the Ordovician, *Heliopora* of the Recent with *Heliolites* of the Ordovician, *Nautilus* of the Recent with *Nautilus* of the Silurian.* Thus some animals have traversed almost the whole of known fossiliferous time with barely generic variation. Hence, returning to our diagram, we have to draw to the circumference of the Recent Period these radii almost parallel throughout the known life-ages before producing them backwards to find the centre of original protoplasm. It may be questioned indeed whether there is in them any divergence at all; whether for instance *Heliopora* is more differentiated than *Heliolites*; but even granting this, it is, on the basis of extreme evolution, pure assumption to assert, that in the pre-fossiliferous ages they had diverged more rapidly than they afterwards did in the



fossiliferous ages. No sufficient reason for such a cessation of advance has been given; if anything it would be more reasonable to suppose that the potency of evolution increased rather than diminished with the progress of time and the advance of organic grade. But this is to make the pre-fossiliferous ages hugely vaster than the fossiliferous ages. Yet already we know how difficult it is becoming, even on a very much modified uniformitarian basis, to account for the accumulation of sediment shown by the fossiliferous ages in the time (the lessening time) allowed by physicists for the age

* Œhlert in Fischer's *Manuel de Conch.*, 1887, placing it as a sub-genus of *Lingula*, remarks, "it is the most ancient form of Brachiopod actually known."

of the earth. That dilemma, therefore, becomes greatly intensified by the vast period which has thus to be predicated for the existence of life before the earliest of the known geological systems.

5 (4). And further the constant discoveries of new forms of life in the older formations are yearly increasing this dilemma. We are continually finding that various genera, families, and even orders, reach a little further back in time than we knew before. We are gradually learning that the older formations contained a very much larger and more varied fauna than has been hitherto supposed. Thus the imperfection of the Geological Record becomes constantly more evident. For the discovery of new forms only renders the existence of many others, yet undiscovered, more probable. And the larger these old faunas are found to be, the larger is the field for which extreme evolution has to account in pre-fossiliferous ages; and therefore the longer is the time required to be allowed to those ages for their development.

5 (5). Further the discovery at the same time of linking species or of generalized forms does not lessen this difficulty where aberrant or specialized forms exist alongside them; for it is the most aberrant and specialized form of any one period that has to be traced back to primordial protoplasm if the theory of extreme evolution be valid.

5 (6). Another sphere of probable difficulties lies in the general temporal arrangement of related forms. While the different formations have each distinctive facies of their own and their faunas grade upwards in a most notable manner, we not only find the above-mentioned persistently stationary forms all through, but also a distinct scattering of related forms with very little apparent connection to epoch. Thus if a systematic list of the genera of almost any class of animals be examined, it is remarkable how completely commingled the ages of its adjoining genera appear; old and new formations occur side by side on many of its pages; and it cannot in itself be made the basis of a chronological classification. Even where, as in the corals and crinoids supposed time-groups have been made the groundwork of a physiological classification, that classification has been proved by further research to break down. It may of course be argued that this only indicates the greatness of the number of the "missing links" in it; but, if so, it at least emphasizes the greater magnitude of the original chain.

5 (7). Akin to this perplexity is that of the high relative

position in their groups of many of the earliest known species of those groups. Certainly we have nothing in any fauna that indicates it to be an early stage of development from primæval protoplasm. Even the earlier palæozoics, though in parts restricted, have all the characters of fairly grown up faunas. Put aside vertebrates, and the amount of variety in the Silurian and Devonian faunas does not (allowing for the imperfection of the Geological Record) present any very striking contrast to the amount of variety in the present age. That is to say, if the progress of evolution be taken as a measure of geologic time, the Devonian and Silurian systems would find places in the scale which would be approximately near to the Recent compared with the Age of primordial protoplasm. If, in still older formations, simple forms are found which are supposed to be archetypal, there is nothing to show that they are not themselves stationary or even degenerate forms, as indeed the nearly synchronous existence of other higher and varied forms almost presupposes.

5 (8). Again the frequency of "Characteristic Fossils" brings into view a broad range of difficulties. By their characteristic fossils the same strata may be recognized in different localities, often at great distances apart. Their constant occurrence points to the great geographical extension of species in synchronous or homotaxial minor epochs, and also suggests the question how far Evolution can account, not only for change, but for identical change over wide areas. To take but one instance, *Rhychonella procuboides* of the Eifelian is replaced both in England and Germany by *Rhychonella cuboides* in the Cuboides Beds. Thus we have an apparently very sedentary species similarly replaced in distant countries. This can hardly be supposed to have been effected by a single operation, but seems to imply a wholesale modification producing in distant regions the same result.

5 (9). Yet another difficulty lies in the fact that the action of free evolution ought to be as much centripetal as centrifugal. There is no intrinsic reason why variation from type should be stronger than reversion to type. When a species has varied under the control of man and thereby produced definite varieties, the first thing which happens when that control is removed is that the varieties merge and the old conformity is re-established. But such reversion is hardly to be noted in geological ages. We rarely, if ever, find a species, once modified by descent into another species, reverting in a subsequent age back to the original species

again. Even the colonies of Barrande have been proved to be fictitious. It may, in fact, be said to be a law of palæontology that a species once extinct never revives. Species do not repeat themselves in diverse ages; evolution, having climbed on from a level it had before achieved, appears never to sink back to *exactly* the same level again.

5 (10). We may now venture to turn, though in a very brief and general way, to embryology. The notable correspondences between the growth of the embryo on the one hand, and the graduations in biology and palæontology on the other, are regarded by some (perhaps rather hastily) as authoritative demonstrations of extreme evolution. It may be open to question how far they really bear upon it at all.* For embryology traces the progress from the simple germ to the elaborate mature animal, but does not explain the motive forces of that progress. Its answer to "Why does it?" cannot get beyond "It always does." It asserts its laws as customs, not as ordinances. It reveals the executive, not the legislative, powers which govern nature. One thing it does. It reveals the orderliness of the progress, both in the sequence of growth in the individual, and in the correspondences of growth in the mass of individuals. In fact, it emphasizes the order of the cosmos, though the secret of the reason of that order lies just beyond its sphere. Another thing it does. It reveals the inadequacy of the embryo, regarded as an intrinsic material cause, to produce the mature animal solely as its effect. It thus shows that there is an unknown quantity running all through the problem, and that not as a mere subsidiary, but as a dominant factor to which the solution is due. It is no elucidation of this factor in itself to prove that the results of its working may be measured and defined.

In fact, when embryology has told us everything it has to tell, it leaves the question of the motive power which causes growth, not only unsolved, but more abstruse than ever, inasmuch as the wonders of the processes increase the evidence to the wonder of the power. Indeed in this line scientific discovery is grandly building up the altar to its unknown God. The correspondence of embryonic development to evolution is like a photograph; it is the reproduction

* Dr. Walter Kidd in his paper, "Creation or Evolution" (*Journ. Vict. Inst.*, vol. xxxii, p. 191), deals very exhaustively with this subject and shows that embryology does not go towards sustaining evolution.

of a material view, but one which needs the sun's rays to produce it.

5 (11). It may also be observed that a flaw in its evidence to extreme evolution lies in the fact that the structure of the embryonic cell is very far removed from that uniform simplicity, which used to be (if it is not still) logically assumed for the starting-point of life. Without pursuing this point further it may be enough to note how the process of *Karyokinesis*, as described in this year's Presidential Address of the British Association, presents not only specialized energy but elaborate machinery in the fundamental structures on which the science of embryology is built. Either the most primitive embryo does in no way correspond to primal life, or primal life must in specialization have been very far removed from the simplicity of that chaotic organism which some have almost seemed to hope might be deduced from the inorganic by little more than accident.

5 (12). A difficulty is also developed by a difference between the arguments for evolution from embryology and from palæontology, which must be regarded as *fundamentally important*. In both we trace from the embryo to the mature, from protoplasm to perfection, but in embryology we have something behind the protoplasm, viz., the perfect parent, which, if it does not explain the cause of the growth, at least gives an antecedent reason for expecting its result. But extreme evolution as exemplified by palæontology knows of no parent. To imagine some highly organized being as the parent of primæval protoplasm would be at once to upset the whole theory of the evolution of nature. In that no one would suggest a recurring series, but only a simple advance. If then embryology be called to evidence, arguments from a recurring series have to be applied to explain a simple advance. It remains therefore that to the "unknown quantity" of growth in embryology we have to add the "unknown quantity" of *origin in palæontology* before the facts of the former can be logically brought into line for application to prove extreme evolution.

6. With such difficulties to its action in view, we turn now to the question whether extreme evolution can be of itself conceivable as the "ratio" of the present cosmos.

Here we are met at once by four considerations.

(1) *No rational explanation of the origin of primæval protoplasm itself has ever been given except the creative action of an outside Power.* Nothing can be predicated to it which could

in any way account for its origin *per se*, nor is there anything provable about abiogenesis which can in any way support it by analogy. To produce an *amœba* from warm oil is jugglery not science. Let the oil-amœba reproduce itself, and go on reproducing itself, and we will believe it. Otherwise it is no more an animal than an automaton is a man. Even the cell in embryology implies its parent. "Ex nihilo, nihil fit" remains a principle. "There can be no effect without a cause." But to primæval protoplasm no ancestry is conceivable, and for its origin no cause whatever can be assigned, excepting one—and that is all-sufficient—the action of an outside creative Power. It knows no parentage but the power of God.

(2) *Still less is any rational explanation of the endowment of primæval protoplasm with evolutionary potency conceivable except by the action of an outside Power.* Evolution implies not only variation but advance. Whatever advance has come *ab intus* must be measured by the original potency of the protoplasm; and therefore its assumed simplicity can be no more real simplicity than is the elaborateness of the highest resultant organism. The infinitesimal calculus of evolution gives only an explanation of the method of advance; it no more explains the cause of the power to advance, than if the whole advance had been effected by a single instantaneous operation. Either the force producing the advance must come actively and independently from outside, in which case it is not evolution; or it must be constantly immanent in the advancing organism, and therefore originally to its full extent potentially immanent in the primordial protoplasm. It is therefore no easier to explain the origination of that protoplasm, than to explain (without taking count of its ancestry) the origination of the highest organism that has resulted from it. That is to say, the outside power that produced the protoplasm with such a potency, must have been at the very least as mighty as if it had directly produced the highest organism that has resulted therefrom.

(3) *The introduction of the consideration of circumstance, or correspondence to environment, does not account for the cause of the action of evolution.*—Correspondence to environment must result, as to any particular organism, either from animate or from inanimate circumstances. If the former, it is only due (on the theory of extreme evolution) to the development elsewhere of the same original protoplasm that gave rise to that organism itself. Its action, therefore, is covered by the

remarks in our last paragraph, and need not here be considered further. If on the other hand it results from inanimate circumstance it must be accounted for through the forces of inanimate nature. It really is part of the question involved in the nature and history of the earth and sun and air. Whether the natural forces inherent in these are sufficient to explain much of the advance which the theory of extreme evolution requires, we need not now discuss. So far their outside influence may be allowed for the sake of argument; but we are thereby simply carried back to the greater question, "*What* brought about inanimate nature itself?" It contains in itself no reason for its own history, no explanation of its own origin. If it be sufficient to account for sun and air and earth, for chemical elements and physical agencies, by adopting Topsy's science and saying "they growed," the question may be left unsolved. But if inanimate effects, no less than animate, must have a cause, if it is unimaginable that the existing Universe arose without an Author, then too these outside correspondences are only the methods of His work, they are the channels, not the causes, of the incentives to evolution, which thus must find their only starting-point from Him.

(4) *Extreme evolution, acting through any measurable time, is inadequate to explain the production of the present state of animated nature from primordial protoplasm, except under the definite outside control of a Power, acting incessantly to direct and hasten its action, so that such results should be produced.*— For the doctrine of chances, applied to the unaided advance from protoplasm by evolution, at once shows how improbable it is, that, even in an illimitable time, the present "cosmos," with its intricate variety elaborately in order, could be achieved by it alone; and the acknowledged time-limit turns this improbability into a mathematical impossibility. Such difficulties to the working of extreme evolution, as we have already reviewed, would, if it were supposed unaided, become at once insuperable. In face of these drawbacks no possibility of such a result to its action would be conceivable at all, unless an outside Power turned its weakness into strength.

7. But if these things are so, we arrive at this; that Nature, in its origin, progress, and present state, is the workmanship of an outside originating and controlling Power; and therefore we may, and have a right to, use for it the word "Creation"; and extreme evolution, if it could be asserted as an established fact, would be the strongest argument for Theism.

8. Next, therefore, taking Theism definitely as our basis, and acknowledging to the full all that the existence of the Almighty Creating and Controlling Power means, we may proceed to inquire how far evolution, either extreme or partial, may be taken as an established fact, or be regarded as a probable or possible explanation of the method of Creation.

We certainly have now an adequate reason for its possibility; but we have in the same factor equal reason for the possibility of other methods of Creation. There are multitudinous data proving correspondence and similarity and relationship between different kinds of beings, but it can no longer be argued that these of necessity point to community of origin, but only to the unity of that Intelligence by which they were arranged. For we have found that we are dealing with "workmanship"; and the investigation therefore is no longer limited to the mere mechanical tracing out of consecutive changes in advancing organization, but enters the higher sphere of the consideration of the *plan and purpose of the great Worker*—the Worker whose power, once discerned, must be acknowledged to be only describable as infinite. In His working, order and connection and similitude and correspondence appear on every hand; but these are not necessarily proof of unity of origin in the works themselves, but only of a comprehensive plan of the Author. Hence to gauge their true bearing on the former question, they must first be weighed in detail in the light of the latter. Is it not possible that the shutting off of this latter consideration, now scientifically fashionable, is really the great weakness of evolutionary doctrines? For instance, the first difficulty, noticed above, is at once swept away by a recognition of the Divine plan of creation. The present cosmos thus becomes the foreseen goal towards which the action of evolution may have been directed throughout preceding ages: and so the present state of animate nature becomes a definite basis for the inquiry upon evolution. It is, however, *a priori*, equally easy to imagine that its Author willed to bring it about from a single primæval origin or protoplasm, or that He willed its various elements to come into existence as separate creations at different times. It lies with us, therefore, to examine all obtainable evidence and seek therefrom to ascertain, more or less clearly, His methods and His plan of work. The question thus becomes one of pure scientific research, unbound by the

limits of any preconceived human axioms. We simply have to weigh every fact of palæontology and of embryology, and to inquire in what direction its evidence goes. That evidence has now become weaker on its mechanical, but stronger on its philosophic side.

This change in the weight of the evidence may be illustrated by a trivial allegory. Suppose we were entirely ignorant of the art of pottery, and that for the first time we came across some ordinary set of china ware. Suppose too either that our knowledge were so bounded that we did not recognize their purely mineral character, or that we had some scientific reason to regard them as in the nature of fossils or remains of something having a history akin to life (assuming the possibility of a character ranking with, but distinct from, those which we know as animal and vegetable life). Upon examination of the set we should at once be struck with the various similarities existing in its diverse articles, which would clearly prove to us some definite relationship between them all. Next suppose that in our investigations we discovered, besides the finished set, a workshop containing the unfinished articles in various stages of incompleteness down to that point where they were all in their most immature condition. It would be only natural to apply to them the doctrine of evolution, and doubtless the result would be to trace the whole varied set back to a common source, and to find for them all a common origin. But, leaving supposition, let us now face fact. The fact is that on the one hand the set owes its cosmos not to unity in its own origin, but to the mind of the Potter; but that on the other hand the immature examples do truly point to actual descent through the working of the Potter's hands. We need not pursue the illustration further. The correspondences of animated nature reveal the unity of the Creative Mind, whether or not they prove universal community of descent in things created. For the latter problem scientific research does not yet seem sufficiently advanced to give a final solution; but its progress may tend to do so at some future time. What seems essential is that it should never be assumed to prove more than in any particular it actually does prove; that no missing links in any chain of facts be allowed to be filled in by theories however specious or ingenious; and that every discovered scientific fact be given its true weight without bias, and be never fitted by force into a preconceived hypothesis.

9. There seems a natural tendency in men's minds to seek after unity in the essence of things. The "unities" of the poets no less than the uniformitarian and evolutional theories of scientists are phases thereof. The importance of this tendency is not to be minimized: it may be the instinctive groping after truths whose real roots and meanings have not yet been scientifically fathomed and comprehended. But on the other hand it is possible that an interim result of this tendency may be the narrowing and restriction of the greater truth from the failure of present discovery to reach its centre. We learn by mathematics that all parallel straight lines meet at infinity; to the unassisted human eye they would appear to meet very much sooner. It must be said that the arguments of evolution do make for this underlying unity in creation. But it may be that the extreme evolutionist is seeking its origin too near; that he is prematurely uniting chains of life whose roots start really far beyond his ken; that the telescope of his research gathers up unity too quickly from the inadequacy of its focal length to penetrate to its true source; and that improved telescopes may hereafter dissolve the nebula now seen and reveal unfathomed distances in the cosmical mystery of life. For from the point of view of the Christian thinker the unison of nature must have a far wider range, a much deeper seat, than has yet been dreamed of in the naturalist's philosophy.* He finds its source and final explanation at no point short of the Unity of God.

10. In the evidence of any detailed facts to evolution one very "slim" danger cannot be too carefully observed. Similitudes, however striking, do not of necessity point to a common original. The ancestry of the horse, for instance, has been a favourite subject with evolutionists. It is well known to be an awkward fact that lines of descent have been worked out deducing it from two distinct sets of ancestors. Again, having had to study carefully the critical marks upon the cephalothorax of *Bronteus*, I was amused at noting their exact agreement with the lines on a baby's face. No one, I imagine, would argue that this quaint similitude indicated relationship. But, were such a striking resemblance observed in nearly

* "Πίστει νοοῦμεν κατηρτίσθαι τοὺς αἰῶνας ῥήματι Θεοῦ, εἰς τὸ μὴ ἐκ φαινομένων τὰ βλεπόμενα γεγονέναι."—Heb. xi, 3. By faith (the evidence of the unseen) we realize that the ages have been builded up by the voice of God, so that not from phenomena have the things we see been made.

allied organisms, it would (and possibly quite as fallaciously) be regarded as a certain proof of common origin. Again, I have known Brachiopods externally so similar as actually to be placed in one species, until their internal arrangements were discovered, and found to be fundamentally different. The fact is that the relationships relied on by evolutionists must in general be described as distal, not proximal, to the motive centre of being. There is, therefore, the more danger that supposed relationships may sometimes prove to be mere accidents unconnected by anything but coincidence of appearance. But even where the relationships are true, they cannot be wholly accounted for as simple and direct modifications of the resembling parts themselves. The reasons for their production must be sought not merely from the particular local circumstances of the organs in which they occur, but from the innate being of the animal itself producing local changes in its parts consequent on tendencies that may have been produced upon itself by the local causes.

11. This brings me to my last remark—that the material organism is after all not the whole animal. The organs are not the senses which they habilitate, and by which they are worked. And the organs are for the senses, not the senses for the organs. The brain does not evolve talent, but talent evolves the brain. The instincts, the mind, the soul are attributes of animal life unreached by embryology or palæontology; and to its material outcome they may hold a superior, not inferior, place. They may be lieges, not feudatories, to its form. The life-essence of the gorilla and man may, for instance, be dissevered by differences as fundamental and far-reaching as are the marks on the cephalic shield of *Bronteus* and the lines on a baby's face.

Discussion.

The Chairman.—We have a most valuable paper this evening—one which contains a large amount of material for discussion.

I will only just point out that besides the technical part, occupying no less than eight pages, there are important groups of subjects, so well arranged, that they offer opportunities to many of us to discuss, without that technical knowledge necessary to express our views upon them.

I also observe that the author of the paper refers to *evidence*. In these matters we can never go beyond evidence. We can never have a completed induction—there must be limitations; and

we cannot arrive at definite conclusions as in the case of the laws of gravitation for instance. Therefore it can never be more than a more or less good induction.

I should, perhaps, refer to one point that I like very much in the paper, where the author speaks of evolution on these lines in the sixth section, p. 14. I will read the passage, as I think it very important. "For the doctrine of chances, applied to the unaided advance from protoplasm by evolution, at once shows how improbable it is that even in an illimitable time the present 'cosmos,' with its intricate variety elaborately in order, could be achieved by it (*i.e.*, chance) alone; and the acknowledged time-limit turns this improbability into a mathematical impossibility."

I think we ought to be thankful that mathematics can be brought into the question.

Mr. SCHINZEL observed that it was well known that Darwin's bold hypothesis "has gained much popular credence with the general public so that evolution and its accessories—'natural selection,' 'struggle for existence,' and 'survival of the fittest'—have become popular catchwords supposed to be sufficient to explain all the mysteries of nature, while the unthinking multitude are using the theory of evolution in many ways not contemplated by its authors." Those are words quoted from Sir J. W. Dawson's article in the "Expositor," and no one ventures to range Sir J. W. Dawson among the "unscientific."

The author refers to the varieties produced by human agency. This is the special work of the fancier, an individual unfortunately not represented in nature. But all the dog varieties are dogs differing only in outward form, and they breed together, which would not be the case if they were of different species—and the same holds good of fancy pigeons. Nobody has ever succeeded in producing a lion, or even a rabbit from a dog, or a vulture or partridge from a pigeon. The able lecturer again alludes to the same subject further on (p. 16). Allow me to give an illustration.

It is a fact that when fancy pigeons are turned out into a state of nature they soon revert to the rock pigeon, their ancestor. "Natural Selection," says Mr. Duncan Graham, in his book, *Is Natural Selection the Creator of Species?* p. 75—"here makes the awkward mistake of exterminating the improved breeds and preserving the parent forms." The same, by Mr. Wallace's own admission, is the case with fancy rabbits.

I can only conclude that natural selection must be untenable.

The SECRETARY (Professor EDWARD HULL, LL.D.).—I think it is the duty of a Secretary to hold his peace except when he is called upon to speak in his own province as Secretary, but I suppose as a brother geologist to the author of this paper it would be looked upon as an act of disrespect on my part if I did not make some observations upon it.

In the first place allow me to say, as I think you will have all gathered from the paper itself, that Mr. Whidborne is admirably furnished with the necessary knowledge and experience to deal with this problem on geological lines. He is a good geologist himself—a worker in the field—a Fellow of the Geological and of the Palæontographical Societies, in which he has taken an important part, and I am happy to say he has taken an equal interest and important part in the work of the Victoria Institute.

Some of the points to which I intended to refer have really been anticipated by the author.

It has always appeared to me that there are some tremendous difficulties, which geology presents to us, in accepting any theory of evolution. In the first place what the last speaker referred to is very strong when we look at the remarkably sudden and early appearance of very high types of life amongst the strata of the globe. That remarkable and widespread zone known as "the primordial zone" of Barrande, contains Trilobites, crustacea furnished with limbs, and with beautifully constructed eyes, like those of the dragon-fly; and they are very highly organized marine animals indeed. Where does the group of Trilobites come in the geological record? Does it come with the Devonian or the Upper Silurian, or even the Lower Silurian; the Lower Silurian being the direct successor of the primordial zone and amongst the oldest fossiliferous strata we know of? Not at all. It comes in with the primordial zone itself in Britain, Sweden, Bohemia and other parts representing the earliest fossiliferous strata. And along with this type of crustacea we have the Cephalopods —not altogether dissimilar from the Nautilus of the present day. Thus we have the highest type of the mollusca coming in at this early stage of biological history.

Then as to the appearance of plant life on the globe. Through the long ages down to the upper Cretaceous, the flora of the world was represented by lowly organized types such as algæ, lichens,

ferns, palms, cycads and conifers. But with the upper Cretaceous stage of geological history there appears, "with startling suddenness," a whole array of more highly organized forms, namely, dicotyledons representing the forest flora of the present day in sub-arctic and temperate regions. Professor Oswald Heer, in describing this fossil flora as it occurs in Switzerland, says truly that it is "the introduction of a new fundamental conception into the vegetable kingdom." Here we have for the first time oaks, poplars, plane-trees, walnuts, figs, willows, tulip-trees (*Lyriodendra*), hornbeams and myrtles, representing the temperate flora of the present day, and developed on a new organic principle as compared with that of preceding geological periods. The change from the monocotyledenous to the dicotyledonous type in the prevalent flora of these regions is remarkable for its completeness and rapidity, and is analogous to that which, as we have seen, has taken place in the animal kingdom in past times.

Now, how are we to account for these phenomena? I do not believe, given all the license that you may demand for the incompleteness of the geological record; of the occurrence of great gaps in the succession of strata which we have not been able to fill up; these, I confess, do not satisfy my mind as a sufficient reason for the appearance of these types. But we have other types. We have the first appearance of the vertebrata and mammalia, all coming in, in great numbers, at certain geological periods. Do not these indicate special epochs in the Divine plan?

As for the theory of the origin of species by natural selection, I have acknowledged to a certain extent its force, as I suppose every geologist has; but the types of life in the animal and plant world form a problem that we have to deal with and solve, and it seems to me that unless we accept the view that the Creator had in His mind, from all eternity, the introduction of these fresh types of life, giving them certain powers of development, by natural selection and descent and so on, I do not hesitate to say (and I say it most humbly) that I believe the Creator was pleased to intervene, at special periods of the world's history, in order to introduce fresh types of life more and more representative of the fauna and flora of the present day; and thus preparing this globe from the past ages by this wonderful process of evolution and introduction of fresh types for the future habitation of His intelligent creatures.

Professor ORCHARD.—With your permission I would make three or four rather brief observations upon this paper, with the value of which and its logical character I think none of us have failed to be impressed.

That the case for "extreme evolution" is absolutely disproved no one can doubt; but I think the paper goes rather further than that. If we look at page 8, and read of these parallel lines which meet at infinity, and do not meet in time—when we go back as far as evidence warrants our going back; and if, as we extend them through the supposed millions of years, they still do not meet; the fact that they do not meet appears to me to be conclusive that evolution does not exist.

There is another important argument, and that is the argument of reversion. If you endeavour to overstep, by artificial means—by constraint which nature does not herself employ—the boundaries of species, directly you leave the creatures to themselves they revert to their original types, as we know. Now this shows a force opposed to evolution. Why this reversion back to original form, if the great force or power in nature is always toward alteration?

It appears to me to be altogether inconsistent with any form whatever of the doctrine of evolution. I might follow the lecturer on the fact that evolutionists can show no connecting links; with regard to which you may remember the words of the great American (Dana) that if those links ever existed their disappearance without trace is altogether inexplicable. That is a strong argument; but I think the argument as to reversion is even stronger still.

With regard to extreme evolution, some might think that Herbert Spencer's evolution was more extreme than that of Haeckel. Herbert Spencer, as we are aware, does not stop at living forms, but goes back to inanimate matter, which he imagines to have been homogenesis, and acted upon by a force of some mechanical nature—this theory is more extreme and absurd than even Haeckel's, but perhaps they are first cousins to each other.

I am glad that the lecturer had the courage to speak of divine power and design. If the Creator, as we believe, of various forms of life, made them with certain similar functions to fulfil and with certain environments, more or less similar, is it any wonder that there should be a remarkable structural resemblance?

I thank the lecturer much for his important contribution to our study and investigation of the subject.

Mr. MARTIN ROUSE.—I am much struck with the various arguments that have been advanced on this subject. I never heard before that if extreme evolution were true, we should just as much expect to see in the different epochs of geological development, species all reverting into one form as that one form should come in many species. Why should not we find in successive ages, here and there, a number of species converging into one form just as much as we should expect them to be diverging—if evolution were true?

Again, the speaker said that sexual selection was a change—an individual variation.

I do not know exactly who it was who said that whereas, as one speaker just stated, fanciers make various breeds of animals, as for instance, dogs, these dogs do not select one another according to their finer qualities. A large dog does not necessarily interbreed with a large dog, or a long-legged one with a long-legged one, or a dog with a fine sense of smell and long nose with a similarly created one; but they all interbreed promiscuously, which is downright contrary to the idea of sexual selection such as Darwin sets forth. As Lord Salisbury put it at Oxford, when presiding over the British Association, can you conceive that two rabbits, say one at one extremity of a forest, and the other at the other, should pass over all the intermediate individuals in order that they might meet and preserve the finest specimens of their race?

The CHAIRMAN.—I must now ask Mr. Whidborne to reply.

Rev. G. F. WHIDBORNE.—I cordially thank you for the hearty and, indeed, for the most kind way in which you have received my paper, and especially the Chairman, Professor Hull, Mr. Rouse, and Professor Orchard, for their very kind remarks. Having said that I really think I have nothing left to say, because I have not had any scoldings or adverse criticism. I thoroughly agree with Professor Hull's remarks.

Mr. ROUSE.—Excuse me; but there is one thing I meant to have said and which I should like to mention now.

I know it is a scientific fact discovered by some eminent naturalist, that in the primrose, to turn to botany, there are in some specimens long stamens with shorter pistils, and in others

long pistils with shorter stamens. Now, if natural selection be a true doctrine, we should expect to change the plants of the forest by taking the pollen from a long stamen and putting it into a long pistil; whereas you do not produce a change by taking the pollen from a long stamen and putting it into a short pistil or, again, from a short pistil and putting it into a long stamen.

Rev. JOHN TUCKWELL.—I should like to know if there is any well authenticated case of the appearance of new forms of life within the human period, and also whether there is anything like evolution that may be going on at the present time?

If there is no satisfactory evidence of evolution taking place at the present time, such as we are asked to believe took place in past ages, then it seems to me to lead to this thought that if there has been a force at work in the production of new forms of life in the pre-human period, which is not in operation now, we are not in a position to judge, and that any argument based on what is going on now is only misleading and fallacious.

The AUTHOR.—I am afraid I am not in a position to say what is going on at the present time. I have been dealing with the Devonian period all my life; but as far as we know from natural history I do not think there is any such case.

Professor HULL.—There is no such case known.

The AUTHOR.—My simple point is that we need stronger evidence to prove evolution. There are so many difficulties against it, that I cannot see how it is possible unless it was by God's creating and God's guiding all through. I am looking at it now not from a Christian, but a scientific point of view; therefore I cannot point you to a satisfactory scientific solution of the question until we take into account not only the works, but the plan and purpose of the Worker.

[The vote of thanks having been duly put and carried the proceedings terminated.]

COMMUNICATION RECEIVED.

The Institute is to be congratulated on a paper dealing with evolution conceived in a thoroughly scientific and open-minded spirit.

The difficulties presented by what the author terms "extreme

evolution" are doubtless many and formidable, and some of those now adduced were submitted by myself in a paper to the Geologists' Association fourteen years ago.

As the genus *Nautilus* has been mentioned I may draw attention to the remarkable fact that although *Ammonites* and *Nautilus*, both tetrabranchiate cephalopods, flourished under the same conditions and side by side in secondary times, Ammonites were absent at both earlier and later periods, although Nautili flourished and still flourish.

Although the author brings forward difficulties in the way of the acceptance of extreme evolution, I gather that he admits the general doctrine of evolution. And indeed it is difficult to understand how any one scientifically minded can refuse to accept what is alone consonant with the great teaching of all science. For this is that the phenomena of nature are sequential. There is no one in the scientific world that doubts that the phenomena of the inorganic world are sequential, or that every observed phenomenon has had a natural cause, and that cause and effect form an unbroken chain.

The only reasonable conclusion from this is that phenomena in the organic world also, however difficult it may be to understand the process or to observe all the links of the chain of causation, are sequential also.

I am especially glad to find that in Mr. Whidborne's opinion evolution, even "extreme evolution," is not a question affecting religious faith, and that if it could be asserted as an established fact it would be "the strongest argument for Theism."

This is a great change of mental attitude from that which but a few years ago denounced evolution as hostile to and even as destructive of religion.

Scientific questions can alone be solved by scientific facts and arguments, and Mr. Whidborne, it seems to me, merits the best thanks of the Institute for giving to its Members an excellent example of how the great question of evolution should be discussed.

January 21st, 1901. J. LOGAN LOBLEY.