

[We stated last week that a communication on the origin of species was made to the Philosophical Society, by Professor Sedgwick, on Monday, May 7, and we expressed a hope, which the courtesy of the Professor now enables us to realise, that we should be able this week to publish a synopsis of it.]

The Professor first remarked that his communication was to have been read at one of the meetings of the Lent Term; but had been postponed in consequence of an attack of illness, which prevented him from performing his promise to the Council of the Society. The 7th of May was then fixed on by the Council for the reading of his paper; and he undertook the task some time before the publication of the notice that Professor Phillips would deliver, during this Easter Term, a lecture to the University on a kindred subject. From this lecture he anticipated great pleasure and instruction; and many well-considered and elaborate details on points which he (Professor Sedgwick) was hardly permitted to touch upon. What he was about to state was little more than an enunciation of first principles—a mere outline that admitted of very few illustrations and of no elaborate details.

He first gave a short synopsis of the whole series of fossil-bearing rocks, which are separated into four great divisions—the Primary, or Palæozoic; the Secondary, or Mesozoic; the Tertiary, or Neozoic; and the Modern, which end in the deposits going on at the present time. The *flora* and *fauna* of the Palæozoic groups are entirely distinct from the *flora* and *fauna* of the Mesozoic period; and there is a like broad distinction between the Mesozoic and Neozoic or Tertiary groups of strata. He dwelt on a few leading facts which proved the very wide organic separation between these several divisions of the fossiliferous strata. But between the Neozoic and Modern deposits we have no well-marked organic separation. Nor is it, in our present state of knowledge, possible to draw any line between these two divisions which is well indicated (as it is in the older divisions) by combined physical and palæontological characters.

If we were to date the Modern period from the first appearance of man above the newer Tertiary deposits we should not escape from this difficulty in the present state of our physical evidence—the only evidence considered in the introductory remarks of this communication.

The author then mentioned some of the leading groups of the four great divisions of fossil-bearing rocks, and indicated the great organic changes manifested in the successive ascending groups. The lowest Palæozoic strata exhibited but very few and comparatively humble organic types, and rested on deposits in which we find no traces of ancient organic life. But in the upper Palæozoic subdivisions, the *flora* and *fauna* had a much grander development. Fishes of the noblest organic type existed abundantly during the Carboniferous period. Reptiles left their traces (though very rarely) among the Carboniferous rocks; and like traces are found among the Permian rocks, which closed the Palæozoic series.

In the Secondary or Mesozoic period, the organic types abounded, and underwent a great succession of changes. Reptiles were there in vast abundance, and some of their Orders reached a much higher organic type than is found among the Reptiles of the Tertiary groups, or among those of actual, living nature.

One trace of a Mammal form is said to have been found among the Permian groups; and several fragments of Mammal skeletons have been found, at one single spot, in the lower groups of the Oolitic series, and also among the Purbeck beds. The animals, though undoubted hot-blooded Mammals, were of small size, and of a low organic type.

In the Tertiary period we have all the Classes and Orders of existing nature; and traces of Mammal remains, of all ordinary sizes, and some of huge dimensions, are found in abundance—some of them commencing with the lowest groups.

The above facts were illustrated by some sections and drawings, chiefly copied from the works of Professor Owen.

What then is Mr. Darwin's theory—specially adopted for the explanation of the organic succession in the great Palæontological groups? In a few words, it is as follows:—

1. Species are not permanent; nature is continually producing varieties, which are the beginnings of new species.
2. Nature began with the simplest forms; probably with one form—the primæval parent of all organic life.
3. There has been a continual ascent on the organic scale; till living nature became what it now is, by one continued and unbroken stream of onward movement—till Man became the crowning type of this natural organic development.
4. This organic ascent (from a Monad up to Man) is secured by "the battle of life," in which the best varieties, whether of plants or animals, encroach upon, and drive off, the less perfect. This is called "natural selection."
5. We do not mark any great organic changes now, because they are so slow and gradual as to escape observation within the limits of human history.
6. But time, of sufficient length, and natural selection will do the whole work of change on the great geological scale. And on every part of that scale, where the organic changes are great, as we pass from any one known deposit to that which immediately rests upon it, there must have been a corresponding lapse of time between the periods of their formation—perhaps millions or billions of years.

Such is the theory, as far as its meaning can be conveyed in a few words.

The author of the communication first remarked that Darwin's theory is not inductive—is not based on a series of acknowledged facts, leading to a general conclusion evolved, logically, out of the facts, and of course including them. The only facts he pretends to adduce, as true elements of proof, are the varieties produced by domes-

location and the artifices of cross breeding. We all admit the varieties, and the wide limits of variation among domestic animals. Hence there may have been many blunders made by naturalists in the discrimination and enumeration of species. The unreal multiplication of supposed species has been one of the vexatious pests of natural history, and may have greatly clogged its true progress. In this respect Darwin's theory may help to simplify our classifications, and thereby do good service to modern science. But he has not undermined any grand truth in the constancy of natural laws, and the continuity of true species. Again, the very varieties on which he builds are the varieties of domestication and human artifice, and could have no existence during the old geological periods, before man had learnt to tamper with the fixed order of nature.

Species have been constant for thousands of years. This is not denied by any one who has a wide knowledge of the living inhabitants of the globe. There is a succession of coral reefs on the coasts of North America, which (if we admit the statement of Agassiz) carry us back through years that may be counted by tens of thousands. But, through all these long periods, not one coralline species has changed. Facts such as these give us a firm trust in the constancy and continuity of natural organic laws.

All the causes submitted to our senses are second causes. These it is our duty to study, as the stepping-stones that lead us to the higher physical truths, whether they belong to organic or inorganic nature. But if we advance beyond these elements of inductive physical truth, and begin to speculate about the beginning of organic species, we deal with matters out of the province of observation and experiment, and run the imminent risk of bewildering ourselves in the mazes of our own invention. For we not only draw conclusions not warranted by our premises, but we frame conclusions which are utterly incapable of being submitted to experimental test. Better far to remain in imperfect knowledge, than to be the advocates of that which is untrue to nature.

We can, however, see, through all organic nature, a mutual adaptation of parts, fitted for the condition of each individual being; and a wonderful adaptation of its organs to all the complicated conditions of the surrounding world. These things we can see and comprehend; and they prove with the force of demonstration that there is exterior to, and far above the mere phenomena of nature, a great prescient and overruling cause. Believing this, we have no difficulty in the repetition of new species during successive epochs in the history of the earth. We say they were created; but of the mode of creation itself we have no knowledge, because it is removed from the evidence of sense; and is, we believe, out of the reach of human knowledge.

But on this view Mr. Darwin may say that we are introducing a succession of miracles into the natural world. Is not the commencement of organic life and organic laws a mystery and a miracle? The view here given does assume the existence of a great, wise, and prescient First Cause. It does not suspend or interrupt any established laws of nature. It does suppose the introduction of a new phenomenon in perfect harmony with established laws, yet unaccounted for by any known law of nature. Such a phenomenon being out of the province of inductive truth, we appeal to a creative power, which ordained all material laws, whether organic or inorganic, continues to uphold them, and has ever acted in harmony and conformity with them.

The author of the communication then discussed, and illustrated by diagrams, some of the leading features exhibited in the great Palaeontological series.

(1) In the lowest Palaeozoic deposits, were Darwin's theory true, we surely ought to find great groups of strata with none but the lowest forms of organic life, to mark the period during which the primæval monads were working their way through the ascending scale of development. We find no such groups of strata; and the evidence, so far as it is positive, gives no shadow of proof whereon to build the hypothesis. As we ascend through the Cambrian, Silurian, Devonian, and Carboniferous groups, we find, in each of them, a characteristic fauna; but we find no wavering among the organic types, and nothing to break down the distinctions between the several molluscous Orders and Genera. They were as distinct then as they are now. We meet with the noblest Brachiopods and Cephalopods that ever have existed. Some of the Genera have continued with specific changes to the present day, and many of them disappeared from the faunas of the old world; but there is not, in the evidence before us, the semblance of a proof that any of them underwent transmutation into a different order of organic types. Before the end of these old periods, we meet with some of the noblest ichthyo types that ever were created. Some of these were exhibited, and the author asked, by what process of "natural selection" could these noble types be made to disappear, and give way to other forms of the same Class which were less powerful and less highly organized? The same remarks were applied to the Carboniferous flora, which became extinguished by great dislocations of the ancient rocks, and was followed by a less noble Permian flora.

He next discussed the complicated organic phenomena of the Mesozoic period, and affirmed that they defied the transmutation theory at every ascending step. It was during this great period that the Reptile faunas exhibited its noblest development. The Orders are numerous, but there is no confusion in their lines of demarcation. How came the Enaliosaurs and Dinosaurs to disappear? By what process of "natural selection" were they exterminated from the faunas of the world? By what natural process of development were the Dinosaurs cut off, and superseded by Reptiles of lower organization and of less power? The Mesozoic fauna throws a stumblingblock in the way of the transmutation theory in every step of our ascent.

Again, if we examine the Mammals of the whole Palaeontological fauna, we find, with almost evanescent exceptions, all the higher types confined to the Tertiary period. How did they begin? By what connecting links can we unite them to any of the higher organic forms of the anterior or Mesozoic period? None of the links have been found; and their production, by any process of ordinary generation is the mere dream of an hypothesis. Again, let us mark their arrangement and classification in the scheme published by Professor Owen. Like the Mammals of the living world, they fall naturally into well-defined Orders and Genera; and when represented pictorially, we see nothing resembling a convergence to some common ancestral form, and no shades of colour which blend the outlines and make one Order to pass into another. Here again the author asserts that the theory breaks down, so far as regards the positive evidence given by the known groups of the Tertiary Mammals.

The author then touched upon the vast periods of time (not measured by centuries, but by the epochs of geology), which Darwin interpolates, in order to account for any great change between two successive faunas in an ascending section. Time may be allowed in ample measure; for we have an eternity of past time on which to draw; but we are bound to use it logically. Time and "natural selection" can do nothing for the hypothesis, unless there be a continual transmuting power—a *sero causa*—acting with them. We deny the existence of such a *sero causa*. Darwin's argument is not cumulative; for each succeeding example is but a repetition of one unproved hypothesis. On the contrary, the objections to the hypothesis are strictly cumulative and independent. For, if the hypothesis be true, it must apply to all times, and to all cases submitted to our senses.

The following examples were selected to test the hypothesis:—

(1.) Towards the end of the Carboniferous period we find proofs of a great extinction of animal and vegetable life. The old crust of the earth was greatly broken up, and the sea-bottom was consequently changed. The old flora and fauna vanished, and a new flora and fauna appeared in the beds called Permian, which overlie the Carboniferous groups. The time in which this was effected may have been very long. But if so, we ought, in some part of the world, to find the connecting organic links which bind together the organic types of the two periods. We do not find these links; and in our step onward we discover no point of rest for the hypothesis which derives the newer types by natural generation from the older. Thus considered, the hypothesis appears in direct antagonism with the facts before us.

(2.) Between the faunas of the Permian groups and the Muschel Kalk, there is again an entire change; and we have no proof from the natural sections that a great series of geological epochs intervened between the two periods. The intervention of such assumed epochs is simply one hypothesis invented to bolster up another.

(3.) If we rise from the Muschel Kalk to the Lias, we again have to remark a complete change in all the inhabitants of the ancient sea. In the ascent from the New Red Sandstone to the Lias of England, and, in the Continental sections, from the Muschel Kalk to the Lias, we have no proof whatever of any great unrepresented gaps in the successive deposits. They are apparently continuous and uninterrupted; and the hypothesis of great gaps of geological time between the two formations is an assumption opposed to physical evidence.

Instances of a similar kind might be greatly multiplied. Each in turn throws a difficulty in the way of a gratuitous hypothesis. And the objections, being independent, gain strength by their accumulation. Whether the Darwinian hypothesis be true or false, it is not suggested by the obvious facts of Palaeontology, when examined in their natural succession. The hypothesis is not supported by a good inductive argument derived from actual living nature. Its strength is said to lie in the facts supplied by Geology. But when we bring these facts to the test, we find no strength in them, except that which is gained by a virtual assumption of the hypothesis. No good theory was ever built up out of such assumptions—by a series of hypothetical reasonings from the unknown to the known.

The author then entered on some general discussions which cannot be properly detailed in this synopsis. Every good discussion of the laws of creation (if we may be permitted to use such a phrase) must take into account the moral and intellectual attributes of man. Any scheme of nature which suppresses them, virtually leaves out of account the most wonderful fact in the natural history of the world, of which man is an integral part. Man has a conception of cause and effect—can perceive, design, and in a limited sense create; because he himself has (within the limits of his faculties) the power of prescient design. Hence he rises to a conception of a great first, prescient, and designing personal cause. If we reject the evidence of *facti causa*, we thereby mutilate the very elements of our intellectual and moral nature. We have taken the first step towards atheism; and the vanity of man may perhaps, afterwards induce him to take the second; and then he may amuse his soul by natural phantasms not one jot wiser or better than the poetical dreams of Lucretius.

The author here read a series of extracts from modern works which appealed to Darwin's hypothesis for proof; and then utterly repudiated all that was supernatural in Gospel history, making the new Testament no better than a myth, and its miracles nothing better than a series of falsehoods, or delusions, or ignorant impostures. For conclusions such as these he was not so unjust as to make Mr. Darwin responsible. Apart from its hypothesis his work contains many admirable details, many original observations, and charming views of nature. The author concluded by expressing his thankfulness that in early life he had been trained in the stern inductive truths of the Newtonian Philosophy. He expressed his hope that this scheme of teaching would long keep its ground in this University, and that the sons of our *alma Mater* might long continue to seek truth with honest zeal, and follow her lead through whatever track she might guide them. He warned them never to forget their guide, by the seductions of hypotheses; but to generalize inductively from facts well established; and ever, as they advanced, to test their first generalizations, and to expand them, (and sometimes it might be to contract them,) so as to bring them into true logical accordance with their knowledge of the laws of the material world. Pursued in this spirit of cautious and severe induction, we have no results to be afraid of. All

truth (whether natural or moral) will prove consistent with itself; for all truth has "its seat in the bosom of God"—the ordainer of all law and the creator of all living things. In this honest way we may be led on by a true teaching, which embraces all nature, to give to faith what belongs to faith, while we give to reason what belongs to reason. Thus, may we hope to approach the true stature of our manhood, and to reach a lofty knowledge; which, in Bacon's words, is not to be regarded "as a tower of state for a proud mind to raise itself upon, but a rich storehouse for the glory of the Creator and the relief of man's estate."

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