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1900.

ORDINARY MEETING.*

DAVID HOWARD, ESQ., D.L., F.C.S., IN THE CHAIR.

The Minutes of last Meeting were read and the following Elections took place :—

MEMBER :—C. R. N. Mackie, Esq., Devonshire.

ASSOCIATES :—G. A. Gutch, Esq., C.E., London; Mrs. S. C. Kemble, Wilts.

The following paper was then read by the author :—

CREATION OR EVOLUTION. By WALTER KIDD, Esq.,
M.D., F.Z.S.

SEVENTEEN years have passed since a leading review† gave the place of honour to an able and severe attack upon “The Gospel of Evolution” by Dr. Charles Elam. The attitude of the evolutionists of 1880 was more calculated to alarm their opponents, then represented by the majority of educated people, than is the case at the present time; and notwithstanding the truly vast amount of investigation which has proceeded from the evolutionary school of biologists, accompanied by harangues in sufficiently menacing tones, the noise of battle grows fainter and might be mistaken for the distant hum of a united camp. Indeed a notable illustration of the better feeling which prevails took place the year before last, which may well be likened to that honourable incident in the great battle of Saratoga, when, as the body of the gallant General Fraser, in obedience to his dying request, was being carried to its

* 15th March, 1897.

† *Contemporary Review*, May, 1880.

burial within the former British lines, the conquerors turned their hostile fire into the minute-guns of respect for a noble foe. It was so, when not only his allies in great numbers, but such opponents as Lord Salisbury, Lord Kelvin, Mr. Balfour, gathered to do honour to the memory of Professor Huxley, that doughtiest champion of evolution, who had actually died with his severe criticism of Mr. Balfour in hand.

The occasion of the article by Dr. Elam was a striking one. Professor Huxley had recently proclaimed at the Royal Institution, on the occasion of the "coming of age" of *The Origin of Species*, that evolution was "no longer an hypothesis but an historical fact." The vast inheritance of the heir of all the ages of thought seemed to be resting at last on sufficiently secure title deeds. It is true that evolution at that time did not generally and publicly claim more than the origin of all terrestrial life from a few primordial forms: the doctrines foreshadowed by Democritus, Empedocles, and Lucretius were the possession of the few. More recently this theory "rightly conceived," under the improving care of its trustees, has felt called upon to annex the universe.

If the theory of evolution has become more ambitious and has widened its claim over the territory of thought, how comes it that of late, except for an occasional dropping fire from the citadel of faith from Sir Richard Owen, Mr. Gladstone, Sir William Dawson, Dr. Wace, Lord Salisbury or Mr. Balfour, directed against some one or other of the divisions of the investing host, good-natured indifference, on the whole, marks the prevailing attitude of orthodox men of science and men of faith towards this remarkable theory?

Further, though it is not denied that the majority of biologists accept this theory *in some form or other*, is there anything more to be said after seventeen years than what Dr. Elam so well said for that theory, older by some three thousand five hundred years than its rival?

It may be here acknowledged that the theories of creation and evolution, logically pursued, are directly opposed. The former stands or falls with the theory of design, the latter relies solely upon natural causation, dispensing with supernatural intelligence and action.

The term creation implies two conceptions, original creation of the universe, and so-called "special creation" in successive stages, of plants and animals, up to its culmination in the creation of man. There are doubtless certain evolutionists who look upon evolution as a form of *mediate creation*,

but these are not the leaders of thought with whom the believer in creation has to reckon.

The first question may be to a great extent answered by an illustration. The delta of the Mississippi is a vast area comprising 12,300 square miles, and the river itself great enough to deposit sediment annually to the extent of 812,500,000,000 pounds. But great as is the delta and great as is the potential value of its silt, it is nothing in regard to force when compared to the river, as it flowed within its banks. Though this vast amount of detritus leaves fertilizing alluvium on the neighbouring land to be utilized in other days by other men, the river has wandered into a thousand dwarfed channels, and in the Gulf of Mexico has lost itself for ever. Such a change as that of a river into its delta may well describe the present or closely approaching position of the theory of evolution, and indicates its weakness as an attacking force. Some explanation may here be given of the introduction into such questions as those of evolution and creation of terms which suggest strife. In the popular view, in its earlier days, Darwinism was nothing if not combative, however little its great founder was responsible for this. It was not unnatural, probably necessary, in the state of public opinion which then existed, that Huxley should employ the imagery of war in his brilliant essays against superstition, Hebrew tradition and other "strangled snakes." But this was very much what gave pith and point to evolutionary literature. Now, however, seeing that the theory of evolution is still an unproved theory, and that the citadel of faith is more full than ever of warriors, whose attacks are directed rather against the common foe under the aspect of heathenism than of evolutionary agnosticism, a dangerous slowing of the current of the evolutionary river has set in, and no better description of the state of things can be given than that of a German writer, "a confused and indefinite movement of the mind of the age"—in fact the delta-stage.

For answer to the first question more is required than illustration and assertion, but the facts which supply this will be best derived from the answer which will be offered to the second question. Seeing then that the majority of biologists accept the evolution hypothesis in some form or other, is there more now to be said in favour of the creation hypothesis than there was in 1880? Progress there has been, of a remarkable kind, but that "last infirmity of noble mind" has led many out of their depth, and far from the

shore of fact, so that time has been on the side of the older theory. The fact that the consensus of current biological teaching is in favour of evolution hardly needs much proof. If Mr. Herbert Spencer can make the compendious claims which he did lately in *Lord Salisbury on Evolution*, Mr. Wallace reminds us, from time to time, of the *Method of Organic Evolution*, proof of the fact not seeming necessary; Professor Haeckel could make it a strong point in the praises of Lang's *Comparative Anatomy*, in his prefatory remarks, that "he has always endeavoured to give the phylogenetic significance of ontogenetic facts"; if Professor Huxley could say in the *Encyclopædia Britannica* that "on the evidence of palæontology the evolution of many existing forms of animal life from their predecessors is no longer an hypothesis but an historical fact"; if Romanes could say of this theory that "it is held to be virtually a completed induction"; if Professor Karl Pearson, in an attack upon Lord Salisbury's Address, recognising "the danger of the reaction which is spreading among us," could say that "the danger to science . . . was in truth small," this indicating evolutionary teaching of course, the elegant description of the opposing line of thought being "the old bigotry"; if Professor Marsh could say a few years ago that "to doubt evolution is to doubt science, and science is only another name for truth"; and if the "story of Creation" can be told by Mr. Clodd with nearly equal authority, though hardly the majesty of Genesis, from the opposite point of view; and if the scientific and quasi-scientific press is full of references to it and assumptions that never raise a question of its truth—if these things be so, it behoves the man of faith to give good reasons from the side of science which justify him in still believing those noble words, "In the beginning God created the heaven and the earth."

Before proceeding to the special consideration of this theory and its imperial claims, it may be remarked that the ranks of evolutionists are anything but united, and the divergences of view become ever more marked. To take a few notable specimens: Darwin's views on the origin of species by natural selection through heredity, great as was the revolution they produced, were not concerned with that "great progression of nature from the inorganic to the organic, the formless to the formed, the simple to the complex" which Huxley and Haeckel have assisted in adding to the original theory. Mr. Wallace, who has been

justly honoured as the joint-discoverer of the theory of natural selection, has strongly opposed the origin of the higher faculties of man by natural selection, and has been looked upon as a deserter from the ranks, claims for it an exclusive prerogative in the field of organic revolution. Romanes, the loyal and highly cultivated follower of Darwin, maintained the joint action of natural selection and sexual selection in this process. On the subject of the inheritance of acquired characters, Professor Weissmann, as ardent an evolutionist as any, is engaged in hot conflict with Mr. Herbert Spencer, who himself took the field in this fruitful subject before 1859, and who now claims "all existence" as the province of evolution, with rigid logic spurning the notion that only "things that breed" come under its action. The Christian evolutionism of the late Professor Drummond, and the social evolution of Mr. Benjamin Kidd, which some of our transcendental and severe scientists, but not Mr. Wallace, would be for placing on the *Index Expurgatorius* of science, need only to be mentioned to show that the younger followers of this school of biology see plainly that synthetic philosophy will not satisfy the moral and religious sense of this generation.

The broad lines of evidence, which are supposed to favour the theory of organic evolution, are well-known and have been brought forward with valuable clearness by Mr. Herbert Spencer, to the evident advantage of both sides. The lines of evidence, indirect or direct, for inorganic evolution, exist only in the inner consciousness of Mr. Herbert Spencer, Professor Karl Pearson,* and Professor Haeckel. Romanes indeed said "it is now a matter of demonstrated fact that throughout the range of *inorganic* nature the principles of evolution have obtained,"† giving the geological history of the earth as an instance. Such absolutely vague statements as to what constitutes evolution do not help the theory much; nor did such flashes as those of Tyndall at Belfast, and Huxley,‡ being more in the nature of delicate touches in the hand of an artist, when finishing off a picture, than of sober argument.

The five lines of evidence for the theory are:—(I) The facts of classification; (II) Geographical distribution; (III) Palæontology; (IV) Rudimentary characters; (V) Embryology.

* *Fortnightly Review*, November, 1895, pp. 678, 679.

† *Darwin and after Darwin*, part I, p. 17.

‡ *Critiques and Addresses*, pp. 238, 239.

These formidable witnesses must first be heard, and then certain flagrant discrepancies in the tale which they are supposed to tell of terrestrial life must again be brought forward, after which teleology, the old and incorruptible witness for the opposite side, will be examined once more.

Classification.—The now familiar tree of life, constructed by evolutionists upon the ruins of many older and artificial systems of classification, gives an excellent educational view of natural history. It will serve its purpose admirably while the pendulum of current science swings to the evolutionist side. But the theory of creation is not among the class of extinct beliefs, nor is that Book obsolete in which this theory is enshrined, and in which it is announced as a fact, if one society alone sends forth every year four million copies, or portions of it, and it be translated into 320 languages and dialects; under which circumstances the arborescent view of classification may still obtain when the delta shall have been well passed. The knowledge of a Darwin or a Romanes would hardly suffice to test the statements made by the latter in his remarkable chapter on classification. But if all be allowed which is claimed,* the “argument from ignorance,” which Romanes offers as the last ditch to the defenders of special creation, proves a fortress of remarkable strength. When the marvellous order which exists, as the plants and animals of this globe are marshalled in review by an expert in biology, it is positively trifling with the matter to allow that this order, of immense duration in point of time, could arise by a process of natural selection, which would be nothing if chance did not enter largely into it, and to refuse to see this same order emanating from a Divine Power, whose operations depend upon intelligence and will. Romanes truly says, that if the defenders of the creation theory explain by the hidden reasons which the Creator may have had, those zoological and botanical affinities which exist, they are bound to show some independent evidence for their theory. Nothing can be more fair; and this the facts of teleology—absolutely independent—will supply. Classification may be left out of account as being equally in favour of the two theories—opposed to neither.

Geographical distribution.—In this department facts are multitudinous, much valuable silt having been brought by the tributaries of the evolutionary river. The most impor-

* *Darwin and after Darwin*, part I.

tant work of all has been done by that master in biology, co-discoverer of natural selection, seceder from the ranks of orthodox Darwinism, opponent of the origin of man's higher faculties through natural selection, Dr. Wallace. In this division of the subject it may be noted that the theory of creation seldom receives fair handling from its opponents. There is a prevalent misapprehension as to what Genesis does and does not say. Details, times, and methods are ascribed to that Infinite Mind which planned the cosmos, not only by the mistaken opponents, but also by many mistaken defenders of the theory. In those early records written (*pace* Wellhausen!) in the sixteenth century before our era, the marvel is to observe how the "current science" of Egypt and Babylon has been studiously avoided, how as much cosmogony as the early readers could apprehend, or the later need, was given in two short chapters, and how place was left in the two first verses, before the ordering of this earth for man commenced, as announced in the third verse, for all those geological epochs which science has so lately discovered. The "British Cuvier," as Huxley called Owen, summarised in his great axiom the true view of creation, with specific centres—"The continuous operation of the ordained becoming of living things"—from Laurentian times to the age of man. When this aspect of creation is allowed fair play, most of the difficulties as to geographical distribution of plants and animals disappear. Various curious questions may be asked by evolutionists (and ingenious answers supplied by their own theory) as to such facts as geographical restriction and natural affinity being correlated, as to the same plan obtaining in extinct as well as in living species of plants and animals, as to remoteness of affinity and range of dispersal, or as to the reason for difference in type on opposite sides of a mountain-chain. All such general facts, those of emigration of forms of life from neighbouring continents to oceanic islands, and such as the large percentage of *peculiar* faunæ and floræ in oceanic islands of known high antiquity, the law that "every species has come into existence coincident in time and space with a pre-existing allied species," find their explanation not less naturally under the above view of creation than under any theory of descent with modifications. One continental island may be considered as an example. The Australian mammalian fauna is limited to a few low types, marsupials, bats, rodents, and the oviparous monotremata; and looked at dispassionately, this adaptation

of fauna to a peculiar soil and climate speaks fully as plainly in favour of design, as of an independent centre of evolution. In passing a reference may be made to the monotremata. These "animated fossils," so-called, are of great use to the evolutionist builder of the family tree of man. They figure among certain important links in the chain from the invertebrata to man, and, being oviparous mammals, are of peculiar value to the diagrammatic method, ranking in point of importance with lemurs, insectivora, and the honoured amphioxus. They did not need to be invented, as did certain of Professor Haeckel's links formerly, for two genera of them do actually exist. Here is a remarkable little group, ancestors of man, not known anywhere except on a great continental island, which probably *from its origin* was disconnected from the rest of the land, and not known palæontologically, except for one species of echidna in Australia itself, in late Tertiary times; and yet this group is to rank as an important link in the ancestry of man! The results of human experiments illustrate by contrast the wisdom which has regulated the fauna and flora of New Zealand and Australia. A few instances may be mentioned, quoted partly from a paper by the Rev. Theodore Wood.* Thirty-six years ago a few rabbits were introduced into Australia, by way of experiment, with that disastrous result which is now an old story in Australia. It is said that after this experiment, in one season, 1880, twenty millions of skins of rabbits were exported; that on one estate eighteen poisoners were kept daily and constantly at work; that £400,000 was paid in New South Wales alone as "head-money," and all in vain. In New Zealand the sparrow was imported from Europe with similarly grievous results. In the case of plants, the water-cress was introduced into New Zealand by certain persons with sufficiently innocent intentions, but with the result of producing in ten years Brobdingnagian weeds, with stems as thick as a man's wrist, and leaves as large as a water-lily, blocking up the streams and ditches. A Scotchman of patriotic mind plants a single thistle in Australia; in a few years the weed has grown so alarmingly that his neighbours rise up and call him—well—not blessed. And as with the sweet-briar, a harmless enough plant in its English and *appropriate* home, but one which in Australia soon becomes such a pest that farmers are dragging it from

* *On the Australian Mammals*, Victoria Institute, April 13, 1896.

their land with cart ropes and teams of horses. One may at least be thankful that no similar *entrepreneur* has attempted to improve the fauna of Australasia by the importation of a batch of wild felidæ of various kinds! The regulation of the fauna and flora of this region of the world by divine wisdom has not produced, through vast geological epochs, the chaotic results which a generation of human bungling has easily brought to pass.

In the case of geographical distribution, as in that of classification, if the same justice be extended to the theory of creation which the opposing theory would claim for itself, this line of evidence supports the former as much as the latter.

Palæontology.—This department forms the probable battleground of the future, and an ample field indeed is supplied by the succession of life-forms from Cambrian or Pre-Cambrian to Quaternary times. It is obvious from the nature of the case that, if the doctrine of evolution be true, the teachings of palæontology, with the growth of ascertained facts, must verify it accurately. In this subject the evolutionist is in a very comfortable position. If the facts of palæontology favour him, well and good; and with such a vast *succession* of life-forms for his study, it is inconceivable that many lines will not favour him. If the facts are against him, he has but to point to that imperfection of the record which is a name to conjure with, and which is admitted by all. If finally no light is forthcoming from the fossiliferous beds on a certain line of argument, again the imperfection of the record is adduced. Evidently here the evolutionist “stands to win” for some time to come. All writers insist so elaborately on the necessarily broken record of palæontology that it needs no proof, but the latest utterance from English geology, by Professor Marr, may be alluded to. He said at Liverpool in his presidential address, “As it is, we have barely crossed the threshold of discovery, and the ‘imperfection of the geological record’ gives geology one of its greatest charms.”* Several lines of descent are supposed to be proved as favouring the theory, and, as mentioned already, Professor Huxley spoke of the evolution of certain forms from their predecessors as an historical fact, instancing the equine type in particular, the ungulate types in general, the carnivora, birds, and reptiles, and the crocodilia. By this time the equine type has become

* British Association of Science, 1896. Presidential Address in Geological Section, p. 2.

a little *passé*. In the day in which Dr. Elam wrote it was an old story, and there has been really enough said *for* it, but there are some very awkward imputations cast upon its character as a credible witness for evolution by Sir William Dawson, whose eminence as an authority will not be questioned. Some words of his on this point are so striking that they may be quoted in full. "The worthlessness of such derivation is well shown in a case which has often been paraded as an illustration of evolution—the supposed genealogy of the horse. In America a series of horse-like animals has been selected, beginning with the Eohippus of the Eocene—an animal the size of a fox, and with four toes in front and three behind, and these have been marshalled as the ancestors of the fossil horses of America; for there are no native horses in America in the modern period, the result of the long series of improvements having apparently been extinction. Yet all this is purely arbitrary, and dependent merely on a succession of genera more and more closely resembling the modern horse, being procurable from successive Tertiary deposits often widely separate in time and place. In Europe, on the other hand, the ancestry of the horse has been traced back to Palæotherium—an entirely different form—by just as likely indications, the truth being that as the group to which the horse belongs culminated in the early Tertiary times, the animal has too many imaginary ancestors. Both genealogies can scarcely be true, and there is no actual proof of either. The existing American horses, which are of European parentage, are, according to the theory, descendants of Palæotherium, not of Eohippus; but if we had not known this on historical evidence, there would have been nothing to prevent us from tracing them to the latter animal. This simple consideration alone is sufficient to show that such genealogies are not of the nature of scientific evidence."*

Four formidable objections brought against the theory of evolution from palæontological facts in regard to animals, and three in regard to plants,† are mentioned by Romanes. All the former‡ are met with arguments drawn from "the imperfection of the record," what could be called "the argument from ignorance if used by an opponent, and of the

* *Modern Ideas of Evolution*, p. 119.

† *Darwin and after Darwin*, part I, Appendix, p. 435.

‡ *Origin of Species*, 6th edition, p. 267.

latter one is met in the same manner. Such acknowledgment of the vast extent of the present and possible evidence which remains to be unravelled, renders it becoming for the advocates of either theory to be chary of dogmatic statements. Darwin* himself expressed this forcibly: "From these considerations, from our ignorance of the geology of other countries beyond the confines of Europe and the United States, and from the revolution in our palæontological knowledge effected by the discoveries of the last dozen years, it seems to me about as rash to dogmatize on the succession of organic forms throughout the world, as it would be for a naturalist to land for five minutes on a barren point in Australia, and then discuss the number and range of its productions." As we have had such uncompromising statements of late on this line of evidence from one side, it is appropriate that one by Sir William Dawson, which must carry much weight, should conclude this portion of the subject. He says:† "It cannot be disguised that though it is possible to pick out some series of animal forms, like the horses already referred to, which simulate a genetic order, the general testimony of palæontology is on the whole adverse to the ordinary theories of evolution, whether applied to the vegetable or to the animal kingdom"; and, "we may also conclude that the settlement in very early times of so many great principles of construction, and the majestic march of life along determinate paths throughout the vast lapse of geological ages, and along with so many great physical changes, cannot be fortuitous, but must represent a great creative plan conceived in the beginning and carried out with unchanging consistency."‡

Rudimentary characters would be more properly called "vestigial" in all cases. Whatever these characters indicate they are not rudimentary or elementary, but all of them "speak of something that is gone." In an altogether new sense we are now taught that "our birth is but a sleep and a forgetting," and this class of characters is pointed to in proof. Professor Drummond's slightly scornful description of the human body—"museum of obsolete anatomies"—belongs to this class of teaching. Professor Huxley admitted this class of facts to be double-edged, inasmuch as it is

* *Darwin and after Darwin*, part I, p. 438.

† *Modern Ideas of Evolution*, p. 146.

‡ *Ibid.*, p. 127.

impossible to prove that they are not of use to their present possessors. In truth according to the theory of special creation, it is only in keeping with its basis to allow that the original type of man, for instance, was a more perfect machine, if possible, than we find to be the case after several thousand years of degeneration. Reference will be made later to the subject of degeneration, which is an important factor in the history of terrestrial life, insisted upon much by evolutionists themselves. Certain vestigial characters in man which are brought forward are irrelevant, others incorrectly stated, but it is not out of keeping with the theory of creation that others, such as the muscles which move the skin of the forehead and neck, those which extend from one part of the pinna to the other, and those which are attached to the side of the head and move the pinna, which are found in a certain number of human subjects, other muscles which are occasionally found connecting the sacrum and coccyx, should be simply departures from a more perfect type and cases in which degeneration through disuse has taken place; in fact that they are "vestigial" in a sense different from that which is usually employed. The vermiform appendix of the cæcum, called by Mr. Bland Sutton an "abdominal tonsil," is as difficult to explain on the theory of design as the tonsil itself, though there is a possible significance in the commanding position which each occupies and the incidence of microbic attacks upon each, by reason of the mass of lymphoid tissue with which they abound. Its comparative anatomy is singular. It is confined to man and the anthropoid apes, and is found only in one other animal, the curious Australian marsupial, the wombat, and it appears to represent the long cæcum of herbivorous animals in whom it is functionally active. In the wombat Professor Struthers* doubts if the tube which exists along the end of the ileum, opening by the side of the ileum into the colon, is a true appendix of the cæcum. But to say the least of it, it is remarkable to find a so-called "vestige" of this kind only in man, the anthropoid apes, and a closely similar structure in a low marsupial animal. Seeing that man is not supposed to be the direct descendant of the higher apes now existing, such an ancestry as is required for this little appendix stretches back into the hoary antiquity of Miocene times,

* *On varieties of the appendix vermiformis, cæcum, and ileocæcal valve in Man.* John Struthers, M.D., p. 34.

and in so doing casts grave reflections upon the efficiency of natural selection. It is not here a question of a trifling degenerate muscle, or a fold of mucous membrane, which is either useless or slightly useful to the possessor, but of a structure which is frequently the seat of serious and fatal inflammation by reason of its position. It is said to be functionless: but a worse indictment is brought against it for the danger which it constitutes to its possessor. It is the subject of language almost abusive in character, and as some think of surgical abuse, being considered by certain authorities so perilous to the young as to warrant its excision. All the reflections cast upon the vermiform appendix cannot fail to interest the opponent of evolution. Here at last was something tangible and valuable that natural selection, in the course of many thousand years, might have brought about, viz., elimination from the human body of a structure so dangerous to it in its struggle for existence.

The strong inward deflection of the foot of the human infant is taken as a vestigial character, inherited from simian ancestors; an entirely unnecessary view of it, when the many months during which the foetal foot is in this position are taken into account.

The *membrana nictitans* of all vertebrate animals is of more or less functional value, especially no doubt in birds and fishes, but the *plica semilunaris* in the human subject is of manifest value, by its action as a kind of ledge, over which various small foreign bodies are pushed into a safer position than if this little fold were absent from the deeply set inner corner of the eye.

Certain facts connected with the distribution of hair on the human body are supposed to point back to a simian ancestry. Of these the distribution of hair on the forearm of man and the higher apes is incorrectly described by Romanes in* *Darwin after Darwin*, and the whole subject dealt with in a partial manner, as shown in papers treating of this subject.† The lower forms of life are held to be full of vestigial structures, but, by whatever theory they are met, great difficulties remain. The aborted pelvic limbs and their arches, of python and tortrix, the only two of about a thousand species of snakes which possess them, are most obscure on any theory,

* pp. 89, 91.

† *The Difficulties of Evolution*, Walter Kidd, M.D., Victoria Institute, May 4, 1896; *Nature*, January 7, 1897, p. 267.

and almost as remarkable as the possession by the wombat of something very like the human appendix cæci. The foetal teeth of Balænidæ, and the generally aborted dentition of the Cetacea and Sirenia, are in keeping with their character of degenerate mammals, which have become aquatic. It is in keeping with this also that an ancient Sirenian from the Tertiary deposits of Jamaica exhibits a distinctly superior dentition to those now living, and that the extinct Zeuglodon and Squalodon manifest a similar superiority over any existing Cetacean, whose teeth are simple, numerous, and of one kind. DEGENERATION DOWNWARDS in the scale of organization may be found as valid an explanation of these characters in man and the lower animals as that of the evolutionist.

Embryology has been left to the last, because in the "evolution of the individual" we do actually come upon undoubted evolution or development. Let the evolutionist dwell to his heart's content on the facts of this class, which are clear, open to verification, and undisputed. But in proportion to the fulness and freedom of this study will be the demonstration that if this be evolution, it has no thinkable relation to the supposed origin of species or of communities by evolution. Vaguest analogy there may be, such as would suit the purpose of a biological teacher for diagrams on the blackboard, but true similarity of process or causation there is none. The supposed origin of species depends for its very existence upon certain factors which all, more or less truly, represent observed facts, and which it is the conspicuous merit of Darwin and Mr. Wallace (in some degree preceded by Mr. Herbert Spencer) to have discovered. Wonderful as was the insight gained by this discovery, or systematizing of previous discoveries, into the workings of nature, the conclusions drawn from them are exceedingly insecure. The factors referred to are of course the familiar "struggle for existence," "natural selection" or "survival of the fittest," "heredity," "variation," and one, which is often ignored, *extinction*. And of these there is only one which can with any reason be applied to the cells of the developing embryo, viz.—heredity. The process by which the embryo is developed is called "epigenesis," or "the successive differentiation of a relatively homogeneous rudiment into the parts and structures which are characteristic of the adult," and in the phenomena of ovulation, fertilization of the ovum, blending of the male and female pronuclei,

karyokinesis, segmentation of the ovum, gastrulation, formation of ectoderm and endoderm, a beautifully accurate knowledge is obtained of *this* development. But the very exactitude of the knowledge of embryology is the precise reason which prevents this class of facts from lending any aid to the general doctrine of organic evolution. Huxley could say no more than "it is a probable hypothesis that what the world is to organisms in general, each organism is to the molecules of which it is composed. Multitudes of these, having diverse tendencies, are competing with one another for opportunity to exist and multiply; and the organism, as a whole, is as much the product of the molecules which are victorious as the fauna or flora of a country is the product of the victorious organic beings in it."* This is obviously no more than the *opinion* of an eminent man. Among the developing cells of an embryo neither "struggle for existence," "survival of the fittest," "variation" nor "extinction" is proved to take place, and, by the terms of the definition of epigenesis given above, even true analogy to general organic evolution is absent. In the embryo there is a definite and ascertained beginning, a fixed line of development, a certain known type to which it is tending, an *adult* or finished stage. In the production of species according to the postulate of the evolutionist where is the perfect type, or that which corresponds to the adult stage to which an embryo tends? The ambitious theorizing of evolutionist teachers has indeed extended far into nebulous regions, but they cannot with any regard for consistency claim that organic evolution ends with man, and, if not, then even the analogy of general with individual development fails in an essential point. So that without proof, and without complete analogy, this line of evidence is poor indeed. The doctrine of recapitulation invented by Fritz Müller teaches that the development of the individual is an epitome of the development of the race, that an embryo "climbs up its genealogical tree" during its embryonic history, repeating the steps of its ancestry in its own development. It is taught by Romanes, by way of accounting for the great gaps which are left in these ancestral histories, that a foreshortening of the developmental history will take place, and those steps which are not necessary, and which put too

* *Critiques and Addresses*, p. 309.

much strain upon the resources of the developing embryo, will be got rid of by natural selection, "or whatever adjustable causes we may suppose to have been at work in the adaptation of organisms to their surroundings." This statement is quoted with the object of showing how much the evolutionist feels the difficulty of bringing into line the gaps and contradictions which he finds in the histories of embryos with this necessary doctrine of recapitulation! But one cannot but ask how *any* of the ancestral traits which are exhibited can be of use to the individual embryo? This recapitulation may be a *picture*, and a very interesting one, but a great authority lately admitted that these ancestral traits are "rudely indicated," "roughly represented"; and in the vegetable kingdom "recapitulation" has been very scantily observed. Professor Ray Lankester said of this doctrine "though it is now recognised that 'recapitulation' is vastly and bewilderingly modified by special adaptations in every case, yet the principle has served, and still serves, as a guide of great value."* In very much of the arguments from embryology in favour of evolution there is more of the teacher of current biology with epitomes and diagrams at his elbow, than of the interrogator of nature.

The five lines of indirect evidence for the theory of evolution have now been shortly examined, and it is maintained that CLASSIFICATION and GEOGRAPHICAL DISTRIBUTION are equally in favour of this theory and its rival, PALÆONTOLOGY, too imperfect as yet to give a final verdict, but considered by a great living authority to be *on the whole adverse to evolution*—RUDIMENTARY or VESTIGIAL CHARACTERS, double-edged and uncertain—EMBRYOLOGY, suicidal if pressed much in favour of evolution. Of these five, Embryology by Romanes;† Palæontology by Huxley;‡ Geographical Distribution in connection with Palæontology by Huxley;§ have all been said to be the strongest of the lines of argument, and Vestigial Characters by Huxley to have been the most potent in promoting general acceptance of the doctrine of organic evolution.||

The question must be considered how it comes that the great majority of eminent living biologists accept the theory

* *Encyclopædia Britannica*, vol. xxiv, p. 811.

† *Darwin and after Darwin*, part I, p. 155.

‡ *Nature*, June 21, 1883; November 1, 1894.

§ *Encyclopædia Britannica*, vol. viii.

|| *Ibid.*, p. 751.

of evolution in some form. In the first place, the vastness of the subject both as to time and area of distribution affords endless scope for investigation for generations to come, and scientific men are at liberty to hold this theory in any degree of exactitude, from that of "a working hypothesis" to that of a mechanical theory of the universe reaching back even to the "physical selection of more stable elements" of Professor Karl Pearson,* and forward through the whole series of plant and animal life-histories to those still future beings which presumably are to succeed man. The wide-reaching and intricate character of the problems involved, and the great extent of the facts underlying them forbid the expectation of proof or disproof of this theory for many a year to come; this accordingly adds much fascination to the theory. Further it promises to science the high reward of systematizing under natural law "all existence," faith, except as placed in the men of science themselves, being excluded. Soon after its promulgation in form by Darwin, it received the enthusiastic support of a brilliant writer and speaker as well as one of the greatest zoologists of his day, though in Huxley's advocacy there seemed ever to be a reserve such as one so candid and judicial would feel. Lord Kelvin indeed at the Royal Society said in 1894, "We may well be glad that the advocate of 'the origin of species by natural selection,' who once bore down its foes, is still among us, ready, if needs be, to save it from its friends!"†

Finally, this ancient theory modernized, came into apparent conflict with views of creation, held for ages by faith, and supported by most imperfect knowledge of biology and geology, which views were not contained in the true exegesis of the records which were appealed to; and the profound reserve of which, with accuracy in what they did teach, are alone an evidence of divinity. Now that it is seen that the Bible is not a handbook of science for Chaldaean, Greek, Roman, or modern times, but a book essentially moral in its purpose, whose science, if scanty, is true, and whose history every "find" of entombed treasures of the East endorses, and in whose favour the very stones are crying out, this conflict has lost its bitterest sting.

Certain difficulties which obstruct the path of the thorough-going evolutionist remain to be mentioned.

* *Fortnightly Review*, Novemebr, 1895, p. 678.

† *Address at Anniversary Meeting of the Royal Society*, p. 19.

Abiogenesis or "equivocal generation" is no nearer to proof than it was when in 1873 Professor Huxley was obliged to "admit with sorrow that the question has been 'marking time,' rather than marching,"* and that it appeared to him that "Redi's great doctrine of Biogenesis" was "victorious along the whole line at the present day,"† with certain limitations which were strictly only prophetic acts of philosophical faith. It was the question of Abiogenesis which provoked from Darwin himself the remark, with an impatience rare in him, that this was "mere rubbish." The remarkable progress of synthesis of organic compounds, as with certain other lines of scientific evidence captured by evolution, by virtue of its immense positive progress on the one hand, and its significant negative results on the other, goes to swell the general verdict, "not proven." If this "hiatus valde deflendus" continue indefinitely, the origin of life will either require to be demanded as an axiom of scientific faith, or the evolutionist will need to fall back upon Lord Kelvin's suggestion of an aberrant meteorite as the origin of the life of this globe, a suggestion apparently not made seriously. It is not without a significance which bears upon this question that the most fruitful of all advances in surgery, reaching even to medicine, that of Lord Lister, depended for its possibility on the fact that, in the present order of things, Abiogenesis does *not* occur, as shown by the genius of Pasteur and Tyndall, and foreshadowed by Helmholtz.

Natural Selection.—Without reference to the difficulties under this heading no criticism of evolution should proceed. Natural selection or "survival of the fittest," a phrase of whose "unfortunate ambiguity" Huxley speaks‡ is without doubt the cardinal point in the theory of organic evolution; so much so that Mr. Wallace makes all the evolution that does exist to depend upon it. But Darwin found it inadequate, and invented *sexual selection*, for the purpose of accounting for facts of beauty, colouring and markings, and Romanes has fully supported this supplementary theory. As before referred to, Professor Karl Pearson suggests that *physical selection* of more stable elements may account for inorganic evolution, pointing out truly that this physical

* *Critiques and Addresses*, Preface, p. xii.

† *Ibid.*, p. 39.

‡ *Evolution and Ethics*, p. 32.

selection is but a part of natural selection, viewed broadly and apart from heredity. Sexual selection is taught for the purpose of supplying the obvious inadequacy of natural selection, and is admittedly applicable, when it seeks to account for beauty of form, colour and markings, only to those higher animals which have sufficient intelligence to come under its sphere. Here is a vast wealth of beauty of lower invertebrate life wholly outside sexual selection! The beauty of this class has to find another explanation, and it finds it in *accident*, the bye-products of chemical processes supplying a parallel. The fact that beauty among these life-forms is not universal is taken in proof of this theory of accident; but beauty is no more universal in monkeys (even if not nearly absent), many classes of ungulate mammals, cetacea, reptiles, *among allied classes of which* sexual selection is supposed to operate in the production of facts of beauty. One more great class of forms of life which come neither under natural selection nor sexual selection, and which Romanes declares to constitute half of the animal species of the world, is that of parasites, largely degenerate animals. The beauty of colouring and form of plants, the gaily-coloured corollæ, variegated leaves, numerous markings, and attractive fruits are accounted for by the theory of natural selection, owing to the fact that so large a proportion of these are fertilized by birds and insects, and that these attractions bring about a form of selection and survival of the fittest among plants, their gay fruit and flowers leading to the swallowing of the seeds by birds, and conveyance of pollen by insects to other plants, with obvious results. For that class of plants, which, whether hermaphrodite or not, are fertilized in this mediate manner, this explanation is good enough. But there remains a class of plants directly self-fertilized, or fertilized by the action of wind, which also are necessarily removed from the range of sexual selection and yet not destitute of beauty. This class is very much smaller than that in which cross-fertilization takes place, as Darwin shows. In illustration of it he mentions two lists each of forty-nine genera which he examined. In the first* list fertilization by insects was proved, and of these forty-nine there were about thirty-two which had asymmetrical flowers or presented remarkable peculiarities. The second list of forty-nine genera, including species which were fully or

* *Cross and Self-Fertilization of Plants*, p. 371.

moderately fertile when insects were excluded, showed only about twenty-one out of the forty-nine whose flowers were asymmetrical or presented remarkable peculiarities.

Still another class of organisms, often of remarkable beauty and variety, the larvæ of lepidoptera, which in their markings and colouring differ strongly from those of the pupa and imago stages, and which of course are removed from sexual selection, remain unaccounted for, as to their beauty, by natural or sexual selection. This point has nothing to do with their "protective markings."

One patent objection to the claims of natural selection in the production of species is in the earlier stages of organic evolution. It is not enough to be dazzled by men of vast knowledge with cleverly described cases among higher animals, such as vertebrata, where the ideas of struggle, selection, adaptation to environment can be more or less graphically portrayed for us. The imaginary picture of the lengthening of the cervical vertebræ of the giraffe, again brought forward by Mr. Herbert Spencer, is at least conceivably though not demonstrably true. But when we are told to suppose that in the case of the myriads of larvæ, grubs, worms, insects, required by the voracious and world-wide insectivora, to whom a fast of four hours is fatal, in the case of the thousand herrings, smelts and other marine animals which a great cetacean or elasmobranch fish may engulf in a day, similar *wholesale* ravages upon lower forms of life going on now in numerous lower levels of life, as well as the infinite extinction in this manner, which has reached back, for example, to Devonian times—that in these cases natural selection or survival of the fittest must have operated in the production of new species—and further that it is in harmony with scientific thought that processes analogous to those in the giraffe must have taken place in the *individuals* of the foraminifera and diatomaceæ, we feel no obligation whatever to accept such dogmas. In a piece of chalk, composed of little else than minute Globigerinæ about $\frac{1}{100}$ th of an inch in diameter, or a mass of cretaceous marl from Upper Eocene beds, weighing 21 oz., with a sectional area of 14 square inches, on which section are visible 109 univalve fresh-water fossils, Planorbis measuring from $\frac{1}{12}$ th of an inch, to 1 inch in diameter, Paludina $\frac{1}{20}$ th of an inch, to $\frac{3}{4}$ of an inch in length, we have an object-lesson of the wholesale ruthless extermination, without regard to variations, favourable or otherwise, which must have taken place

in Secondary and Tertiary times. And when a vague conception is attempted of the futility of natural selection applied to individual Foraminifera, Crinoids, Sponges, and Corals, which in more recent times are flooring the Atlantic and Pacific Oceans with the "Atlantic ooze," and have built up the limestone and flint which have entered so largely into the earth's crust, we cannot but wonder how the process of progressive transformation, or survival of the fittest, or natural selection ever began.

We are thus met with a diminished number of acres of the once fair inheritance of natural selection, origin of species of protozoa unaccounted for by natural selection, as to proof, and even in imagination—facts of beauty in general unaccounted for by natural selection—those of lower invertebrata by sexual selection—those of plants self-fertilized or fertilized by wind—those of larvæ of lepidoptera unaccounted for by sexual selection—parasites by either natural or sexual selection.

There are results which would have been looked for from natural selection, but which it has *not* produced. The dog has been domesticated by man certainly from early Assyrian times and probably in those of palæolithic man, from the wild forms of *Canidæ* indigenous to the various countries in which they exist. This period would at the lowest calculation reach back five thousand years—Prince Kropotkin and others might allow twenty thousand, and others thirty thousand years. At any rate during a vast stretch of time artificial selection has been carried on by man among the descendants of the wolf, and the extent of this is visible all around us in the bewildering varieties of the dog in every land. The change of intelligence which has been produced is described by Huxley* with his usual felicity as that which has converted the brother of the wolf into the faithful guardian of the flock, and he hazarded the hope that the same intelligence which had produced this result might do much to change the nature of man himself—a poor substitute, by the way, for the Commandments given on the Mount to Moses, and for the New Commandment given in later days. But in the change wrought in the brother of the wolf as to intelligence or instinct by artificial selection, a most remarkable result has been produced, and by its very contrast to the small physiological change, it is the more remarkable.

* *Evolution and Ethics*, p. 36.

These thousands of years of artificial selection have failed to develop a true new physiological species, seeing that the wolf and dog still interbreed, and produce fertile offspring, their gestation is the same in duration, and osteologically they agree. Here is an instance in which selection carried out during several thousand years, having done so much in regard to mental change, might reasonably have been expected to have acted powerfully, in a vast crucial experiment of this nature, as to physiological change. The non-production of a physiological species is one of the outstanding accounts against natural selection, in regard to which one of Huxley's inconveniently clear statements is on record. "I adopt Mr. Darwin's hypothesis, therefore, subject to the production of proof that physiological species may be produced by selective breeding."* All the extended experiments in this direction have not produced a normally fertile and stable new species, the cases of hybrids between horses and asses, sheep and goats, hares and rabbits having resulted in descendants infertile or of limited fertility, or of a fertility lapsing after a few generations. De Quatrefages speaks of this infertility, or restricted and rapidly limited fertility between species, as a *law* equal in the organic world to that of attraction in the sidereal world, and says: "Suppress upon earth the law of crossing and the confusion would be immense. It is scarcely possible to say where it would stop. After a few generations the groups which we call genera, families, orders and classes would most certainly have disappeared."†

Degeneration is a factor almost invariable in individual, family and national history, and evolutionists themselves show the great effect the doctrine of Dohrn has had upon their teachings. A large number of individual animals beside parasites are degenerate animals, and according to evolutionary views one may consider all animals as degenerate *qua* this or that organ or character. Man himself is looked upon as highly degenerate, as to his external ears, his organ of hearing which once was a gill-slit, his sense of smell, his eyesight, his teeth, his non-hairy skin, his pentadactyl and plantigrade state. These are all matters of theory in line with evolutionary doctrines. But, as to facts, we know how quickly man degenerates in

* *Man's Place in Nature*, p. 150.

† De Quatrefages, *The Human Species*, p. 80.

his higher mental and moral qualities under certain conditions, and no better illustration of this can be given than the case of Alexander Selkirk, a vigorous Scotchman thirty years old, placed in the island of Juan Fernandez, and rescued by Dampier, of whom Rogers says in his narrative, "Immediately our pinnace returned from the shore and brought abundance of cray-fish with a man cloathed in goat-skins, who looked wilder than the first owners of them. . . At his first coming on board us he had so much forgot his language for want of use that we could scarce understand him; for he seemed to speak his words by halves." This "degeneration" was accomplished in four years and four months.

It was strongly contended by Professor Haycraft in his Milroy Lectures on "Darwinism and Race Progress" that civilisation and preventive medicine have together markedly diminished the vigour of those races to whom they have been applied, and he stated, "Preventive medicine is trying a unique experiment and the result is already discernible—race decay."*

"The introduction of this conception (degeneration or progressive simplification) necessarily has had a most important effect in the attempt to unravel the genealogical affinities of animals. It renders the task a more complicated one; at the same time it removes some serious difficulties, and throws a flood of light on every group of the animal kingdom."† This "degeneration" appears to be of that kind which leaves in the particular organism vestigial characters on its upward course of development, but *degeneration from a higher to a lower type* is a view of the process which needs to be reckoned with.

It is submitted that the case for evolution though vast in area and unlimited in ambition, is still unverified; and a Quarterly Reviewer speaking of the lifework of Owen was able to say, "It can now be said that the greatest English comparative anatomist of this century has, after a consideration of the hypothesis for more than the duration of a generation, continuously and finally rejected it."‡ The case for design with which creation is linked, stands reinforced by the fruitful labours of a generation of evolutionists, and the multiplied proofs of adaptation of organisms to their environ-

* *Lancet*, 1894, p. 457.

† *Encyclopædia Britannica*, vol. xxiv, p. 811.

‡ *Quarterly Review*, April, 1895, p. 398.

ments, traced in the interest of the theory of natural causation, cannot fail to shed an added light upon the teleology of Paley. This "correspondence of life with its circumstances" is so immanent in nature as to warrant a fresh name; accordingly the "new teleology" with its subtle connotation of "better" or "truer," takes the place which has been pronounced vacant, and a *mechanical* theory is ready to attempt the grouping of all the facts of adaptation in organic nature under a natural law. Indeed, Romanes says, "Unless the theory has succeeded in doing this, it has not succeeded in doing anything, beyond making a great noise in the world. If Mr. Darwin has not discovered a new mechanical cause in the selection principle, his labour has been worse than useless."* To this last statement few even of his opponents would agree. The "new teleology," which emerges from Darwinian studies, so far transcends in accurate minuteness the former teaching, as to be itself a stronghold for those who hold the necessity of divine origination and superintendence of that Cosmos which encircles us. That cause which, on the development theory, availed even in the course of four hundred millions of years to elaborate from carbon, oxygen, hydrogen, and nitrogen, those protozoa, which, amidst incalculable disturbances, eventuated in man, can be nothing else than a supremely intelligent and powerful Being. In comparison with a "law" such as that of evolution, those with which astronomers and physicists have to deal are simplicity itself.

The whole of animal and vegetable life affords a field for the study of these adaptations, but the anatomy and physiology of man offer the best, because the most elaborate illustrations of design, and for an introduction to this investigation, "Natural Theology," with certain subtractions, and a few additions, is valuable indeed. In physiology, defined by Huxley as "the mechanical engineering of living machines" rather than in anatomy, much has been added in a hundred years to the demonstration of the perfect mechanism of the human body for its life; and organ after organ has been dignified by a discovery of its function, until it is hardly exaggeration to say that every tissue and organ is instinct with purpose, calculable and demonstrable from the side of physiology. The most recent demonstration of the interworking of the various organs of the body is that of the

* *Darwin and after Darwin*, part I, p. 402.

profound effect upon the general health produced by ablation or disease of the thyroid body.

Not more than a few simple illustrations of design in this highest of life-forms can be given here. The arrangement of the skeleton of man, tubular construction of the shafts and mechanical disposition of cancellous tissue in the ends of the long bones,—the remarkable qualities of bone as a tissue,—the positions and actions of the two hundred and sixty pairs of voluntary muscles,—the protection by position of the large arteries, veins and nerves, and of the thoracic duct—the protection by strong bone of the brain and spinal cord—the delicate water-bed on which they lie—the spaces in the interior of the brain with vascular fringes, in which heightened blood-supply can occur—the various types of joints—the sudoriparous glands, numbering between two and three millions—the specialized functions of all the organs, with a wealth of anatomical and physiological facts which it were wearisome to enumerate, constitute a weighty mass of *a priori* evidence for design and contrivance.

Three more latter-day discoveries pointing to minute teleology may be mentioned. The course by which the lymph is collected from the different tissues of the body and conveyed by branching vessels into the thoracic duct (which itself lies in about the most carefully protected situation which can be conceived), and so into the general venous current at the exactly appropriate spot, is wonderful indeed. But more recent investigations into the peripheral circulation of the lymph show contrivances still more minute. In the pleura, pericardium and peritoneum, which are open lymph-spaces, the lymph is drawn by suction into the neighbouring lymph vessels, through the constant motion in the pericardium of its contained heart, and in the pleura and peritoneum by the muscular action of the diaphragm in respiration. Similarly, as shown by Ludwig, the relaxation and elongation of the voluntary muscles and their contraction and shortening which takes place during exercise, on the one hand draw by suction into the lymph-spaces which exist in the *faciæ* of each muscle the plasma from the muscular tissue, and on the other drive it out of these lymph-spaces into the surrounding lymph-vessels, which are supplied with valves, at the same time drawing in an increased blood supply. And in the arteries a similar pumping of the lymph from the spaces between the intima and media takes place by reason of the alternate expansion and contraction of

these arteries, and *pari passu* blood is drawn from the *vasa vasorum* for the fresh supply of their coats.*

A second illustration of minute teleology is exhibited in the demonstration by Lord Lister and others, that inspired organisms do not as a rule enter the air cells, being detained or destroyed in the respiratory passages. And Dr. St. Clair Thomson† has found that though 1,500 micro-organisms are inhaled every hour in a London atmosphere, "The interior of the great majority of normal nasal cavities is perfectly aseptic," this vast assemblage of germs being filtered by the vibrissæ in the anterior nares, and washed away by the watery mucus and cilia of the epithelium of the passages. A third illustration is in the extensive arrangements for defence against invading micro-organisms, constituted by that phagocytosis which has been found to be occurring in the white corpuscles of the blood, and the lymphoid tissue which abounds in many regions of the body, and the *immunity* against repeated attacks, and probable extermination by zymotic disease, which so largely obtains.

It goes without saying that all these few contrivances, which are eloquent of design, are claimed to have been produced by selection, and in fact as many more as may be known now, or remain to be discovered. Romanes allows one serious and formidable case of difficulty, and only one—the electric organ in the tail of the skate—from which we gather some measure of the supposed extent of selection.

The adaptations of organisms to their various environments being so wonderful as they are, have perhaps been studied in a one-sided manner too often; and here the evolutionist, with his denial of supernatural causation and his reliance upon "struggle for existence," "survival of the fittest," "natural selection," "sexual selection," "heredity," and finally "accident," which constitute his varied and efficient armament, has too often triumphed over his teleological opponent. He can show that very many of these adaptations can be conceived to occur after his method, and his theory is therefore possible, and that others do occur. More than this is not needed, for has he not hundreds of millions of years for his time, and all terrestrial life for his space! The advocate for creation and design by an Omnipotent Being *ex hypothesi* does not claim to specify in human language all the purposive details of all the life-forms in

* *Lancet*, October 12, 1895, Brunton, p. 901, 902.

† *Lancet*, January 11, 1896, p. 86.

earth, air, and water. His faith in a Person Whose mind he darkly discerns in His manifold works, is deemed unworthy of the consideration which the faith of an evolutionist in a kaleidoscopic "law" deserves. The *facts* of biology are the common possession of both, but the man who sees in them "broken lights" of One Whom he knows by "verified experience," is not less worthy than his opponent of the honoured attribute, "scientific."

But another side to this question is inextricably mixed with the point at issue, "Creation or Evolution?" A simple illustration will best introduce this line of evidence. The history of any fertilized ovum, say in mammalia, furnishes one continuous commentary upon design, plan, preparation. It is not enough to study to the uttermost the stages through which the embryo itself passes until the birth of the individual. The environments which it meets from the outset, a vascular mucous membrane, an arterial circulation capable of being massed together for the placenta, a distensible sac, space in which enlargement can take place, muscular power for its eventual extrusion, each and all of these is an essential factor in its development.

Not less necessary is it to study, in the controversy as to design in general, that marvellous preparation of the environments for all life, from man to the protozoa. In this region neither "evolution," "progressive transformation," "survival of the fittest," "natural selection," "sexual selection," "heredity," nor their discreditable ally, "accident," using this term in its broadest meaning, will even verbally account for the amazing fitness of the environments for the organisms "about to be." No longer, though employed in this preparation, are the secondary laws of physics and chemistry in question. No talk of the cooling globe, with its phenomena of upturnings, flexures, bendings of strata, metamorphosis of rocks, opening of fractures with production of volcanoes, earthquakes and the like, will touch the fringe of the subject, nor will theorizing as to nebular condensation help the case, nor will it avail to point out that the organic remains of myriads of buried invertebrata and cryptogams have in the dim past of Cambrian, Silurian, Carboniferous and Cretaceous times gone to form in measure the very home and food of their successors, and heirs. It can hardly be that by means of one mechanical law all vegetable and animal life has been evolved, their requirements being met by other blind laws, such as those of physics and chemistry, a matchless environ-

ment being thus prepared for each coming race. The broad facts of environment referred to are such simple major conditions as—

1. Adequate and not insupportable supply of solar heat.
2. An atmosphere surrounding the globe, by which heat and light are moderated and the proportion of oxygen, carbon dioxide, hydrogen, and nitrogen, suited to terrestrial life are afforded.
3. Supply of average rainfall.
4. Nutritive material in the crust of the earth for plants, however produced.
5. Inter-relation of plants and animals, as to nutrition and respiration.
6. The seasons.
7. Alternation of day and night.
8. Variety of soil and climate.
9. Varying contour of earth and sea.

Certain minor "circumstances" which obviously contribute to the higher possibilities of animal life, of man especially—

1. Specific gravity of animal bodies as compared with water which removes the *necessity* of drowning.
2. Supply of wood and metals contributing to the higher efficiency of man.
3. Preparation of soil by earthworms for increased productivity.

If no other than these fore-ordained conditions of life for coming millions of beings can be adduced, a very temple of design stands out to view, and rebukes a mechanical theory of the universe.

Design, supremely wise, supremely powerful, is not less manifest in the preparation of the required environments for each succeeding generation of living things, from the dawn of terrestrial life to the age of man, than was human foresight and purpose in the purchase by David of the threshing-floor of Ornan, and the collection by himself and Solomon of the treasures of Lebanon and Ophir, for that army of workmen who were to fashion, and did fashion the Temple of Solomon to its perfected design.

Teleology, which thus recognises the harmony between life and its circumstances, the adaptation of environments for organisms, not less than the adaptation of organisms to their environments, will ever furnish a solid mass of indirect evidence for Design and Creation.

DISCUSSION.

The CHAIRMAN.—We shall now welcome any remarks on the very interesting and suggestive paper which we have just heard. I think all will join in giving Dr. Kidd a most hearty vote of thanks for his paper.

The Rev. HAMMOND R. BAILEY.—I come from the home of inductive science (Cambridge), where I was bred and reared and lived a long time, though at present it is and has been my lot for many years to be simply that despised character—a country clergyman; but the subject of Evolution has been brought before me very strongly in recent times.

First, I thank Dr. Kidd very much for his paper, and I was specially pleased to hear what he said in comparing the advance of Evolution coming to the “Delta stages.”

In regard to creation there is one tremendous flaw, surely, in Darwin's book (I speak of his large edition corrected and enlarged by himself), in which, as you all remember, he traces the genealogy of man and of animals, really, to one primordial being—to one Protozoon—between the vegetable and animal kingdom—something of an Ascidian, I think it is called; and more than once he excuses this and apologises for this by adapting, or applying to it, the theory of Maupertuis. We can all understand that the Almighty in the Universe allows to be used, or uses such force as is suitable. Maupertuis, as you know, applies his theory as if it excused him in reducing creation to its lowest term. Those who have read his remarks will remember that he constantly carps at creation, as if the creation of an individual race and so on was a thing to be hardly swallowed, and that the creation of one original was easy. There is a manifest fallacy in that. The creation of one being implies Almighty power most assuredly, and if the Almighty power can create one animal, or being, it can create as many as it sees fit. You will remember, as Dr. Kidd said, his great theory is “natural selection,” which he plainly learnt from what he found in artificial selection in regard to animals, the force that is acting upon it being, as he says, in so many words, the “struggle for existence.” As far as my poor reason enters into it, if there was one form of life from which all

others were developed, it has the world before it, and its own home, and where is the struggle? I cannot see it.

The third fallacy seems to be in the word "existence." Speculation is limited by what experience proves in these cases—experience proves this—that in the case of animals without choice they are provided (by, we believe, the Almighty) with what serves to prolong their existence and maintain their life and, with that, life is defended and maintained; after that is provided for they are satisfied and do not want more.

There is another point, as it seems to me. Science, as far as I used to know anything about it at Cambridge, proceeds upon demonstration—that is natural science—its method of evidence is demonstration, not possibility. We get no demonstration here.

The theory of Descartes, as accounting for the motion of the heavenly bodies, was founded on fact, but was the merest guess and speculation in the world, and the theory is scientific; and so the theories of evolution may be founded on facts, as they are, but it does not for a moment follow that the theory is scientific.

Dr. Kidd, in one part of his excellent paper, uses a kindly expression, viz., "venial"; but I do not think, myself, that the putting out of these theories is a venial thing. It may be very well for an investigator to have before him a kind of approximate definition by which he works; but to put those things out to men of a reasoning mind in this age of the world, I think, is not venial. They do not study these things merely to play with them and toss them about. They know very well that the matter has to do with serious and important things. Men of science in arriving at foundation truth require positive and necessary proof, as it seems to me, the same as in mathematics and other subjects.

I am sorry to have occupied your time so long, and I thank you for having listened to me.

Professor EDWARD HULL.—We have all listened with pleasure to the "country parson," and it is not the first time that a country parson has thrown a great deal of intelligent light and good sense on topics which exercise us at the present day.

Now, in regard to Dr. Kidd's paper I must say, and I think it must be the feeling of all those present, that I have listened to it

with the greatest gratification. It shows it has emanated from a man, who is not only by his profession a physiologist and comparative anatomist, but from one who has also grasped the problems of that science which I pretend to know something about—that is, geology; and it is quite true that anyone dealing with this question of development, or evolution, whatever name you choose to give it, must in some degree have mastered the rudiments of geology, as well as of physiology, and comparative anatomy. Dr. Kidd, in his paper, has shown that he has done so—sufficient certainly for the purpose he had in hand.

Now, I have spoken so often on questions of this kind that I really hesitate to appear before this Society this evening, and I should much have preferred to have been an intelligent listener and to have heard others, who have taken up this question of the succession of animal and plant-life on our globe, than to hear myself speak upon it. But I thought that, perhaps, the author of the paper might think, that if I did not take part in the discussion, I did not sufficiently appreciate the value of the subject which he has put before us; that is very far from being the case.

Now with regard to the general question of design in Nature I am really ashamed to have to stand here, or in any company, and to have to plead, along with others, for the evidence there exists for Design in creation. It seems to me so to plead for itself, and to answer for itself, that it is almost impertinent for any one having ordinary reason, with which he is endowed, to have to come before an assembly, and have to point out the wonderful organization and arrangement of animals and plants of this globe, as well as those bodies which I am glad to see the author has introduced under the term of inorganic evolution, though I doubt whether it is a proper term. When we look at the world around us and know something of past history, physical and organic, to deny creative design seems to me to be like a man who shuts his eyes and denies there is a sun in the heavens. The "country parson," if he will allow me to call him so, as I have not caught his name, has very properly stated that the origin of life requires a Creator. There is in the current number of the *Contemporary Review* a most able article by the Duke of Argyll, who, I am pleased to see, although of very advanced age, still possesses that acute intellect and reasoning power combined with great range of

knowledge as fresh as it was 20, 30, or 40 years ago. It is an article on this very subject in reply to one by Mr. Herbert Spencer, whose essay was dealt with by Lord Salisbury in trenchant words at the British Association at Oxford. The Duke of Argyll has made use of an argument there which seems to me to be absolutely incontrovertible. It is partly a geological and partly a zoological point. He says (or in words to this effect) every geologist must admit—that there was a period in this world's history (when in a gaseous or molten condition) at which life could not have existed. Therefore life has been implanted on this globe at a time when the outer crust came into such a condition that it was suitable for the existence of life upon its surface and not till then. Well, where did this life come from?

Dr. Kidd referred to Lord Kelvin's amazing idea (I can only call it amazing, and I do not think it was ever referred to by its author again), which he expressed at the British Association at Glasgow, that perhaps life was implanted in this world by a meteorolite coming from some celestial world in the universe, and happening to alight on this little world of ours and so introducing life for the first time in the form of some simple and minute organism. I think it cannot have been serious, or, perhaps, only an outburst of fancy coming at the end of a most interesting and able Presidential address. Then, as our reverend friend well stated, if there was necessarily a Creator to introduce life upon the globe at a particular period, why might not the same Creator have introduced various forms or types of life, from time to time during the vast period that has elapsed from the commencement of the primordial period down to the present time? If you admit that He has once necessarily interfered in the history of creation, you cannot deny that He may have interfered throughout successive ages down to the present day. It may be out of order; but I may be permitted to refer to a remarkable utterance of Him whom we, as Christians, call our Divine Master when He said, "My Father worketh hitherto and I work." That is a most remarkable expression, and it seems to me to imply this—that God, the Creator, has been engaged in superintending, carrying on, by design and through evolution of some kind, the work of creation in this world, but that He had now ceased to do so; and then it was the time that the Saviour Himself should commence His divine mission amongst mankind.

Having said so much I will not detain the Meeting longer at this stage. I thank Dr. Kidd most heartily for this able and lucid explanation of the subject, and I am sure it is not only a gratification to us, but it is a great advantage, in the present state of controversy, to have such a paper to fall back upon for future reference.

Professor ORCHARD.—With your permission, Mr. Chairman, I wish to express my acquiescence in that tribute to Dr. Kidd for his paper which has been so felicitously tendered by Professor Hull. The paper, in my judgment, is, perhaps, the most valuable on this subject that has ever been brought before this Institute. The very important point, I think, is that in which Dr. Kidd insists, towards the close of the paper, on the co-adaptation of organisms to their environments and *vice versa*.

The paper is indeed eloquent of Teleology and must shatter, in the opinion of all thoughtful people, this much vaunted theory of Evolution. At times one wonders how any one with any logical sense of reasoning could swallow such a theory.

Dr. Kidd has done good service in bringing before us several reasons which no doubt have had to do with the acceptance of the theory by many biologists, and others who are not biologists, but who follow blindly in their wake. To Dr. Kidd's reasons I think may be added two more. One is, undoubtedly, the diversion of the human heart from God, thus causing an inclination to believe in anything that is hostile to the Bible. Another, as has been so well pointed out by the gentleman who spoke first, is this—that this theory is not, apparently, discordant with certain facts. There are certain facts known which do not, of themselves, appear to contradict the theory. That is true; but the same may be said of every false physical theory that has ever been brought forward. The gentleman to whom I have alluded spoke of the vortex theory of Descartes; that did something, no doubt, to retard the theory of truth. So have other theories in the past, and we shall do well to remind ourselves of Huxley's dictum—that if an hypothesis is inconsistent with one known fact that hypothesis should go, and a far greater man than Huxley (Sir Isaac Newton) warned us to accept nothing in science but what is proven.

It is most unfortunate that in what we may call almost the twentieth century there has been a substitution of imagination for science.

I beg to express my personal thanks to Dr. Kidd for his most valuable paper.

A Rev. VISITOR.—May I say one word? I desire that the excellent paper of Dr. Kidd's should not pass without some warm testimony on my part to the remarkable research, the exhaustive examination and fearless looking into of all the various points of the Evolution theory which it displays. It has given me the greatest possible pleasure; but I may be pardoned for apparently speaking strongly when I say that we are laid under a great obligation to the writers on the side of the Evolution question. We should never have had such a splendid paper had not we these strange theories put before us.

I will only add that I beg the author kindly to accept this warm, earnest, and heartfelt testimony to the excellent clearness and lucidity of the paper that he has put before us, and I hope it will strengthen faith in the great argument of Design which has never yet really been impaired.

The discussion was continued by the Rev. J. RATE in support of the views of the author.

The CHAIRMAN.—I think before calling upon Dr. Kidd to reply, and before conveying to him that cordial vote of thanks which has been already expressed so well, I would urge the very careful reading of this paper upon anyone who wants to understand how the matter really stands. It does so clearly trace the curious change which has come over the theory of Evolution. It shows how many theories there are, and how the old theory of chance variations of species has to get over Weissmann's theory—in fact, much has changed to alter the theory of Darwin as it used to be. Then we go to inorganic evolution as compared with original development, and that has got down to development by law and not by caprice. If development by law is not a sign of design I do not know what is. One can use the phrase *evolution* to express what we see around us. "The work of the Creator" is a useful expression. We talk of the electric current, for instance, but one does not commit one's self to the current—a man talks about a hexagon, and makes the sign on the blackboard, and if he believes that is how atoms are built up he must have great belief. Some accept it in that way without committing themselves to any authentic theory, as I believe this is; but when it is used contrary to the doctrine of design, we cannot

too strongly consider the arguments that Dr. Kidd has put forward.

Dr. KIDD.—I am greatly indebted to the Chairman and the speakers for their kind approbation of my paper. I have hardly any adverse criticism to deal with.

I will refer to the last point, which is the only one I need refer to, viz., that mentioned by the Chairman, the belief of Weissmann. That seems to be destructive to a great extent of the real theory of evolution, as Darwin put it forward.

In the end I hope we shall see the Delta stages reached.

I thank you for the very kind reception of my paper.

The Meeting then terminated.

THE FOLLOWING COMMUNICATIONS ON DR. KIDD'S
PAPER HAVE BEEN RECEIVED.

From Rev. F. R. TENNANT :—

I feel grateful to Dr. Kidd for the timely caution which his paper gives. In a time when Evolution is "in the air," it is a courageous, if a thankless task, to point out the difficulties and shortcomings, real or apparent, of the almost universally accepted Theory. I do not feel myself able to estimate the value of all the evidence Dr. Kidd has marshalled against the all-sufficiency of natural selection, but I can the more easily realise, since reading his paper, that possibly the progress of Evolution has been rather too rapid; that science has lately been too much engrossed in enumerating what Evolution *can* explain, to notice as carefully as she might how much evolution, or rather, natural selection, *cannot* as yet explain. I think it is well for evolutionists to be reminded how much of their system has been arrived at by processes which must, to say the least, be regarded as methods of "exterpolation."

But I am sorry that Dr. Kidd has taken up the position, which he expresses in the following sentence :—"It may be here acknowledged that the theories of Creation and Evolution, logically

pursued, are directly opposed." The word "creation," is there ambiguous; it might mean "creation," simply, *i.e.*, bringing into being by God, out of nothing, but His infinite capacity to will or cause; or it may mean what is now commonly called "special creation,"—immediate and direct creation of species in their present state. In whichever sense Dr. Kidd means us to take the word, I should object to the statement. If in the first, he is setting up an imaginary opposition between Evolution and Theology. If Evolution were proved, it would not in the least render creative acts unnecessary or impossible. Most evolutionists have seen that. Darwin, Huxley, Haeckel, Spencer, Tyndall, Romanes, Clifford, and others can be quoted as stating that Evolution supplies no argument against the *possibility* of creative acts. And if the theory of Evolution is often stated to rely "solely upon natural causation, dispensing with supernatural intelligence and action," I presume no evolutionist would be so rash as to assert that it precludes, and is *incompatible* with supernatural intelligence and guidance. The possibility of an original creation, which is absolutely essential to Christian theology, or of a Divine Personal Intelligence immanent in nature, is a question which natural science cannot decide one way or the other.

The whole question is as to the *mode* of creation. And this brings us to the second possible meaning of the word in the sentence I have quoted above from Dr. Kidd. It is of course plain that Evolution and "Special Creation" are contradictory to the other, though "Creation *by* Evolution" is a possible third alternative, which I regret that Dr. Kidd ignores. And, with regard to the opposition between the theories of Evolution and Special Creation, I would like to point out that the Christian Faith is not committed to the theory of Special Creation. That theory was manufactured mainly by seventeenth and eighteenth century science.* There had, of course, been commentators on Genesis in all ages, who had interpreted the Bible in terms of it; but there had been great authorities of influence, like St. Augustine, and St. Thomas Aquinas, who preferred a crude "evolutionary" interpretation. Neither was regarded as essential. Theology refuses to be held responsible for either. She can absorb the theory of Evolution, I think,

* Ray, Linnæus, Cuvier.

with less difficulty than the other, if it should prove the true one. Of course, I am assuming that the old-fashioned (but unauthoritative) view regarding the inspiration of scripture, which would make us look to Genesis for infallible natural science, and not merely for great spiritual truths taught in the imperfect scientific language of remote centuries, must be laid aside for one which is more true to the facts.

NOTES BY MAJOR W. H. TURTON, R.E., ON DR.
KIDD'S PAPER ON "CREATION OR EVOLUTION."

(1) I am unable to agree with what the author says as to Creation and Evolution being opposite theories, the former alone showing design; or perhaps I do not attach the same meaning to Evolution as he does. As I understand the term it is the *process* by which all forms of organic life have been developed out of the earliest form, and a process is not a cause. Each slight variation must have been caused somehow. It cannot be due to *chance* or accident, for this is merely a convenient term for the results of certain forces of nature when we are unable to calculate them, and strictly speaking cannot cause anything. And therefore Evolution requires an Evolver, just as much as Creation requires a Creator, and the opposing theories would in my opinion be better expressed as Creation *by* Evolution, or Creation *by* separate acts. Each equally shows design, each equally requires a Designer. Only on the former hypothesis (that of Evolution) the design is seen to be on a grander and more comprehensive scale, and therefore more worthy of the Designer.

(2) Moreover, I do not agree with the theory that the geological epochs can be fitted in between the second and third verse of Genesis I. The evidence appears to me to be overwhelmingly in favour of the view that the word *day* in Genesis I. denotes an *indefinite* period of time, though the subject scarcely falls within the present paper.

Mr. ROBERT P. C. CORFE writes:—

The most able lecture to which we have just listened comes as

a fresh, cool, invigorating breeze across the hot desert of dust and doubt of this present age.

There is, however, in connexion with all this vast subject, an aspect of the highest importance, which cannot now be ignored, and which has become so closely associated with the subject of this paper as to be now inseparable from it—namely, the incorporating of unproved theories of Evolution into the religious teaching of the country, even including the adoption of the Evolutionist's theory of the origin of man as an integral part of Christian teaching.

I should wish to express especial pleasure at the learned lecturer's admirable reference to the gradual but effective demolition of that particular form of attack on the Bible which is known under the singularly attractive title of "The Higher Criticism," and which is attributable to the frequent discoveries being made in the East hardly more, may I add, than to the patient literary work of faithful divines and laymen in this country.

However, this demolition is at present a Nemesis of which the Higher Critics seem to be hardly yet aware.

I trust, however, and believe that a similar Nemesis, hastened by the labours of this Victoria Institute, will soon overtake all who have joined in the hue and cry against God and the Bible; but whether it comes sooner or later, we have a right to expect that they shall fight on the side of God and the Bible who have set themselves apart for teaching and guiding the religious life of their fellow-countrymen.

Dr. GLADSTONE, F.R.S., writes as follows:—

I have had no time to think over the very interesting and suggestive paper to which we have listened, but I may express my general concurrence with the views of the writer. Looking lately at the work of the Rev. A. D. White—*A History of the Warfare of Science with Theology*—I was led to think how it has come to pass that the words of the Bible were appealed to to settle what is true or what is false in recent science. It is not that the sacred writers themselves make any claim to be authorities in this matter. They

do frequently introduce allusions to nature, but it is in the way of illustration, or to direct the hearer's thoughts up to God, the great Creator and Ruler of the universe. The language in which this is done is usually that of poetry; and I do not remember that in any case any didactic reference to nature is introduced by such a formula as "Thus saith the Lord." Most of the old pagan nations worshipped the sun or some other natural object, and, accordingly, they looked upon their priests or sacred books as expositors of nature. Is it possible that this same idea has been transferred, like many other pagan notions, to the Jewish and Christian writings, which make no such profession?

As to the question of creation by evolution; there is no scriptural difficulty in receiving what is now the almost universally accepted view of the origin of different species of plants and animals, including man himself. Anyone who will take the trouble to look up the forty-eight or more passages of scripture where the word *Bara* is employed, will find that, as already stated, the word is never used except with reference to the work of God; but it is not stated or even implied in any one of them that this creation was out of nothing, while it is impossible to attach such a meaning to such passages as Psalm cii, 18, Isaiah liv, 16, Ezekiel xxi, 30. The same is equally true of the thirty-eight passages in the New Testament where $\kappa\tau\acute{\iota}\zeta\omega$ or its derivatives occur. I am fully convinced that, in making the material world as we see it now, God has proceeded by a method of gradual development similar to that which He has employed in revelation.