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ARTICLE IV.

THE ORIGIN OF NEW SPECIES AND OF MAN.

BY PROFESSOR GEORGE MACLOSIE, LL.D., D.SC.

CHARLES DARWIN taught that new species have come, and are still coming, by the same route that all babies arrive; namely, by being born of older species. The only difference is, according to him, that the new species are not exact facsimiles of their fathers and mothers, but have adopted some features of their own. To this beginning he appended a series of interesting speculations, naming them collectively as *natural selection*, which in effect made the fate of the new arrivals dependent on a chapter of accidents. Chance under his system seemed to take the place of Providence, as he was not theologian enough to know that chance is one of the methods by which Providence secures its behests. By the aid of chance he explained many phenomena which had been previously ascribed by nature-philosophers to an ever-interfering *deus-ex-machina*. It was this last feature which gladdened the foes of religion, and dismayed its friends. Many worthy people seemed to regard the theory of evolution as an invention of Satan, one of his masterpieces, specially elaborated for the purpose of eclipsing Moses and of choking the gospel.

I began my biology under the pre-Darwinian star, and well remember the puzzles of the old method,—the types and archetypes, the mystery of homologies which nobody could account for, except on the *deus-ex-machina* fancy of the old nature-philosophy, the rudiments, the extraordinary transitory structures that seemed of no use in the

world except to puzzle people. Then the old principles of classification were wonderful; as, the exposition in the Introduction to Lindley's "Vegetable Kingdom," which Sachs has shown to have immensely helped Lindley, because he did not follow it; and the grotesque quincuncial system, which I often admire as I look at it in the old cyclopædia in my library. I have also sat by the cradle of Darwinism. I did not like it very much in its infancy; it was very irreverent, and noisy, and disrespectful to names that I had revered. It proved to be an *enfant terrible*, and for a time seemed to be a confirmed atheist. But I have seen its "evolution," where it toned down, and has become quite modest and painstaking; and, as it got out of its baby-clothes, and attained its majority, and now is moving out into the world, it is even becoming as conservative as its critics used to be. Its first triumph was the explanation of homologies and rudiments and all these old riddles, and its rectification of classification; so that, in our time, classification often proves an instrument of research. It immediately explained Hofmeister's discoveries of the parallelism and differences between the Mosses, Ferns, and Gymnosperms, and gave the botanists a prophetic power; so that they have carried similar investigations into the other classes of plants. As to man; it destroyed Louis Agassiz's theories that the different races could not be descended from common ancestors; and also the strange fancies that many of the animals and plants were created in multiple,—one pair in Patagonia, another pair (their counterparts) in Alaska, and a third set in Central Asia, and so on. The old methods, though faithfully elaborated by good and able men, were the kindergarten of biology. Now we are in a good school, where we are finding that many things are unknown to us, yet are coming to know many things; and if we ever go higher, it will be, in biology at least, by the application and aid of evolution;

though many of the deep problems which it has introduced seem very far from solution.

A new era arrived when it was discovered that teleology, and this of a higher order, survived the revolution. Asa Gray, good Christian that he always was, insisted on this from the first; Thomas Huxley, of a different school, was honest enough to indorse the argument; gradually it dawned on the philosophers that the argument from design was neither dead, nor even sick. The physiologists, dealing with the most difficult and most important part of biology, came forward with their argument, that, whilst some of them thought they might get along without the Bible or the gospel, they could not at all get along without design; that teleology was the soul of their work. Neither animal nor vegetable physiology can take a step without facing evidence of design, and a teleological thread is their best guide through the dark labyrinths which they are always exploring.

These discoveries have brought the new science into favor with those who for a time were shy; some of the orthodox have been pleading for evolution; and some brethren, less orthodox, have been asking to have it placed along with doctrines of our faith, as if it were of special religious value. We shall always favor revision of religious as well as of all other kinds of creeds; but we cannot favor the elevation of scientific theories, even when well established, to the high rank of doctrines of salvation.

It is now generally conceded that (excepting the spiritual part of man) the question of the evolution of species is not a religious problem. Like an archæological discovery, it may influence our interpretation of parts of Scripture; but its own fate depends on its scientific value. We are not, however, to conclude from this that it is a settled question. There is much and increasing evidence in its favor; but is not yet proven nor even understood. That some-

how or other new species are derived from older species is probably true; but the experts are well aware that much remains to be done before this theory can be regarded as settled in a scientific way. Darwin's attempts to prove it consisted in his trying it on biological problems; many of which it was very successful in solving. He tried his key on many locks, and found that it was able to open some of them; whence he inferred that it must be the master-key. We recall the fact, however, that the emission theory of light solved a great many problems, till it was finally tried, and found wanting, on a crucial problem. And we need somebody who can find the crucial problem for trying evolution.

Newton did all his work on optics by using the false theory of the emission of light. And the other famous opticians, including Gauss and Brewster, followed his example. It was not until the year 1850 that Foucault killed the emission theory, and established the wave theory, by proving that light passes through air more quickly than through water. Even now the emission theory, though dead beyond hope of resurrection, is unwilling to lie dead; for the opticians still use it, because it simplifies the calculations of the common problems. Even the latest and best of them, Drude, in his beautiful little treatise, uses it in the first part, apologizing for his act, and afterwards makes amends for his transgression, by going over the ground on the more difficult method of the wave theory. Now who will assert that Newton and Gauss and Brewster committed sins of ignorance, or that Drude is "sinning against light" (in either sense of the phrase)? People require to be taught that errors, intentional or inadvertent, in scientific methods, do not involve either sin or disgrace. And we would here explain that we do not admit that the method of evolution is erroneous, although it must be conceded that our knowledge of it is very defective; but, even

if it were erroneous, its utility would be ample justification for its application as a provisional theory.

We cordially admit that, whether it is or is not the master-key, it is for the present a very valuable key. The legitimacy of its employment as a working biological theory is not at all conditioned by our belief in its scientific integrity. If we regarded it as theoretically a mistake, there would be neither mistake nor sin in our employing it as a help in our investigations. Mathematicians do not err when they use impossibilities and imaginaries in their analyses; and the old biological theory of types had its day of usefulness before better was invented. The better for the existing occasion is certainly evolution; whether it is the best or not remains yet to be shown. It may in time be compelled to submit to amendments, and to the filling of lacunæ, and the lighting up of dark recesses, and to strict limitations, before its claim as the dominant theory is finally conceded. Until that time comes, all deductions from it must be regarded as only provisional, the uncertainty of the basis and necessary limitations of the theory attaching themselves in duplicate ratio to unverified deductions.

Let us not, however, forget to thank God, and to honor its inventors, for the good that is in the new theory, so far as it may be legitimately applied. Evolution has done much to reorganize the most difficult of the sciences. It has taught us how to weigh and compare vegetable and animal affinities, to understand the phenomena of embryology, to provide a natural and really useful classification of organic nature, to find the permanent and hereditary characters of organisms, also to appreciate the relations of organisms to the environment, and to explain all sorts of perplexing problems. It has likewise opened the way to multitudes of biological discoveries, and has conferred on us the gift of scientific prophesying of what is to be expected,

—a gift which has often been crowned with victory, and is most useful in its negative service, when it warns us against what is not to be expected. On the whole, the theory has lighted the march of modern biology along every pathway. All these services are significant as proving that, if it is not the true theory, it must be somehow its double,—an approximation towards it, or possibly a distortion thereof. Until it is rationally explained, however, it must consent to stand the criticisms and new experimentations of specialists; and we fully expect that one of the results of its rationalization, if ever that event comes, will be the artificial breeding of new, probably improved, species of plants and animals, as the chemists are synthesizing what they have completely investigated, and are even getting ahead of nature by making new species of carbohydrates or minerals, and as even the bacteria are changed under cultivation.

Whilst the march of the theory has been rather triumphal, and bright, there is still much darkness about it. Whence came the variations which initiate the new species? The proper Darwinians seem to insist that they are inscrutable; and, as they unquestionably occur, we are told that our only business is to take advantage of them and not to further worry over their origin. Some of our American friends venture to explain the origin as well as the survival of the fittest; and they get beyond their depth in the attempt. Some try to steer midway, but seem to us to find no clear passage. Best we think is DeVries of Amsterdam, who is serving the cause in the experimental way. He has opened new ground by showing that apparently one species, the Evening Primrose, has under observation produced not only offspring of its own kind, but other offspring with permanent inheritable "mutations," so as to give several new and good species. Generalizing thence, he would endow at least some species of plants and ani-

imals with two kinds of reproduction, which may be designated as: (1) *homogenetic*, or true, each giving offspring after its own kind; (2) *homoiogetic*, or mutational, giving offspring of a new specific kind. This would be his way of deriving species, "dust from the earth," by their growth from those previously existing; and it would provide a continuity of new specific births, so as to compensate for such as are being exterminated. But such an hypothesis must pass through a great deal of independent experimentation, and discussion of results, if it is ever to give what we have not yet got, a scientific theory of evolution.

The origin of the human species is in some respects the brightest part of species-building, the very crown of the whole; but from the scientific side it is the darkest. Considering the large measure of research that has been bestowed on it, we should not expect to find it still the unknown part of the general subject. The research into human anatomy and comparative anatomy, and archæological investigations, have thus far failed to tell us whence it came. It rather reflects unfavorably on the general theory, to think that, after all has been done about its most interesting subdivision, the investigators seem for the time to have lost the scent. Most of the biologists are of opinion, and justly so, that man has somehow been evolved. Most of them probably think that there has been something special in his case, perhaps a sudden or *per saltum* variation, or a decisive mutation, to use De Vries's term, which would leave few traces behind, and nothing of the 'missing-link' kind. Whilst believers in God will supplement this by the addition of a miraculous act, indicated by the expression that God breathed into man the breath of life, so that he became a living soul, this is not in any way interfering with the scientific process. Biology does not attempt to explain the higher spiritual processes, which are not meas-

urable by its methods, and which yet force themselves on our attention at every turn. Mere evolution, which illustrates the wisdom, power, and goodness of God, may suffice for the brutes; but power of a higher order must be superadded to it for the making of man. Science may reveal the evolution; the Word of God reveals the higher factors of our origin; and the Faith which accepts both science and God, is at liberty to give both evolution and creation a place in our making, each on its own independent evidence.

Whatever may be the possibilities or probabilities, there is no difference of view among the scientists as to the matter of fact, that the evolution of man is not yet scientifically established. If anybody can show otherwise, let him bring out his proofs, and he will be famous. It is still true, as was written by Claus in his "Zoölogy" about twenty years ago, that the view of man's evolution is only a deduction from the theory as applied elsewhere. Now seeing that as to other forms it is at least only empirically proven, that is, its rationale and its real foundations and limitations are unknown; it cannot be used deductively as a means of its extension. It may be used deductively as a tentative measure; like what Jeremy Bentham called 'indicative evidence' in criminology, such as may set us on the track of getting better evidence. A great many biologists have been and are following its 'indications' in quest of the genuine evidence; but the verifications are not yet attained.

About ten years ago the assembled naturalists in Yale University refused to indorse it as a scientific doctrine. This year the subject was discussed in Washington at the Zoölogical Section of the American Association, by eminent specialists who believe that man has been evolved, but do not pretend that they have proved their case, or even that they know the line of his probable descent. Pro-

fessors Wilder and Gill confined their comparisons mainly to the brain, comparing that of man with that of monkeys. This is confessedly the most difficult part of the structure; and that on which the scientific views are now most in course of change. The references to Dubois's *Pithecanthropus erectus* as a 'missing link' are dependent on the single point of the size of the brain case of the fossil; it is considerably smaller than that of a modern man, but far more considerably exceeding that of an ape. Thus cranially the animal might be deemed somewhat intermediate.

But the rule in biology is that we must regard the entire structure; and if we regard the limbs, the most distinctive part of our own body, Dubois gives a specific name to his find, a correct name, which declares that it is not an intermediate form, but strictly human. *Erectus* would not do for an ape, and exactly suits man. As Topinard, the great French anthropologist, writes, the foot of man and the posterior hand of all the monkeys are alike specialized and fixed, but in opposite directions; so that the one cannot have been derived from the other. This argument renders it in our opinion futile ever to expect a missing link between them, in fact explains what has been deemed a singular absence of intermediate forms. Of course both man and ape may come from a lower group, not specialized either way; and if it were still represented among living forms it would be, after a fashion, intermediate, because it would not resemble either as to the most characteristic parts.

Lest our estimate of Dubois's specimen may be thought too conservative, we submit a summary of what the lamented Cope said in his "Primary Factors."¹ He states that Dubois's find, consisting of a calvarium, last upper molar, and a femur, had a brain cavity of 1000 cc. as against 1500cc. normal human, and about 500 cc. for the gorilla; that Vir-

¹ 1896, Part I. chap. ii.

chow gave 950 as the cranial capacity of some negritos, and only 860 for an inhabitant of New Britain. The tooth might do for a gorilla; but the femur is long and straight, entirely human. Cope concludes that the specimen belongs to Genus Homo, not to *Pithecanthropus*; that it may be *Homo sapiens*, or *H. neanderthalensis*; we cannot tell which, as the distinction depends on the under jaw, which is unknown.

It is manifestly impossible that the human species can be simian as to its brain and antisimian as to the limbs; and hence very reluctantly, and we might say sometimes with wry faces, the best biologists have been abandoning the simian ancestry; though we are not certain that recent pressure in another part may not induce some of them to return to it. For a time the attempt was made to derive the Primates, including monkeys and man, independent of each other, from the lemurs, which were thought to be a simpler group of the same order. This hypothesis, however, failed because of an unexpected discovery that Hæckel had been mistaken when he ascribed to lemurs the discoid placentation, which is characteristic of man and monkeys. It would seem to us that lemurs are hardly entitled to rank among Primates, that they are a transition group below the disciplacentals.

Hubrecht has recently endeavored to find the starting-point of man and monkeys in the Tarsiids, once erroneously included in the lemurs; and he provisionally accepts the fossil skull found by Cope in the early Tertiary formations of Wyoming, and by Cope named *Anaptomorphus homunculus*. This is a Tarsiid; but what kind of limbs it possessed we know not. So far as we now know, it may have been in the ancestral line; but this is merely 'indicative' in the Benthamian sense.

In all these discussions it is to be observed that the best critic of theories is the scientist; anybody is welcome to

take a hand, who shows his competency to deal with the subject in the scientific way. It brings honor to any biologist, however young he be, if he can succeed in correcting errors of others. Science watches science, and the subject of human evolution is now on trial, so that no "snap judgment" will prevail.

In comparing this state of the question with the early chapters of the Bible and with accepted theology, we would exclude as illegitimate any change either of the science or of the theological doctrine for the mere sake of harmonizing. In fact, we ought not to be impatient to harmonize; errors in this direction are always hurtful, and have been very common. There are many other points of which we have some knowledge, though we may not be able to place these in line for exact conciliation.

Negatively, it has been shown in this Review by Dr. W. H. Green,¹ and more lately emphasized by Dr. G. F. Wright, that we have in Scripture no data for a biblical chronology. Hence I would let the archæologists have free scope in the matter of chronology. Dr. Wright is at liberty, himself being a geologist, to insist on a limit of time; but I think that this must be made absolutely on extra-biblical grounds. If the archæologists were so very liberal as to fix on 200,000 post-glacial years as having already passed, I do not see why the biblicist's equanimity should be disturbed.

As to the relative antiquity of man and beast, the Bible and science coincide. As to man's chronological antiquity there has been misunderstanding, because the exegetes have not considered that the Bible talks about pedigrees in the same way that we talk. I am called by a name that makes me the son of somebody who lived five hundred years or more before I was born. So the Bible might make Noah "the son of Adam," without giving us all the missing

¹ April, 1890, pp. 285 seq.

links, or for that matter it might say that "Adam begat Noah"; and its friends fancy that respect for its divine authority requires them to ignore the possibility of missing links, and to condense the chronology in defiance of all the scientific evidence in the world. The rectification of this abuse involves the elongation of the chronology, just as far as the anthropologists and geologists shall agree on as right. For our part, we like Dr. G. F. Wright's moderate, and very carefully elaborated scheme, made from the study of the Niagara gorge and other evidence in the New World, and reinforced by his researches on Lake Baikal and other places in the Old World. But if the scientific discussions go finally in favor of the longer periods of the Uniformitarians, we know of nothing in the Bible that is seriously implicated in the result.

Nor is there now any longer a controversy as to teleology in nature. We may rely on the scientists for granting this; for, in fact, they cannot afford to dispense with it. The theory of Evolution is, if anything, an organized teleological system. This subject is now coming up in its philosophical bearings, and is being discussed in philosophical books. Nor is there any longer a question as to the social rank of primeval man. The archæologists have found that the earliest races of which traces are preserved were not all abject savages. Some of the palæolithic men were shrewd and artistic.

Nor yet is there any difficulty over the miraculous element in Scripture. As Huxley said, there are so many wonders in nature, that a scientific man will not question the possibility of miracles. Huxley's only objection was to the evidence; an objection in which we may well agree, for there have been many 'lying wonders' proclaimed, which we reject, not because of impossibility, but because the evidence is *contra*. We can, however, accept the miracles of the Bible, when we find the argument in favor of

the truth of the Bible stronger, in the special case of a revelation from God, and of a work of redemption, than the improbability of the occurrences declared to be miraculous.

Evolution, if proven as to man, will be held by the bibli-
cist to be a part, the naturalistic part, of the total work of his making, the other part being his endowment miraculously with a spiritual nature, so that he was created in the image of God. This higher part of his making cannot be reached by science; if it were scientifically explained, it would cease to be a miracle. The Bible indicates both parts of his making; that the man, and through him in some way the woman, were made of the dust of the earth, in the same manner apparently as the other creatures; and that the spirit was breathed into them, so that in this respect they were peculiar. As a member of the animal kingdom, man was created by God, probably in the same naturalistic fashion as the beasts that perish; but, unlike them, he has endowments which point to a higher, namely a supernaturalistic, order of creation.

By present showing, man's evolution would probably consist in the production of a single pair of ancestors. If Adam and Eve and Paradise were not historical, our scientific friends would insist on them as prehistoric realities. In fact this is what Bible-repudiators have already done. They must have ancestral couples, a single pair or more than one pair of Adams and Eves, and a Paradise, or an isolation-place and center of distribution for the growing families. Hæckel, monogenist for all the chief groups, but polygenist for mankind, presents them as manlike apes and apelike men starting up from the lower simian community like the palm trees that soar above a tropical forest. He also gives us paradise, fixing it in spite of himself in the very region around the Persian Gulf to which Sayce teaches us that it is assigned by the Bible, and by other traditional records. True, Hæckel "saved his face" on this by prolonging his

primeval home of our race southward into the Indian Ocean, where he imagined a sort of Oriental Atlantis; but the fabled Lemuria has already disappeared, as if still-born, and the traditional Eden remains. His own argument for "polyphyletic" origin, is also boiled down to only two or three pairs, by his explanation that it depends on the number of primitive languages. Although we are satisfied with the one pair, we remember that some good biblicists have pleaded for more than one; but evolution, and all the other evidence, appears to us to be monophyletic, and so to agree with the common view of what the Bible teaches. Topinard, as an anthropologist, adopts this view, though admitting that an argument can be made for a different conclusion.

The doctrines of creation in original righteousness, of a covenant, and of a fall into sin, may be all affirmed as fairly in accord with scientific conceptions; at least not at all contradicted by science. The fact that man is a moral creature, and at the same a sinful creature, is manifest by daily experience. Sin is a very dark subject; but the record that gives us a hint that we were not always sinners, and that states, in however vague a way, how we either suddenly or gradually degenerated, does not darken it further, nor add to the difficulty; nay when such record becomes a foil for the primeval revelation of salvation, it is part and parcel of the most glorious part of God's word. The objection to the hereditary character of the lapse must seem singular to a scientist, who knows that heredity is the polestar of evolution, that it is seen in the degenerating as well as the progressive developments which abound over organic nature. The term "covenant" is a favorite mark for a certain kind of criticism; whether the term is applied in Scripture or not is immaterial; if the parents were in such relation to the posterity as to be representative, the term that would best say so is legitimate. This aspect of responsibility,

which is a subject for philosophical consideration, is found everywhere in nature. In the Bible there is recorded something special in the case of man, which has nothing to do with science, and is in no way discredited by anything known to science; this needs a name, and the term 'covenant' suits very well, even without regard to Scripture usage.

Sayce has disposed of objections founded on the assumption that the book of Genesis cannot have been written so early as its Mosaic authorship requires. He shows that it is now proved that the time of Moses was marked by singular literary activity in Bible lands. Moses also had at hand, as we now know, abundant materials for helping in the preparation of an introduction to the religious history of his own time. These were the historical tablets from Babylon, and other places, many of which have been resurrected in our own day. We may suppose that he did what Daniel did in a similar situation, and what any one of us would do. He may have used the traditional tables; many of them had good traditions, however they were obtained; and he exercised discrimination in their use. He re-wrote the cosmogony so skillfully, that whilst the Babylonian forms had myths about false gods, and wild legends, nobody had ever pretended to find any such in his cosmogony; and so well from the scientific side, that Hæckel, with all his bitter prejudices against the Bible, does not withhold his admiration from this part. Huxley's charge that it errs by dating the origin of birds before that of reptiles would scarcely have been made if he had observed that the inversions show that the order of the particular passage is not chronological but rhetorical.

Sayce suggests, comparing the Egyptian and Babylonian records, that the first two chapters of Genesis give corrected summaries of two different documents, often using the very words. This may account for variations and supple-

mentary statements, which have led critics to charge Moses with self-contradictions which would be incredible even for an average man.

Not only was polytheism eliminated, but the introduction of evangelical sentiments, and the institution of the day of rest, and examples of communion with God, formed a precious support to the faithful of primitive ages. The "flourishes" are not dismissed from this or any part of Scripture; just as they are retained by ourselves in like cases. References elsewhere in the Old and New Testaments are our best guide as to what is didactic and what is picturesque. But nowhere does the Bible descend to the dead level of a code of laws or a church-creed, in the vain effort to leave no loophole for the ill-disposed.