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DARWIN ON THE ORIGIN OF SPECIES.*

ORTHODOX naturalists have hard work to defend their favourite dogma of the immutability of species. Scarcely have they recovered from the commotion into which they were thrown by the author of the Vestiges of Creation, and now Mr. Darwin comes forward to disquiet them with a new Theory of Development. There is little in common between his views and those which Lamark [sic] propounded, and which were popularized by the author of the Vestiges. He agrees with those writers in believing in the derivation of one species from another, but differs fundamentally from them in his conception of the mode by which that process has been effected. The opinions he now holds first dawned upon hint about a quarter of a century ago, during his voyage as naturalist on board the Beagle. He has been constantly engaged in maturing them since 1842, and he now finds that he does not stand alone in entertaining them, for "Mr. Wallace, who is now studying the natural history of the Malay archipelago, has arrived at almost the same general conclusions on the origin of species."

A memoir on the subject by that gentleman was published last year in the third volume of the Journal of the Linnean Society, accompanied, by desire of Sir Charles Lyell and Dr. Hooker, with some extracts from Mr. Darwin's manuscripts; and this circumstance, conjoined with feeble health, has induced Mr. Darwin to publish the present volume, which is an abstract, necessarily imperfect, of an elaborate work that will require two or three more years for its completion. Meanwhile it must be remembered in justice to him that his case is not yet fully set forth, and that no final decision can be pronounced upon it so long as he has had but a partial hearing. Need we add that, in offering our meagre abstract of his Abstract of five hundred pages, we disclaim all judicial pretensions, and that our only object is to give some account of a most remarkable book, and briefly to indicate the scope of the one long argument that constitutes its entire matter.

Naturalists are almost universally agreed in believing that every species of animal and plant is the result of a special creation, and that its distinguishing characters have been transmitted, without change, to every individual comprised in it, from the parent stock. The grounds on which this belief reposes are purely negative; they consist in the apparent absence of all evidence to the contrary from the records of history and geology; but this is not enough to warrant so positive a conclusion. The geological record is far more imperfect than most geologists believe, and so also is our power to interpret it with reference to the question under consideration. Only a small portion of the world has been geologically

explored. The number of specimens in all our museums is absolutely as nothing compared with the countless generations of countless species which certainly have existed. We should not be able to recognize a species as the parent of any one or more species if we were to examine them ever so closely unless we likewise possessed many of the intermediate links between their past or parent and present states; and that we do not possess these intermediate links gives us no just reason to infer that they never existed; on the contrary, geology itself supplies strong reasons for believing that with respect to them the record should inevitably present vast and frequent blanks.

It is fairly allowable, therefore, to assume hypothetically that species are not immutable, and that they have not descended in right lines from independent stocks, but by successive ramifications from a few; and then, having started this hypothesis, it will be proper to inquire how far it accords or otherwise with known facts. At the very outset of this inquiry, we are struck by the extraordinary amount of hereditary variation seen under domestication. But man does not actually produce variability; he only unintentionally, exposes organic beings to new conditions, of life, and then nature acts on the, organization and causes variability. Man, however, can and does select the variations given to him by nature, and thus accumulates them in any desired manner, insomuch that many of the breeds produced by, this process of selection have to a large extent the character of natural species, as is shown by the inextricable doubts whether very many of them are varieties or aboriginal species. On the other hand it is a fact about which there can scarcely be a shadow of doubt, that all our English breeds of pigeons have descended from the blue rock-pigeon (Columba livia), yet how enormous are the differences between the several breeds, and between all of them and the original stock. Altogether, says Mr. Darwin, "at least a score of pigeons might be chosen, which if shown to an ornithologist, and he were told that they were wild birds, would certainly I think be ranked by him as well-defined species. Moreover I do not believe that any ornithologist -would place the English carrier, the short-faced tumbler, the runt, the barb, pouter, and fantail in the same genus, more especially as in each of these breeds several truly inherited sub-breeds, or species as he might have called them, could be shown him."

All these striking examples of inherited variation have been produced by long-continued selection; but is there anything in nature analogous to the principle of selection which man thus exercises for his own profit or pleasure? Mr. Darwin shows that there is.

The variability of which man takes advantage is not made by, him, as we have said before; it is spontaneously offered to him by nature. He uses those variations which are serviceable to him,

*On the Origin of Species by means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life. By Charles Darwin, M.A. Published by Murray.

and takes no heed of those which might be of use to the animal or plant itself; but in the wild state the Struggle for Existence would tend to perpetuate these latter by what Mr. Darwin calls a process of Natural Selection.

All organic beings are exposed to severe competition, and unless this truth be thoroughly engraved in the mind, the whole economy of nature, with every fact on distribution, rarity, abundance, extinction, and variation, will be dimly seen or quite mis- understood. A universal struggle for existence, including not only the life of the individual, but success in leaving progeny, inevitably follows from the high rate at which all organic beings tend to increase. More are produced than can possibly survive, and each lives by a struggle at some period of its life, in which the merest trifle would often give the victory to one individual or species over another. Bearing in mind what we have said of the tendency to variations, it cannot be thought improbable that instances of these, useful in some way to each being in the great and complex battle of life, should sometimes occur in the course of thousands of generations; nor can it be doubted that any advantage conferred by them, however slight, would give the individuals possessing it the best chance of surviving and of procreating their kind.

It is equally clear that individuals afflicted with any variation in the least degree injurious would sink so much the sooner in the strife, and that the injurious variation would be extinguished with them; whilst the strong hereditary tendency would insure the perpetuation and full development of that one which had given victory to the survivor.

This preservation of favourable variations and rejection of injurious variations is what our author calls Natural Selection. It is a power incessantly ready for action, and is as immeasurably superior to man's feeble efforts as the works of Nature are to those of Art. It has had millions of years to work in, whilst man's operations have been limited to a petty fragment of time. It acts by the preservation and accumulation of infinitesimally small inherited modifications, and might thus produce an inconceivable amount of divergence from the original type, even were the process of change to be conducted thus simply daring vast lapses of time; but it would not have been long in operation before it would become complicated and accelerated by the joint action of the principle called correlation of growth. By this expression is meant that the whole organization is so tied together during its growth and development, that when slight variations in any one part occur, and are accumulated through natural selection, other parts become modified. Breeders are aware of the effects of this principle; they believe that long limbs are almost always accompanied by an elongated head. Pigeons with feathered feet have skin between their outer toes; pigeons with short beaks have small feet, and those with long beaks, large feet, &c. Hence, if man goes on selecting, and thus augmenting, any peculiarity, he will be almost certain unconsciously to modify other parts of the structure, owing to the mysterious laws of the correlation of growth. Such being the constant tendency of plants and animals to di- verge from the parent type, Mr. Darwin feels justified in wholly rejecting the doctrine of the immutability of species. According to him every variety is an incipient species, and every species is a variety strongly marked and become permanent. It contains within it the rudiments of many series and groups of species, whilst conversely every existing group is descended from some one species, living or extinct. Thus the horse and the tapir have had a common ancestor, which

was not necessarily either a horse or a tapir. The genealogical affinity of members of the same class is strongly attested by the "unity of type" pervading the general plan of their organization, and affords the only intelligible explanation of that remarkable phenomenon, as well as of the leading facts of embryology. That the framework of bones is the same in a man's hand, a mole's digging paw, the foreleg of a horse, the paddle of a porpoise, and the wing of a bat,—that the same homology of structure is discoverable in organs so extremely dissimilar in appearance as the mouths of insects,—these and innumerable other facts can by no means be explained by utility or by the doctrine of final causes.

The hopelessness of the attempt has been expressly admitted by Professor Owen in his work on the Nature of Limbs; but the explanation is manifest on the theory of natural selection of successive slight modifications. Add that these modifications have not always supervened at an early age, and have been inherited at a corresponding not early period of life, and then we can clearly see why the embryos of mammals, birds, reptiles, and fishes should be so closely alike, and should be so unlike the adult forms. We may cease marvelling at the embryo of an air-breathing mammal or bird having branchial slits and arteries running in loops, like those of a fish which has to breathe air dissolved in water, by the aid of well developed branchiae; though we shall not acquiesce in the absurd assertion of the author of the Vestiges, that the bird or the mammal is at any stage of its existence a fish.

The question will naturally suggest itself how far does Mr. Darwin extend the doctrine of modification of species into the past and the future? With regard to the future he regards its extent as unlimited.

"Judging from the past; we may safely infer that not one living species will transmit its unaltered likeness to a distant futurity. And of the species now living very few will transmit progeny of any kind to a far distant futurity; for the manner in which all organic beings are grouped, shows that the greater number of species of each genus, and all the species of many genera, have left no descendants, but have become utterly extinct. We can so far take a prophetic glance into futurity as to foretell that it will be the common and widely-spread species, belonging to the larger and dominant groups, which will ultimately prevail and procreate new and dominant species. As all the living forms of life are the lineal descendants of those which lived long before the Silurian epoch, we may feel certain that the ordinary succession by, generation has never once been broken, that no cataclysm has desolated the whole world. Hence we may look with some confidence to a secure future of equally inappreciable length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will, tend to progress towards perfection."

With regard to the past the problem is to ascertain how many independent acts of creation have sufficed to stock the earth with the plants and animals that now overspread it. In this sense-

"The question is difficult to answer, because the more distinct the forms are which we may consider, by so much the arguments fall away in force... But some arguments of the greatest

weight extend very far. All the members of whole classes can be connected together by chains of affinities; and) all can be -classified on the same principle, in groups-subordinate to groups. Fossil remains sometimes tend to fill up very wide intervals between existing orders. Organs in a rudimentary condition plainly show that an early progenitor had the organ in a fully developed state; and this in some instances necessarily implies an enormous amount of modification in the descendants. Throughout whole classes various structures are formed on the' same pattern, and at an embryonic age the species closely resemble each other. Therefore I cannot doubt that the theory of descent with modification embraces all the members of the same class. I believe that animals have descended from at most only four or five progenitors, and plants from, an equal or lesser number.

"Analogy would lead me one step further, namely, to the belief that all animals and plants have descended from some one prototype. But analogy may be a deceitful guide. Nevertheless all living things have much in common, in their chemical composition, their germinal vesicles, their cellular structure, and their laws of growth and reproduction. We see this even in so trifling a circumstance as that the same poison often similarly affects plants and animals; or that the poison secreted by the gall-fly produces monstrous growths on the wild rose or oak tree. Therefore I should infer from analogy that probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed."