

[April 23, 1911.]

Q. CHARLES DARWIN AND "THE ORIGIN OF SPECIES."—Kindly furnish a sketch of the life of this celebrated naturalist, also summarize his principal works, and explain his theory of man's descent.—A. W. J.

A. Charles Robert Darwin was born at Shrewsbury in 12th February, 1809. He is the son of Dr. R. W. Darwin, F.R.S., and the grandson of Dr. Erasmus Darwin, F.R.S., the author of "The Zoonomia." After elementary education at Shrewsbury Grammar School, and two years' attendance at Edinburgh University, he went to Christ's College, Cambridge (1827), where he took his B.A. and M.A. He became attached as naturalist to the *Beagle* during her voyage round the world, in 1831-37. In 1839 he married the grand-daughter of Josiah Wedgwood. He now published his "Journal of Researches into the Geological and Natural History of the Various Countries, etc.," and called "Zooology of the Voyage of the *Beagle*," in 1845 appended "The Structure and Distribution of Coral Reefs"—an important work, containing the first adequate explanation of the organic agency of the coral animal. In 1844 and 1846 there issued from the press "Geological Observations on Volcanic Islands," "Geological Observations on the Coast of South America," and "A Monograph on the Family Cirripedia," two volumes to the elementary care with which he can observe and systematically record the relations of the various organisms. After "Fossil Species," appeared "Origin of Species by means of Natural Selection" (1859). In this work he held that nature in general, as well as the various species that exist therein, are the result of successive changes, and that these in this struggle, while the weakest go to the wall, there is a survival of the fittest. Mr. Darwin's next works were "Fertilization of Orchids" (1862), and "Descent of Man, and Selection in Relation to Sex" (1871), second edition enlarged, in 1871. It is in this work that the principle of selection is carried out to an unparalleled end. The conclusion is clear and definite. It is that "man, the weaker and glory of the universe," is, as Mr. Darwin's own words, "descended from a hairy quadruped, furnished with a tail and pointed ears, probably covered in its habits, and an inhabitant of the Old World." This creature, he asserts us, "if its whole structure had been examined by a naturalist, would have been classed among the Quadrumana as surely as would the corvix and still more ancient progenitor of the Old and New World monkeys, the Quadrumana, and all the higher animals are probably derived from an ancient mammalian animal, and this through a long line of diversified forms, and through some reptile-like, or some amphibian-like creature, and this again from some fish-like animal. In the dim distance of the past we see, one after the other, the important organs of the body (such as the brain and heart) imperfectly developed. This animal seems to have been more like the larvæ of our existing marine bivalves than any of our existing land animals." "The Descent of Man and Animals" (1871). "Mammals and Habits of Chimpanzee Flats." "Insectivorous Plants" (1876), and "Effects of Cross Fertilization in the Stamens of this and other flowers." Darwin was elected a Fellow of the Royal Society, which awarded him the Linnæan and Copley medals. From the Geological Society he has received the Wollaston and Lyellian medals. The Prussian Government has named him a knight of the order *Pour le Mérite*. In 1871 he was elected corresponding member by the Académie des Sciences, and in 1875 he was created M.D. by the University of Leyden.

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Q. EVOLUTION.—Please explain Darwin's theory of evolution and state on what facts it rests.—W. D. F.

A. The theory of evolution, and the collateral hypothesis which express some ingenious modern attempts to explain the facts of evolution, have made an amount of progress in scientific and even popular estimation which is really astonishing in view of the little opportunity afforded by the press. There is, now, perhaps, hardly a distinguished naturalist with whom the held theory of Darwin and Haeckel is not an accepted doctrine, including, of course, many who are not prepared to allow of some of the details which have been claimed for it. Even untrained popularization—such a march more boldly opposed than scientific knowledge—has gradually given an extremely ordinary force and stability of this new phase scientific teaching. For the theory as at present stands Mr. Darwin is not wholly responsible. Of the elaborate superstructure which is superimposed on the chief architect, but the foundation of the belief had already been laid by Lamarck, Goethe, Wallace, and Mr. Darwin's own work. Linnæus taught that varying types were not the result of independent creative acts, but were due to the direct influence on organized forms of changes in their physical surroundings. Mr. Darwin adopted this, but pointed out that those animals which might happen to develop any special adaptation to extraordinary circumstances would be more likely to succeed in the struggle for existence, and therefore to leave a larger number of offspring than others less favorably situated) and that those offspring would in their turn transmit the favouring possibility in the form of a permanent adaptation to their posterity. This proposition forms the kernel of the series of works whose publication has created so much excitement among the savants of England and the continent, and which are the "Origin of Species"; the "Variation of Plants and Animals under Domestication," and the "Descent of Man," and whatever opinion one may hold with regard to the views which Darwin has advanced in these volumes, it is impossible not to admire the force and boldness of his arguments, the clarity of his style, and the erudition of his illustrations. How far he has gone in reasoning and how far in reasoning in philosophy are questions which we cannot take the responsibility of answering. The two chief factors in Mr. Darwin's theory are (1) the tendency of individuals to vary from the typical form of the race; and (2) the influence of the surrounding conditions or environment on both the variation and the survival of the fittest. If these two inter-related processes will, Mr. Darwin seems to think, explain the difficulty of the occasional persistence of species through long ages, and any apparent tendency to variation, a fact which Charles Lyell has begged doubt, and which he and his followers have regarded as absolutely fatal to any hypothesis of evolution. For it is not possible to suppose that those surrounding conditions of country or period, whether the variation should survive and supplant the parent form, or whether the parent form shall survive and supplant the variation. If the surrounding condition happens to be favourable to the variation it will survive, and the parent form becomes extinct by a process of gradual diminution; but if, on the other hand, the parent form should be better adapted to deal with the conditions of its environment than the parent, it will assuredly be victorious in the struggle for existence, and the variation, as the normal type, will persist. In the first case, type may become altered to any conceivable extent, minute modifications will be multiplied into specific differences as distinct from varieties, and a few generations of such a creative fact; in the second the parent form may persist through countless ages without any change of sufficient importance to nature to take note of. The shell fossils of the island of Iceland, of which there are thirty thousand years ago, contain animal remains almost identical with the forms which yet inhabit the coast of Lako. Whatever variations may have arisen in the time have been found and found themselves better able to cope with the special difficulties of their circumstances than their ancestors.

Moreover it has been contended that even when variations do happen to result in advantage to the race, the tendency to sterility may be such that the balance is in favour of the parent form, and hybrids are not infrequently sterile. Yet it is but fair to say that all these points are carefully considered by Mr. Darwin; indeed, he seems to have anticipated the very objection that could be urged against his thesis, and to have prepared replies which, if not convincing, are at least worthy of careful consideration. His illustrations of the principles of natural selection, which are collected from every possible source. The green colour of leaf-eating insects, the mottled grey of bark feeders, and the white plumage of the Alpine partridge in winter, are examples of the adaptation to special conditions which are cited as the result of natural selection. The brightest herons will prove the most numerous in shallow waters, and there, then, and, as a consequence, will have the best chance of wild and through dissemination, and the poorest

forever are just those whose fertilization is carried out by the agency of insects; those which have to depend on the wind have fertilization in either form, and they do not work relatively have either weak faint colours as the ducks and geese, or are entirely colourless as the flowers of grasses. The brilliant plumage of many birds and the radiant beauty of butterflies are referable to their evolution and maintenance to actual results than to natural selection. But in regard to some of the theories of progress, it is not necessary to seem to us unimportant or even useless to their posterity, we must remember that a variation in one particular direction, which natural selection has given permanence will, by the law of correlation, be accompanied by some other modification of form. For example, natural selection may have brought the horns of an ox, by a series of progressive changes, to the highest stage of fitness for the condition of the Laval country; yet these very changes may, by correlation, modify the form of the skull itself, and possibly in some direction unfavourable to its use in the battle with others; in this case natural selection will eventually have to strike a balance between the opposing forces, and the most favourable to the species under all the circumstances will persist. But in the midst of these laws which theoretically are so inevitable and produce such varying results, we are prepared for every conceivable exception. Vigorous parents frequently have feeble offspring and vice versa; such anomalies are not rare, but they do not affect the working of any real law, but they are not to be regarded as sources to erroneous conclusions. Unquestionably the really weak point in the whole theory of evolution will be found in the very paleontological facts which the Darwinian postulate, that each form of life must have been preceded by some very slightly different form is certainly in some extent supported by modern geological researches, but the traces of some stages of special development have often been found without a trace of the intermediate link. Professor Huxley has maintained that this apparent hiatus in the "continuity of the rock" is really demonstrative evidence of the clearest kind. He attributes the imperfection of the geological record to the action of heat or water on the strata containing organic remains, and their consequent destruction; and points to specimens of hardened sandstone containing corvix which, if filled, form perfect casts of fossils, the bones having been dissolved out by the action of water, and the sandstone would fall entire. Footprints of extinct birds have been found stamped in the sandstone, but no bones of their skeletons. The gigantic animal and vegetable forms which flourished in the protoplasmic state of the young world, have left us wonderfully few physical evidences of their existence. This may, however, perhaps be due to the small area over which skilled search has been made. The most complete evidence of the theory is that which pertains to the history of the horse. All mammals have a few teeth which is modified from a typical form of which the human are may be taken as the normal type. In the fore leg of the horse, widely as it differs from this, present rudimentary bones which seem to suggest its origin, and an examination of the fossils of the tertiary period has resulted in a collection of specimens which are modified in just perceptible gradations from the ossification of the bones with their four toes, through a large number of intermediate forms, to the modern horse. And the great gap between birds and reptiles is filled just as completely; and our scientists are constantly claiming to have found the bones of their past theory. As a matter of fact, the possibilities and limitations of the actual and potential, are beyond what we dare conceive. It is either a scientific fact, an ever-shifting cosmogony, as asserted in terms of its truth in a part of Holy Scripture; or it is the theory of the chemist—not to say falsehood—that has ever added the intellectual world.