

Darwinian idea of slow modifications, proceeding throughout geological time, and to throw us back on a doctrine of sudden appearance of new forms, occurring at certain portions of geological time rather than at others, and in the earlier history of animal and vegetable types rather than in their later history, and in early geological times, rather than in those more recent. This doctrine, however, of critical or spasmodic evolution is essentially different from Darwinism, and approaches to that which has been called mediate creation, or creation under natural law.

With respect to the origin of man himself, which is, no doubt, the most important point to us, these difficulties are enormous. We can trace man only a little way back in geological history, not farther than the Pleistocene period, and the earliest men are still men in all essential points, and separated from other animals, recent and fossil, by a gap as wide as that which exists now. Farther, if from the Pleistocene to the modern period man has continued essentially the same, this, on the principle of gradual development, would remove his first appearance not only far beyond the existence of any remains of man or his works, but beyond the time when any animals nearly approaching to him are known to have existed. This is independent altogether of the farther difficulties which attend the spontaneous origination of the mental and moral nature of our species. It would

seem, then, that man must have been introduced, not by a process of gradual development, but in some abrupt and sudden way. Even Wallace, who has all along adhered to the doctrine of natural selection in its integrity, while he agrees with Darwin that man must be a descendant of apes as to his bodily frame,¹ maintains that his higher mental and moral faculties must have had another origin.

These considerations have led many of the more logical and thoughtful of the followers of Darwin to the position of supposing, not a gradual, but an intermittent and sudden development, and this, in the main, in the earliest periods of the history of living beings. In a very able essay by Dr. Alpheus Hyatt, in the *Proceedings* of the Boston Society of Natural History, this view is very fully stated in its application to animals. On the one hand, Hyatt holds that the biological facts and the geological evidence as it has been stated by Marcou, Le Conte, Barrande, Davidson, and by the author of this work, precludes the idea of slow and uniform change proceeding throughout geological time, and he holds justly that the idea of what he calls 'a concentrated and accelerated process of evolution,' in early geological times, brings the doctrine of development nearer to the position of those great naturalists like Cuvier, Louis Agassiz, and Gegenbauer, who have denied any genetic connection between the leading animal types. He

¹ *Darwinism*, p. 461.

quotes Cope and Packard in support of his view on this point. The latter we shall have occasion to refer to in the sequel in connection with cave animals. Cope has, in a series of brilliant essays,¹ endeavoured to illustrate what he terms 'causes of the origin of the fittest.' Of this kind are growth-force modified by retardation or acceleration of development produced by unfavourable or favouring conditions, the effects of use and disuse on modifying structures, the law of correlation of parts and the effects of animal intelligence. These are all causes ignored by the genuine Darwinian. Nevertheless they exist in nature, though rather as causes of mere adaptive variation than of specific difference.

Another modification of orthodox Darwinism is that of Romanes, who may almost be regarded as Darwin's most prominent successor. He has introduced the idea of physiological selection, that is, of the occurrence accidentally or from unknown causes of reproductive changes which render certain individuals of a species infertile with others. The effect of this would be an isolation amounting to the erection of two forms not reproductive with each other; or, in other words, of two species not gradually differentiated, but distinct from the first. This is really an inversion of Darwin's theory, in which the initial stage of Romanes is necessarily the culmination of the development. It differs also essentially in eliminating the

¹ 'Origin of the Fittest,' *American Naturalist*.

idea of use and adaptation to change implied in the theory of natural selection.

Romanes even goes so far as to stigmatise the adherence to natural selection pure and simple as 'Wallaceism,' in contradistinction to Darwinism, while he admits that Wallace has a good right to adhere to this view, as having in some sense antedated Darwin in asserting the dominant influence of natural selection. It is fair to say, with regard to Romanes, that while advocating the importance of 'Physiological Selection,' he claims that Darwin admitted, or would have admitted, this factor, since he believed that in the absence of infertility to prevent intercrossing, natural selection would fail to produce new species. It is worthy of remark here that both Romanes and Wallace seem to be aware that this admission might be fatal to the doctrine of natural selection, unless they can show some other cause capable of producing infertility.

In the meantime, Weismann in Germany has, in the name of what has been called pure Darwinism, introduced into the discussion facts and considerations as destructive to the usual doctrine as Puritanism would be to High Churchism. He contends that all evidence is against the perpetuation by heredity of characters acquired by the individual. Only characters born with him can be perpetuated. For example, a man born with six fingers on his hand may have six-fingered children, but a man who acquires in his life-

time manual dexterity, or who loses a finger by accident, will not transmit either peculiarity. Weismann has undoubtedly made out a strong case in favour of this contention, which would at once overthrow the Lamarckian theory of evolution, and would remove one of the subsidiary props of Darwinism, throwing it back entirely on the natural selection of fortuitous congenital variations. Purified in this way, and reduced to chance variation, perpetuated by accidental action of favouring circumstances, Darwinism would, according to some of its adherents, evaporate without leaving any residuum. Nor has it escaped notice that the theory of Weismann implies profound and far-reaching considerations respecting the independence of the germinal matter of animals of individual peculiarities, and its constancy to the ideal plan of the species, which would help us to account for the wonderful permanence of types in geological time, while it would oppose change, except when this arises from causes directly affecting the reproductive function.

Another important point involved in Weismann's results is the probability that, while asexual reproduction, as, for instance, that of budding, tends to perpetuate individual peculiarities, whether of advance or retrogression, ordinary reproduction tends to eliminate all variations, whether produced by habit and use or by obscure causes affecting the individual in its lifetime. Thus there is a strong barrier set up, especially

in the higher organisms, against either degradation or elevation.

Advantage has been taken of this by some speculators to suggest that new species may have originated by parthenogenesis, that is to say, by what theologians would call miraculous conception, and this idea has by some of them been connected even with the nativity of our Lord on the earth. But such speculations are very far removed from even the borders of science. These speculations may, however, raise the question whether man is to be succeeded by any improved species. If it had pleased God at any time to produce several individuals of a new race as superior to ordinary humanity as was Jesus of Nazareth, and to isolate and protect from admixture this new departure, the world might have entered on a new stage as superior to the present as man himself is to the pre-daceous beasts which the nations of the earth delight to use as their emblems. This idea presented itself to the Prophet Daniel when he saw the successive conquering empires of the world represented by a series of ferocious beasts, and saw these replaced by one 'like unto the Son of Man,' a truly human personage, descending from heaven to reign on earth. The same figure is in the mind of Christ when He calls Himself distinctively the 'Son of Man,' not as merely human or in comparison with God, but as contrasted with the lower powers of earth, and as representing the heaven-descended man of Daniel.

Jesus, however, assures us that not a new species of *homo*, but man himself, in a redeemed, sanctified, and spiritual state, is to be the heir of the coming ages.

A curious point, little thought of by most evolutionists, but deserving consideration here, is that to which Herbert Spencer has given the name 'direct equilibration,' or the balance of parts and forces within the organism itself. The body of an animal, for example, is a very complex machine, and if its parts have been put together by chance, and are drifting onwards on the path of evolution, there must necessarily be a continual struggle going on between the different organs and functions of the body, each tending to swallow up the other, and each struggling for its own existence. This resolution of the body of any animal into a house divided against itself, is at first sight so revolting to common sense, and so hideous to right feeling, that few like to contemplate it; but it has been brought into prominence by Roux and other recent writers, especially in Germany, and it is no doubt a necessary outcome of the evolutionary idea. For why should not the struggle of species against species extend to the individuals and the parts of the individual? On this view, the mechanism of an animal ceases even to be a machine, and becomes a mere mass of conflicting parts thrown together at random, and depending for its continued existence on a chance balance of external forces. It is well for us that we have not in human machinery to deal with such un-

stable and dangerous combinations, else no one's life would be for a moment safe.

Fortunately, geological history so completely negatives this idea, by showing the extreme permanence of many forms of life which have continued to propagate themselves through almost immeasurable ages and great changes of environment, without material variation, and the apparent fixity of these in their final forms, that we are relieved from the dread which this nightmare of German brains tends to create.

Viewed rightly, the direct equilibration of the parts of animals and plants is so perfect and so stable, and such great evils arise from the slightest disturbance of it by the selective agency of man, that it becomes one of the strongest arguments against the production of new species by variation. This has been well shown by Mr. T. Warren O'Neill, of Philadelphia,¹ who adduces a great number of facts, detailed by Darwin himself, to show that when the stability of an organism is artificially altered by man in his attempt to establish new breeds, infertility and death of these varieties or breeds results; and if this happens under the fortuitous selection supposed to occur in nature, any considerable variation would result either in speedy return to the original type or in speedy extinction. In other words, so beautifully balanced is the organism, that an excess or deficiency

¹ *Refutation of Darwin.* Philadelphia, 1880.

in any of its parts, when artificially or accidentally introduced, soon proves fatal to its existence as a species ; so that, unless nature is a vastly more skilful breeder and fancier than man, the production of new species by natural selection is an impossibility.

Two remarkable books by two of the ablest exponents of the Darwinian theory of evolution have recently appeared, which may be taken as specimens of the evolutionary method, and may be commended to those who desire to know this theory as defended and extended by its friends.¹ One of these works is by Alfred Wallace, who may be truly said to have anticipated Darwin in the theory of natural selection—the other by Dr. Romanes, Darwin's successor. Both claim to be orthodox Darwinians, though each accuses the other of some heresy. Wallace's book may, however, be accepted as the best English exposition of Darwinism in general, that of Romanes as the ablest attempt to explain on this theory the evolution of the higher faculties of man. Neither professes to explain the origin of life, but both profess, life and species of animals being given, to explain their development as high as man himself, though they differ materially as to this highest stage of evolution, and also as to the omnipotence of natural selection. The judicious reader will, however, observe that both take for granted what should be proved ; in other words, reason con-

¹ *Darwinism*, by Wallace ; *Mental Evolution in Man*, by Romanes.

stantly in a narrow circle, and constantly use such formulæ as 'we may well suppose,' instead of argument.

We may take as an example from Wallace the history of the evolution of the water-ouzel or dipper. It may serve as an example of the questions which are raised by the Darwinian evolution, and which, if they have no other advantage, tend to promote the minute observation of nature, of which Wallace's book shows many interesting examples. It serves, at the same time, to illustrate that peculiar style of reasoning in a circle which is characteristic of this school of thought. I have chosen this special illustration from Wallace because it is one in which the idea of adaptation to fill a vacant space—an idea as much Lamarckian as Darwinian—is introduced.

An excellent example of how a limited group of species has been able to maintain itself by adaptation to one of these 'vacant places' in nature is afforded by the curious little birds called dippers or water-ouzels, forming the genus *Cinclus* of the family *Cinclidæ* of naturalists. These birds are something like small thrushes, with very short wings and tail and very dense plumage. They frequent, exclusively, mountain torrents in the northern hemisphere, and obtain their food entirely in the water, consisting, as it does, of water-beetles, caddis-worms, and other insect larvæ, as well as numerous small fresh-water shells. These birds, although not far removed in structure from thrushes and wrens, have the extraordinary power of flying under water; for such, according to the best observers, is their process of diving in search of their prey, their dense and somewhat fibrous

plumage retaining so much air that the water is prevented from touching their bodies, or even from wetting their feathers to any great extent. Their powerful feet and long curved claws enable them to hold on to stones at the bottom, and thus to retain their position while picking up insects, shells, &c. As they frequent chiefly the most rapid and boisterous torrents, among rocks, waterfalls, and huge boulders, the water is never frozen over, and they are thus able to live during the severest winters. Only a very few species of dipper are known, all those of the old world being so closely allied to our British bird that some ornithologists consider them to be merely local races of one species; while in North America and the Northern Andes there are two other species.

Here, then, we have a bird, which, in its whole structure, shows a close affinity to the smaller typical perching birds, but which has departed from all its allies in its habits and mode of life, and has secured for itself a place in nature where it has few competitors and few enemies. We may well suppose that, at some remote period, a bird which was perhaps the common and more generalised ancestor of most of our thrushes, warblers, wrens, &c. had spread widely over the great northern continent, and had given rise to numerous varieties adapted to special conditions of life. Among these some took to feeding on the borders of clear streams, picking out such larvæ and molluscs as they could reach in shallow water. When food became scarce they would attempt to pick them out of deeper and deeper water, and while doing this in cold weather many would become frozen and starved. But any which possessed denser and more heavy plumage than usual, which was able to keep out the water, would survive; and thus a race would be formed which would depend more and more on this kind of food. Then, following up the frozen streams into the mountains, they would be able to live there during winter;

and as such places afforded them much protection from enemies and ample shelter for their nests and young, further adaptations would occur, till the wonderful power of diving and flying under water was acquired by a true land-bird.¹

Here it will be seen that a bird, distinctly marked off by important structures and habits from others, is supposed to have originated from a different species at some remote period, by efforts to obtain food in what, to it, must have been an unnatural way; and the sole proof of this is the expression, 'we may well suppose.' Why may we not as well suppose that all the perching birds were at first like water-ouzels, which would accord with the early appearance of aquatic birds, and that they gained their diverse forms by availing themselves of the better circumstances and more varied food to be found in the woods and fields, so that our water-ouzel may be a survival of a primitive type? Neither theory can be proved, and the one is as likely as the other, perhaps the latter, of the two, the more likely, and neither actually explains anything. It is to be observed, also, as already hinted, that the kind of evolution in this, as in some other cases supposed by Wallace, is rather Lamarckian than Darwinian.

It is interesting to note that, though wedded to that strange mode of reasoning of which the extract above given furnishes an example, Wallace frankly and fully admits three of the great breaks in the con-

¹ *Darwinism*, pp 116, 117.

tinuity of evolution. First, he admits that we cannot account for the introduction of life at first, because we know no way in which mere chemical combination can produce living protoplasm. Here, he says, 'we have indications of a new power at work which we may call Vitality.' Secondly, he sees no cause in the continuous evolution for the introduction of animal sensation and consciousness. No attempt at explanation by any modification of protoplasm can here 'afford any mental satisfaction, or help us in any way to a solution of the mystery.' He sees a similar break of continuity in the introduction of the higher faculties of man. 'These faculties could not have been developed by means of the same laws which have determined the progressive development of the organic world in general and also of man's physical organism.' These he refers to an unseen universe—to a world of spirit to which the world of matter is altogether subordinate. If we refer these three great steps to a spiritual Creator, and eliminate, on the other side, the known development of varietal forms, the field for the Darwinian evolution becomes greatly narrowed.

Romanes, the author of the other work, will listen to no such compromises ; but, on the other hand, is willing to admit a union of the Darwinian and Lamarckian doctrines, besides sexual selection and other factors, which are admitted also by Spencer. His latest work is devoted to the bridging over the