WHAT IS DARWINISM?

THE answers to this question have been numerous and contradictory, but the two which have gained most favour with the opponents of Mr. Darwin, are first, that Darwinism is a mere revival of the doctrines of Lamarck, and of the "Vestiges of Creation;" and second, that it is "a form of modern scientific infidelity." To the first objection, it may be replied that though several development theories besides those mentioned have preceded Mr. Darwin's, yet none have been brought forward fortified by so many undoubted facts and such skilful reasoning. In answer to the theological objection, it need only be said that it would be easy to show that Darwinism by no means affects the doctrine of a special Providence, and that many of the facts on which the theory is based are quoted by the natural theologian in his own favour. But when any discussion between science and religion arises, the arguments used seldom carry much weight to the other side, as bearing the impress of special pleading. Our object not being to defend Darwinism, but to gain some idea of its leading principles, it will not be necessary to notice further any general objections which may have been urged against it.

Darwinism is one of those philosophies which teach that all the various forms of organic life around us have not originated by special creation, or, in other words, by the direct miraculous interposition of the First Cause; but by the gradual action of secondary causes on previously existing organisms, and it seeks to explain what these causes are, and their modes of operation. Every object which is sufficiently material to fall under our observation at all, is subject to the action of innumerable secondary laws, the investigation of which is fully within our province; and the growth and variation of animals is no exception to the rule. But we cannot reach the ultimate causes of anything; and as science progresses, she continually finds that the effects which she had in her ignorance supposed to be produced by ultimate causes, are the result of ascertainable laws, the origin of which appears to have receded to the same distance as before.

It is admitted by all that animals and plants are subject to variation to an unknown extent; and the only question at issue between Mr. Darwin and his opponents, is the limit or non-limit of variation.

The number of species now existing in the world is enormous; for example, the number of species of beetles, alone at present recorded, cannot be much fewer than 100,000; and in all probability not one quarter of the whole number at present exist in our collections. Larger animals do not present so vast a number of species, nor are they so prolific or so abundant in individuals. But Malthus and others have satisfactorily shown, by arithmetical calculations, that at the lowest rate of reproduction, supposing that no obstacle to increase existed, there would in a few years be no standing-room in the world for the descendants of a single pair of any one species. A vast amount of extermination of species as well as of individuals has been continually in progress, from the earliest period of which we have any geological knowledge to the present day. It is true that the extermination of those species whose disappearance has fallen under human observation, has been effected mainly by human agency; but this cause could not have operated, of course, in the earlier geological periods.

Variation generally receives a great impetus from domesticity. Hence it is that in our domestic animals we frequently see changes taking place in a few years so great that they would require an

indefinite period to occur in nature. An animal or plant, when domesticated, is inevitably placed in circumstances differing more or less from those under which it has existed in a state of nature. If it is capable of existing in domestication at all, slight modifications which may or may not tend to assimilate it to its new conditions are nearly sure to occur. If the variation was beneficial to the domesticated species, it would be reproduced, while the original wild form would disappear, in domesticity; or if it varied so as to become more useful in any way to the owner, it would be preserved, while the individuals which did not vary would be neglected, or perhaps purposely destroyed. A species might vary in this manner in two or more directions; and when after the lapse of a certain time, the two forms were compared with each other, and with the wild parent, it would very probably appear that there were three distinct species. Still more distinct would the two domesticated forms appear if the wild race had become extinct in the interval. Yet the domesticated forms would still at times display a tendency to revert to the original type, especially if accidentally placed in similar circumstances to those in which the wild species had previously existed. Two remarkable cases of reversion are quoted by Mr. Darwin; one is that of our domestic pigeons, which "are descended from a pigeon (including two or three sub-species or geographical races), of a bluish colour, with certain bars and other marks; and when any breed assumes by simple variation a bluish tint, these bars and other marks invariably appear, but without any other change of form or character. When the oldest and truest breeds of various colours are crossed, we see a strong tendency for the blue tint and bars and marks to reappear in the mongrels." Another case, still more remarkable, is that of the various species of horse, (including the ass, zebra, &c.,) all of which can be crossed, and whose hybrids are more or less fertile, although no one doubts that the species are as distinct as in any other mammalian genus. All these animals have a tendency to become striped, which is most conspicuous in the hybrids; and even the horse shows this at times, especially when of a dun colour, though the horse is more rarely striped than any other species. Of this Mr. Darwin says, in his graphic language, "For myself, I venture confidently to look back thousands on thousands of generations, and I see an animal striped like a zebra, but perhaps otherwise very differently constructed, the common parent of our domesticated horse; whether or not it be descended from one or more wild stocks, of the ass, the hemionus, quagga, and zebra."

In a wild state, species are exposed to fewer influences tending to produce variation; but in every large genus, it is notorious that the distinction drawn between species and varieties is often so slight as to be wholly arbitrary. Two allied species will occur in the same or an adjacent locality, while intermediate forms may occur either with the extremes, or in a different outlying district, the various forms keeping themselves more or less distinct. In the case of a group of large islands, the effect of isolation is often most remarkable. Take for example the case of the genus *Ornithoptera*, which contains some of the largest and most beautiful butterflies known. Its extreme limits are India and Australia, but the species are mostly found in the intermediate archipelago; and the various islands all possess their peculiar forms, often passing into one another by such slow gradations that it is anything but easy to say which forms are entitled to be classed as distinct species, and which should be considered mere varieties. How unlike is the magnificent green of *Ornithoptera Priamus* and its allies, to the rich blue of *O. Urvilliana*, or the brilliant golden orange of *O. Cræsus* and *O. Lydius!* The forms differ also greatly in size, shape, and markings; and yet they pass into one another by such fine gradations that all our best entomologists are now agreed that the twelve or fourteen described species in this group of the genus green, blue, and golden, are merely forms of one variable species. But supposing the intermediate forms were to become extinct, no one would ever dream of classing the others together. This instance may serve to show how indefinite is the idea of a species in the minds of even the most eminent naturalists who have not yet learned to regard the terms "species" and "variety" as synonymous.

It not unfrequently happens that two species will coexist throughout an extensive range, keeping themselves perfectly distinct at one extremity, while at the other they are so blended by intermediate varieties as to be scarcely distinguishable. Thus, two well-known Alpine butterflies, *Parnassius Apollo* and *P. Delius*, keep themselves perfectly distinct in Europe, even the larvæ differing; but in Asia so many intermediate varieties and local sub-species occur, that no satisfactory characters can be certainly relied on to separate them.

It has already been mentioned that the high geometrical ratio of increase of any species imperatively requires an almost equally high counterbalance of destruction to keep it within any reasonable bounds. Mr. Darwin has shown that every animal or plant is dependent for its very existence on an innumerable number of favourable circumstances, and the direct or indirect influence of a great number of other organisms; and that all are liable to immense destruction, generally in their young stages. So long as circumstances are sufficiently favourable to allow a species to arrive at maturity in sufficient numbers for reproduction, it will hold its ground; but a very slight balance on the other side will often exterminate it altogether. A power of adapting itself to circumstances by slight variations over its area of

distribution is, far more often than we are generally inclined to suppose, the chief protection of many a species.

In islands the various species have usually fewer competitors, and therefore become modified with reference to their competitors alone. Consequently, in islands we find most of the species differing from those of the mainland, more or less, according to the length of time the island has been isolated. (Isolation, acting as a bar to migration, may be mentioned as the chief reason why islands are usually poorer in species than continents.) If a continental species should be introduced into an island which has been isolated sufficiently long for its productions to have assumed an insular character, from the larger number of species with which it has had to contend, it will have a great advantage over the indigenous species, and will probably soon become common throughout the island, while the insular species which come into competition with it will run great danger of utter extermination. It also happens that when species are transplanted from one continent to another, they sometimes find their new circumstances so favourable that they are enabled to increase to a great extent, as the horse has done in America.

When a species once loses ground, it is rarely able to recover it; its enemies press it harder, it becomes rare, it is weakened by interbreeding, and interbreeding itself is unfavourable to variation; and from all these causes favourable circumstances or variations present themselves less and less often as the species becomes more reduced in numbers; and finally it sinks from the surface of the great ocean of life, and no trace, except, perhaps, a few chance fossils, remains to show that it has ever existed.

Sometimes a species will in the course of ages change its habits, in which case it may happen that organs of great former importance become useless to it under its new circumstances. Sometimes these organs are retained, as in the case of certain species of geese which are web-footed, but seldom or never swim; but in other cases, as in the wingless beetles of Madeira, and in the blind or semi-blind animals of great caves, disused organs become more or less atrophied, but never so much as to show no trace of their former existence.

It is commonly asserted that hybrids, when producible at all, are infertile, while mongrels are always fertile. But Mr. Darwin has shown that these statements are only partially true, and that though domestication often tends in the first instance to produce sterility in individuals of the same species, yet it afterwards facilitates the interbreeding of distinct species. To take an extreme instance, no difficulty is experienced in inducing any of our races of domestic cattle to interbreed, yet these are well known to have descended from at least three, if not more, distinct wild species.

It is often objected that geology furnishes us with no direct proofs of the progression of species; but this objection would only be valid if our palæontological collections could be assumed to be tolerably complete. But years in geology are as miles in astronomy; and who need wonder, when such immense numbers of living species are daily discovered, even in well-explored countries, that our collections should contain not the ten-thousandth part of the innumerable distinct species (to say nothing of all the intermediate varieties, as is sometimes so unfairly demanded) that have lived and died on the earth since it was a ball of incandescent lava? Again, millions of years are often represented in our cabinets by a very few chance remains of a very few species; and to claim that the geological record should be perfect in any sense would be absurd.

But it may be asked, How is it that, when large animals become extinct, their pigmy representatives often remain? Are the sloths of South America, which are no larger than monkeys, to be considered as the *improved* descendants of the gigantic megatherium, scarcely inferior to an elephant in size? The absurdity is obvious, and the difficulty is real, and yet it apparently admits of a very simple explanation. When a genus or family is dominant in any country, species of all sizes exist together, as we see with the kangaroos of Australia, which vary from the size of a rat to that of a large sheep, according to the species. But when a group or genus is becoming extinct, the hostile influences will act first and most forcibly on the larger species, which must always be fewer in number and less able to take advantage of accidentally favourable circumstances than the smaller ones. It is thus reasonable to conclude that when a group or genus has lost its ascendancy, the larger species will generally be the first to disappear, while some of the smaller may still continue to exist for many centuries after their former companions have become extinct.

The facts of geographical distribution may be considered to establish the axiom, almost universally admitted, that every species has been created or developed in one spot of the earth alone, from whence it has gradually spread itself over the district, large or small, which it now inhabits. We say *created* or *developed* to indicate the practical identity of the words as applied to Nature. The terms are often considered antithetical, but there is no real reason why they should be. No one can explain why distinct but closely allied species should be found on a continent and its islands, or in the Arctic regions and the mountains of temperate climates, on any other theory than that of common descent. Equally difficult, on any other grounds, is it to explain why species, in exactly similar conditions, should be confined to different sides of a continuous mountain-chain. It might, indeed, be

said that the species were created so; but, if this were the case, why should some Corsican species have been created like those of the mainland, while others differ more or less, so as to be reputed as well-marked local varieties, or even perfectly distinct species? If for the mere sake of variety, why should not *all* the species vary, and why should not every few miles of country have its distinct varieties or species instead of the most distinct forms of the whole Continent showing themselves on two small detached islands alone?

The occurrence of arctic species on the mountains of warmer climates is explained by Mr. Darwin to arise from the equatorial migration of all organisms at glacial periods (for it is the opinion of some eminent naturalists that there is a regular recurrence of glacial and tropical periods), when the arctic species were driven south and north to the plains of temperate climates, and the temperate species to the tropics. When the cold decreased, the arctic species would retreat towards the poles, and would ascend the mountains, where a few still remain. Some of the temperate species, at the same period, appear to have penetrated to the equator, with or without the aid of mountains; and on the return of the warmth were driven both north and south, which will account for the presence of so many identical temperate species both north and south of the equator.

One of the most singular phenomena which can be philosophically explained by Darwinism is that of mimicry,* *i.e.* the assumption by helpless animals of the colours or markings of those which are better protected, or else of inanimate objects. Thus the colour of desert animals is usually sandy. The common frog, which lives in muddy water, is mud-coloured, while the tree-frog is green. Arctic animals are almost invariably white. But, leaving these general resemblances, let us come to what is called mimicry proper, the assimilation of one animal to another totally unconnected with it. The most striking instances of this occur among insects. Insects will imitate flowers, leaves, snakes, and almost every conceivable object, but most frequently other insects which are better protected. A caterpillar, supposed to be that of one of the *Bombycidæ*, or silkworm moths, was once observed by Mr. Bates in South America, which presented such an extraordinary resemblance to a small venomous snake as to frighten all the natives to whom he showed it. The bee-hawkmoths, and the clear-wing hawkmoths generally, present so striking a resemblance to bees, wasps, hornets, and other stinging insects, as at times to deceive the entomologist. There is one large family of butterflies, the *Heliconidæ* (also including the old families, *Danaidæ* and *Acræidæ*) all whose members exude, when touched, a disagreeable, ill-smelling fluid, which appears to render them obnoxious to birds and other insectivorous animals. One group is almost peculiar to Africa, another to the East Indies, and another to South America; and in all these countries we find butterflies belonging to several other groups, and even moths, which resemble them so completely that they are at times undistinguishable from them without close examination, and when on the wing must be perfectly so. All these mimicking species are much rarer than the insects they mimic, and are evidently mistaken by birds for uneatable insects. It therefore appears that as the insects of waning groups decreased in numbers, a slight variation, tending to assimilate them to those of a dominant group, would be beneficial to them, while the individuals which did not present it would be inevitably destroyed; and the ultimate effect of this would be that the variety would more and more assimilate itself by natural selection to the common species, till it became in time, perhaps, almost identical in appearance with it, and would thus be preserved when no other safeguard would avail it. The preservation of the female is of far more importance in many animals than that of the male, and so we often find the female protected by mimicry, dull colours, and similar means, while the male has no such protection.

We have now bestowed a passing glance on a few of the most remarkable of Mr. Darwin's theories and arguments, as laid down in his celebrated book "On the Origin of Species," and have also briefly noticed one or two of the more interesting subjects which have been discussed by his followers since its publication; but to go fully into a subject, each of whose branches would require at least an entire volume for its elucidation, is of course impossible here. But whether we go to the extreme length of the theory, and believe with Mr. Darwin that all the forms of organic life have originated from half a dozen primordial germs at most—and probably from one only—or whether we are simply led from an examination of his arguments to the conclusion that species are more variable than is commonly supposed, it is scarcely to be disputed that the whole subject is worthy of far more serious attention from the general public than it has hitherto received; and if these few pages shall have the effect of calling the attention of one unprejudiced thinker to the subject, our object will have been attained.

Dublin. W. F. Kirby.

* Compare the able article on "Mimicry and other Protective Resemblances among Animals," in the *Westminster Review* for July, 1867.

Fleas.—During the drought we rarely ever saw such a thing as a flea; but the rain had scarcely visited us before we were infested, so much so as to become a task to rid ourselves of them.—*G. Bullard.*