THE ORIGIN OF SPECIES.

On the Origin of Species by means of Natural Selection, in the Preservation of Favoured Races in the Struggle for Life. By CHARLES DARWIN, F.R.S. Murray.

WHATEVER may be the ultimate opinion of men of science about Mr. Darwin's book, we cannot be far wrong in describing it as one of the most valuable contributions to natural history which has issued from the press during the present century. When we differ most from the author, we are disarmed by the candour with which he states his difficulties, and allows for the possibility of his readers arriving at a different conclusion. If his logic is weak, he does not endeavour to cram his conclusions down our throats; and, far from setting himself in hostile array against revealed religion, he calmly pursues the tenor of his way, convinced, we doubt not, that at the last, however the Bible and science may appear to differ, their seemingly contradictory results will one day be reconciled. At present, they run on different lines; but the time will come when those lines, which now seem parallel because we see so small a portion of them, will meet in one point—that of Truth. Religion, or theology rather, has suffered injury by the identification of ancient and popular dogmas with revealed truth; and, when the discoveries of science were found to be in apparent contradiction to the Word of God, as usually interpreted, it was forgotten that the old gloss put upon Scripture was not necessarily the true one, and that the traditions of Churches could not for ever stand against the testimony afforded by the works of God himself.

The principle of Mr. Darwin's book may be enunciated in very few words:—"All species were originated by means of natural selection, or through the preservation of the favoured races in the struggle for life." Beginning with animals in a state of domestication, we are shown how man has taken advantage of the apparently casual variations of nature to raise up new species, as is particularly notorious in the sheep, ox, dog, pigeon, rabbit, and horse, the extreme species of which seem to have almost no relation to each other. By a skilful use of the principle of selection, a cattle-breeder may not only modify the character of his flock, but change it altogether. Sir John Sebright, a famous pigeon fancier, used to boast that "he would produce any given feather in three years." It is by selection that our racehorses have come to surpass in fleetness and size the parent Arab stock. In a similar way the gardener has produced new quasi-permanent varieties of fruits and flowers. But as these varieties, if neglected or improperly crossed, have a tendency to fall back to the old form, the analogy of domestication does not altogether support Mr. Darwin's theory. He, indeed, admits that the colour and two black bars of the wild rock pigeon of India (*columba intermedia*) have a constant tendency to reappear in all our domestic varieties, and that in the domestic horse certain marks are continually showing themselves, so as to identify the nature of the species from which the existing varieties have been produced; and yet he does not see how far these efforts of nature to revert from her abnormal to her normal condition are contradictory to his law of progressive improvement.

Turning to plants and animals in a wild state, Mr. Darwin thinks that the immense variety of each at present existing on the earth is the result of what, for want of a better term, he calls "natural selection." He argues that, as under domestication the whole organisation becomes in some degree plastic, "it is not impossible, seeing that variations useful to man have undoubtedly occurred, other variations 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." This may be rendered plain by an extract from the author's communication to the Linnæan Society in June, 1858:—

"To give an imaginary example from changes in progress on an island:—let the organization of a canine animal, which preyed chiefly on rabbits but sometimes on hares, become slightly plastic; let these same changes cause the number of rabbits very slowly to decrease, and the number of hares to increase; the effect of this would be that the fox or dog would be driven to try to catch more hares; his organization, however, being slightly plastic, those individuals with the lightest forms, longest limbs, and best eyesight (let the difference be ever so small), would be slightly favoured, and would tend to live longer and to survive during that time of the year when food was scarcest; they would also rear more young, which would tend to inherit these slight peculiarities (?). The less fleet ones would be rigidly destroyed. I can see no more reason to doubt that these causes in a thousand generations would produce a marked effect, and adapt the form of the fox or dog to the catching of hares instead of rabbits, than that greyhounds can be improved by selection and careful breeding. So would it be with plants under similar circumstances. If the number of individuals of a species with plumed seeds could be increased by greater powers of dissemination within its own area (that is, if the check to increase fell chiefly on the seeds), those seeds which were provided with ever so little more down, would, in the long run, be most disseminated; hence a greater number of seeds thus formed would germinate, and would tend to produce plants inheriting the slightly better-adapted down."

Mr. Darwin's reasoning from the artificial changes wrought upon animals in a domesticated state to the natural ones presumed to be effected in a wild state, is most inconclusive. Is it not fairer to infer that, as these variations took place in domestication, they were one of the consequences of that abnormal state, and that, if the animals had remained in their natural wild state, such variations would not have occurred? Man, by his art, makes the variation permanent; in nature, the variation being accidental, would not be repeated. If the Austrian lip has been transmitted from one generation to another, abnormal formations (as of the toes) disappear in the grandchildren, nature constantly striving, as it were, to revert to the original type. A French physiologist (Brown-Séquard) has succeeded in producing in the guinea-pig an artificial defect in the first generation; but as yet the transmission has not reached the second generation.

The ultimate result of Mr. Darwin's theory is, of course, to reduce the number of parent animals and plants to a very few. "I believe," he says, "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*." Then, growing bolder (after acknowledging analogy to be "a deceitful guide"), he infers "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;" in other words, all the organised beings in air, water, or on land, plants and animals alike, have descended from one primordial cell. What is this but the development theory of Lamarck, and of the *Vestiges of Creation*, which is so contemptuously alluded to in the Introduction? Mr. Wallace, whose views appear to be identical with Mr. Darwin's, saw this, and attempted to evade it in the following manner:—

"The powerful retractile talons of the falcon and the cat tribes have not been produced or increased by the volition of those animals; but among the different varieties which occurred in the earlier and less highly organized forms of these groups, *those always survived longest which had the greatest facilities for seizing their prey.* Neither did the giraffe acquire its long neck by desiring to reach the foliage of the more lofty shrubs and constantly stretching its neck for the purpose, but because any varieties which occurred among its antitypes with a longer neck than usual *at once secured a fresh range of pasture over the same ground as their shorter-necked companions, and on the first scarcity of food were thereby enabled to outlive them.* Even the peculiar colours of many animals, especially insects, so closely resembling the soil, or the leaves, or the trunks on which they habitually reside, are explained on the same principle; for though in the course of ages varieties of many tints may have occurred, yet those races having colours best adapted to concealment from their enemies would inevitably survive the longest."

Within very narrow limits—so narrow, indeed, as to be practically useless—this theory may be true; but in the present state of the sciences of botany and zoology it can be taken as little else than a convenient hypothesis, which may or may not eventually lead us to a knowledge of the true cause of the origin of species. But, if we go back to the "primordial cell," or to the "four or five progenitors," how did the first falcon acquire its talons, or the first giraffe its long neck, except by some development of their own organs so far as to modify their structure and habits? It is not, however, necessary to discuss this portion of Mr. Darwin's theory, as it must sink or swim with Lamarck's. He is of course ready to accept another deduction from his theory—that man is not permanent, but transitional, and that, as he emerged from the monkey, so he will advance to something greater than himself. And yet man is still the same as he was six thousand years ago.

By what direct arguments is this "principle of natural selection" theory established? Here the volume fails to satisfy us. Geology Mr. Darwin frankly confesses to be against him, so far as the absence of evidence one way or the other may be considered negative; but then "the geological record is extremely imperfect." If this be so, what becomes of the fine theories which have been built on this "imperfect" science? And if, during the 306 millions of years which Mr. Darwin supposes to have been required for the denudation of the Weald, we find no proof of this presumed gradual and continuous transition from one species to another, is it likely that we shall catch any of these forms, *in transitu*, within the brief space over which living observation extends? Mr. Darwin, replying to this objection, argues that, "if his theory be true, numberless intermediate varieties must have assuredly existed; but the very process of natural selection constantly tends to exterminate the parent forms and the intermediate links." The only kind of proof admissible in an inductive science is the evidence of the existence of these intermediate forms at some period of time or other—pre-Adamite or post-Adamite, it matters not. The facts must prove the theory, and not the reverse. To argue from the last links of a chain that all the preceding links must have been different is the madness of logic. It is greatly to Mr. Darwin's credit that he does not conceal the difficulties against which he has to contend; indeed, he is so very frank that his opponents have little more to do than to quote him against himself. It is of course within his competence to start any hypothesis likely to account for the phenomena of nature. The history of science is little else but a record of hypotheses that have been tried and found wanting. That is at last held to be the true one which embraces the greatest number of facts in the simplest and easiest form, and, at the same time, accounts for the apparent exceptions. The inductive philosophy does not forbid such "guesses at truth," but furnishes us with the means of testing them. Theories serve their time, and are forgotten.

At times, the author rides his hobby so hard that his "selection" theory appears to have become a monomania. Thus, in his sixth chapter, where he treats of "organs of extreme perfection and complication," he outstrips even the author of the *Vestiges*. He begins by admitting that "it seems absurd in the highest possible degree" to suppose that the eye, "with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic observation," could have been produced by natural selection; and yet "reason tells him that the difficulty, though *insuperable by our imagination*, can hardly be considered real." This is not reasoning at all, but that playing with words in which men of one idea are too apt to indulge. The following passage will, we think, decidedly settle this portion of the theory:—

"It is scarcely possible to avoid comparing the eye to a telescope. We know that this instrument has been perfected by the long-continued efforts of the human intellects; and we naturally infer that the eye has been formed by a somewhat analogous process. But may not this inference be presumptuous? Have we any right to assume that the Creator works by intellectual powers like those of man? If we must compare the eye to an optical instrument, we ought in imagination to take a thick layer of transparent tissue, with a nerve sensitive to light beneath, and then suppose every part of this layer to be continually changing slowly in density, so as to separate into layers of different densities and thicknesses, placed at different distances from each other, and with the surfaces of each layer slowly changing in form. Further, we must suppose that there is a power always intently watching each slight accidental alteration in the transparent layers; and carefully selecting each alteration which, under varied circumstances, may in any way, or in any degree, tend to produce a distincter image. We must suppose each new state of the instrument to be multiplied by the million; and each to be preserved till a better be produced, and then the old ones to be destroyed. In living bodies, variation will cause the slight alterations, generation will multiply them almost infinitely, and natural selection will pick out with unerring skill each improvement. Let this process go on for millions on millions of years; and during each year on millions of individuals of many kinds; and may we not believe that a living optical instrument might thus be formed as superior to one of glass, as the works of the Creator are to those of man?"

Very true: for, as we read in the *Biglow Papers*:—

Everythin' 's nothin' except by position.
The fears of a monkey, whose hold chanced to fail,
Draw'd the vertibry out to a prehensile tail!

Instincts, as might be expected, are a great stumbling block to the "natural selection" theory; yet Mr. Darwin can "see no difficulty, under changing conditions in life, in natural selection accumulating slight modifications of instinct *to any extent in any useful direction.*" But it is not a question of what a man's imagination sees, but a question of fact. Are there any proofs of instinct being permanently modified? Pigs have been trained to act as pointers; but were the descendants of these pigs able to do the same? Mr. Darwin thinks he has caught nature in a transitional state in certain species of bees. "Between the extreme perfection of the cells of the hive bee and the simplicity of those of the humble bee, we have the cells of the Mexican Melipona domestica," which are nearly spherical, and of nearly equal sizes, and aggregated into an irregular mass. On examining the peculiarities of the cells of the Melipona, he thought that "*if* this bee had made its spheres at some given distance from each other, *and* had made them of equal sizes, *and* had arranged them symmetrically in a double layer, the resulting structure would probably have been as perfect as the comb of the hive bee." In order to correct these wonderful "ifs" into certainties, Mr. Darwin consulted Professor Miller, who favoured him with this illustration of "simple instincts":—

"If a number of equal spheres be described with their centres placed in two parallel layers; with the centre of each sphere at the distance of radius × √2, or radius × 1·41421 (or at some lesser distance), from the centres of the six surrounding spheres in the same layer; and at the same distance from the centres of the adjoining spheres in the other and parallel layer; then, if planes of intersection between the several spheres in both layers be formed, there will result a double layer of hexagonal prisms united together by pyramidal bases formed of three rhombs; and the rhombs and the sides of the hexagonal prisms will have every angle identically the same with the best measurements which have been made of the cells of the bee-hive."

"If we could slightly modify"—slightly modify!—"the instincts of the Melipona, that bee would be able to make a comb as perfect as the comb of the hive bee." Not a doubt of it. If pigs had wings, they might be able to fly.

Properly to test Mr. Darwin's theory, it would be necessary to go back to the "one primordial cell," and its immediate descendants. What made one a plant and the other an animal? one giving out, the other absorbing, oxygen. Science gains nothing in real simplicity by this straining after unity. It is not more difficult to imagine the creation of many parent species than of this wondrous cell. In the infancy of chemistry there were counted but four elements, and some Grecian philosophers reduced even these to one; now they exceed sixty in number. So it will probably be in natural history, when our knowledge is extended, and men of science are agreed upon the meaning of the word "species."