## III.—PHILOSOPHICAL AND SCIENTIFIC.

*The Variation of Animals and Plants under Domestication.* By CHARLES DARWIN, M.A., F.R.S., &c. Two vols., 8vo. London: Murray. 1868.

WHEN Mr. Darwin startled the naturalist world eight years ago by the "Origin of Species," the book was at once accepted, both by those who received and those who rejected the Darwinian hypothesis, as marking an epoch in the history of scientific investigation. Speculations enough there had been before on the subject, but no attempt at calm philosophical induction. The Lamarckian hypothesis, and the speculations of "The Vestiges," had each in their day

evoked much criticism, had been eagerly embraced or ruthlessly ridiculed, but none of their supporters could feel that they proposed a philosophical explanation of the complex phenomena of organic life. They merely expressed the gasping after some such explanation which was felt by many minds—they were merely the spasmodic struggles of a convulsed arm, clutching at a solution, not the well-directed movements of the workman's hand.

But, whatever might be our opinion of Mr. Darwin's hypothesis, only the most ignorant and superficial could identify it with its predecessors; whether visionary or demonstrable, it must be admitted to be self-consistent, symmetrical, thorough, and complete. The theory was philosophical, and was carried remorselessly to its bitter end, even up to the "one primeval germ." There, however, it left, and still leaves, the problem of life, an unfathomable mystery. No doubt Lamarck and "The Vestiges," had paved the way for Darwinism, and had dimly foreshadowed it. Lamarck held that structures could be modified through modification of adaptation, but he never grasped any law of development. The author of "The Vestiges" assumed a pre-existent type, and applied time as his only factor. Both laid hold of *causes*, but neither of complete causes, nor of causes of universal applicability. But Mr. Darwin puts forth in his "Origin of Species," as the cause of *all* variation, a law which is demonstrably the cause of much variation, and in which law many other minor causes are embraced—the law of so-called "selection," "natural selection," "or "the survival of the fittest," or "the struggle for existence."

In his first work, Mr. Darwin gave us in a condensed form the conclusions to which he had been led by years of study and investigation, and supplied us with but few of the facts on which his induction was based. The boldness and sweeping comprehensiveness of these conclusions almost took away the breath of most naturalists. But it was felt we must wait for the facts, which he promised, if life were spared him, to communicate at greater length to the world; and we were assured the induction would then be satisfactory. These facts were indeed necessary; for even the warmest advocates of the hypothesis had to admit that the hiatuses were wide and many, the induction often apparently incomplete, and the pyramid seemingly built on its apex. There was a reluctance felt by many, though expressed by few, to found such universal conclusions upon particular premises. But the confidence in Mr. Darwin's judgment, caution, and philosophic insight into nature, led most even of those who shrank from his conclusions to await with anxiety his promised justification. Many, too, who were ready to accept the Development Hypothesis, were uncertain how far Natural Selection was the true mode of development action. They held that while succession and modification must be the *veræ causæ* of existent species, yet that Natural Selection was not a complete explanation of the *modus operandi*, though far better than any of its predecessors, but destined like them in turn to fall into oblivion.

At length Mr. Darwin has redeemed his promise, so far as regards one portion of his subject. The two ponderous tomes before us, with their close-set type, and endless references, bespeak prodigious labour. We are amazed at the unremitting observation and the vast reading which has heaped these mountains of facts. The general line of argument may be briefly summarised thus: that what man has effected for his purposes in modifying the structures and habits of animals and plants by conscious selection, *that* nature has done unconsciously in her whole realm through a period of countless ages. The object of the first volume is not to describe all the many races of animals and plants which have been domesticated or cultivated by men, but merely under the head of each species to give those facts the author has been able to collect which bear on the general principle of variation. On fowls and rabbits, but above all on pigeons, Mr. Darwin dilates with more than his usual fulness, having the materials more ready to hand.

Thus, domestic dogs and cats, horses and asses, pigs, cattle, sheep and goats, domestic rabbits, pigeons, fowls, ducks, geese, turkeys, canary-birds, gold-fish, bees, cereals, culinary plants, fruit trees, ornamental trees, florists' flowers, leaf-variegated plants, are all successively brought under review. The amount and causes of selected varieties are traced with great fulness, and the correlation of variation is often shown in a manner which will be new to many naturalists, for upon this mysterious correlation of the different parts in their variability the

theory largely depends. In the case of the pigeon this is very clearly shown in the correlated diminution or increase in the length of the beak and claws, and in the fowls in the thickening of the skull in the Polish fowl, to enable it to sustain its acquired tuft of feathers on the great frontal protuberance.

As to the dog, Mr. Darwin is strongly of opinion that our many breeds have sprung in different countries from distinct wild originals, the dog having been among the first animals domesticated by man, and almost every region of the world possessing some feral canine species, and he points out that in various countries the domestic dogs resemble distinct wild species still existing there. Thus, the Indian dog is traced to the North American wolf, the Esquimaux dog to the grey wolf, the Hare-Indian dog to the prairie wolf, the dogs of South America to several indigenous species, the Pariah dog of India to the Indian wolf, the domestic dogs of Lower Egypt to the *Canis lupaster* of the country, the Bosjesman dog to the *Canis mesomelas* of South Africa. Horses, on the contrary, are traced to one lost original, as are asses, while all our breeds of pigs may be clearly traced to two groups, *Sus scrofa*, and the wild original, *Sus indica*, of Pallas, which, however, does not now inhabit India.

The most exhaustive chapters are those on the fowl and the pigeon. As to the origin of the various breeds of pigeons, Mr. Darwin observes:—

"In order to understand how the chief domestic races have become distinctly separated from each other, it is important to bear in mind that fanciers constantly try to breed from the best bird, and consequently that those which are inferior in the requisite qualities are in each generation neglected, so that after a time the less improved parent stocks, and many subsequently-formed intermediate grades, become extinct. This has occurred in the case of the pouter, turbit, and trumpeter, for these highly-improved breeds are now left without any links closely connecting them either with each other, or with the aboriginal rock-pigeon. In other countries, indeed, where the same care has not been applied, or where the same fashion has not prevailed, the earlier forms may long remain unaltered, or altered only in a slight degree, and we are thus sometimes enabled to recover the connecting links. This is the case in Persia and India with the tumbler and carrier, which there differ but slightly from the rock-pigeon in the perfection of their beaks. So, again, in Java, the fantail sometimes has only fourteen caudal feathers, and the tail is much less elevated and expanded than in our improved birds, so that the Java bird forms a link between a first-rate fantail and the rock-pigeon."

All the domestic races, Mr. Darwin concludes with confidence, are descended from *Columba livia*, including under this name certain wild races. Their plasticity of organization apparently results from changed conditions of life. Disuse has reduced certain parts of the body. Correlation of growth so ties the organization together that when one part varies, other parts vary at the same time. Similarly all our breeds of fowls are traced to the jungle fowl, *Gallus bankiva*, of India. Many curious examples of correlation of growth are here shown, as in Cochin and game fowls, between the colour of the plumage and the darkness of the eggshell, and even of the yolk. (Though in this instance we should observe that the colour of the game fowl egg is that of the wild original, and the colourless shell a degeneracy under domestication.)

The chapters on cereals and other cultivated plants are full of suggestive matter, though the little, if any improvement in wheat, *e.g.*, from the earliest period, in spite of the vast care which has always been bestowed on its selection, and the fact of the modification in the form of the plants being attributable only to climate and soil, seem not to show great plasticity of organization, but rather great adaptability in most of our cereals, while we cannot trace with any certainty a wild original for any one of those so all-important to man.

The second volume Mr. Darwin has devoted to the deductions from the accumulated facts of the first volume, treating first of inheritance, then of crossing, of selection, of the causes of variability, and laws of variation. Towards the end of the volume is a chapter setting forth a provisional hypothesis of pangenesis, which scarcely can be said to be directly connected with the previous portion of the work, except as offering a further expansion of the hypothesis of the "Origin of Species."

On inheritance we see that, strong as is its force, it allows the incessant appearance of new characters. These, whether beneficial or injurious, trifling or important, are all liable to be inherited. The chances are obviously in favour of any character which has long been transmitted true or unaltered

being still transmitted true, so long as the conditions of life remain the same; when these are changed, the most (to all appearance) permanent characters are changed.

The importance of crossing and the evil results of close interbreeding in all living things are set forth in five exhaustive chapters. But is there not a covert *petitio principii* in the following remarks?—

"Before passing on to birds I ought to refer to man, though I am unwilling to enter on this subject, as it is surrounded by natural prejudices. It has, moreover, been discussed by various authors under many points of view. Mr. Tylor has shown that with widely different races, in the most different quarters of the world, marriages between relations—even between distant relations—have been strictly prohibited. . . . . Mr. Tylor is inclined to believe that the almost universal prohibition of closely-related marriages has arisen from their evil effects having been observed, and he ingeniously explains some apparent anomalies in the prohibition not extending equally to the relations both on the male and female side. He admits, however, that other causes, such as the extension of friendly alliances, may have come into play. Mr. W. Adam, on the other hand, concludes that related marriages are prohibited and viewed with repugnance from the confusion which would thus arise in the descent of property, and from other still more recondite reasons; but I cannot accept this view, seeing that the savages of Australia and South America, who have no property to bequeath, or fine moral feeling to confuse, hold the crime of incest in abhorrence.

"*It would be interesting to know, if it could be ascertained, as throwing light on this question with respect to man, what occurs with the higher anthropomorphous apes*, whether the young males and females soon wander away from their parents, or whether the old males become jealous of their sons and expel them, or whether any instinctive feeling, from being beneficial, has been generated, leading the young males and females of the same family to prefer pairing with distinct families, and to dislike pairing with each other. . . . . It seems more probable that degraded savages should thus unconsciously have acquired their dislike and even abhorrence of incestuous marriages, rather than that they should have discovered by reasoning and observation the evil results."—(Vol. ii., pp. 123, 124.)

We need scarcely remark on this, that the very epithet *degraded* suggests another and a far easier solution for the admitted fact than the gratuitous conjecture of the accumulated experience of anthropomorphous apes.

There are no chapters more instructive than those on the laws which govern variations, the author's conclusions from the vast induction he has accumulated. It is important to note that with domesticated animals the reduction of a part from disuse is never carried so far that a mere rudiment is left, though Mr. Darwin believes it has often occurred under nature. He explains this belief both from the limited time during which domestication has existed, and from the protection of these animals from the struggles for life, thus shutting out the action of economy of organization. On the contrary, structures rudimentary in the parent species become partially redeveloped in their domesticated progeny.

On a general survey of the work we are compelled to admit not only the vast changes which man has artificially induced, but the force of the argument that the like may have often occurred in nature. The fact that each very small district has had its own peculiar breeds of almost every domesticated animal and cultivated plant, that isolation kept these breeds apart for many ages, and yet that they must have sprung from the same wild originals, that commerce and increased intercourse have rapidly diminished the number of these local races, and in many cases have utterly extirpated them, are arguments of great weight. Again, the law of reversion in the case of domesticated animals reverting to the feral condition, which has often been used as an argument against the hypothesis, is shown to be actually in favour of the law of natural selection, because the animal, restored to its original condition, reverts to those characters which were best fitted to sustain the struggle for existence under those conditions.

That these variations are by law in the sense of preordination, the author cannot admit.

"If we assume that each particular variation was from the beginning of all time preordained, the plasticity of organization which leads to many injurious deviations of structure, as well as that redundant power of reproduction which inevitably leads to a struggle for existence, and as a consequence to the natural selection or survival of the

fittest, must appear to us superfluous laws of nature. On the other hand, an Omnipotent and Omniscient Creator ordains everything and foresees everything. Thus we are brought face to face with a difficulty as insoluble as is that of free-will and predestination."—(Vol. ii., p. 432.)

Mr. Darwin thus well submits his claim to be heard:—

"In scientific investigation it is permitted to invent any hypothesis, and if it explains various large and independent classes of facts, it rises to the rank of a well-grounded theory. . . . . Now this hypothesis may be tested by trying whether it explains several large and independent classes of facts, such as the geological succession of organic beings, their distribution in past and present times, and their mutual affinities and homologies."

In this work Mr. Darwin has clearly shown the plasticity of many organizations under changed conditions. But we are only at the threshold of the difficulties. We must wait for the explanation of the geological record, we must know more of the means of distribution, above all, we need some light on that which is the greatest difficulty of all, the possibility of transitions in organs.

We can only hope that life and health may be spared to Mr. Darwin to set before us as fully his investigations on these subjects, as he has here elaborated the methods of variation under domestication. We shall then be better able to test the provisional hypothesis of pangenesis.