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VARIATION OF ANIMALS AND PLANTS UNDER DOMESTICATION.*

FOR critical examination in detail, Mr. Darwin's new book must be referred to the scientific journals and to cultivators and breeders. Still, whatever audience he may address, a wide circle of general readers is sure to attend the frontier of a new era, and the word Darwinism has become as familiar as Salvation or Mormonism. Readers from more serious and likely to be somewhat disappointed in the present work. It is, perhaps, more what may say heavy—with facts, and facts is obvious, important as they are in this case both to practical men and philosophical investigators, are seldom half as exciting as speculations. To the "Origin of Species," more over, there was the added merit of heterodoxy. Everybody hastened to read a book which was widely discussed, even by some scientific authorities, as dangerous or improper. No doubt the present volumes are furnished with the doctrine of their predecessor, which this is intended to support by evidence. But their main interest lies in the vast array of facts which are here collected and discussed, with the characteristic boldness and candor of a writer who was never known to temper with the evidence, or to keep back anything which told against his theory. There is, moreover, plenty of hypothesis in the second volume, and that quite independent of the Darwinian theory.

These volumes are, in the main, a storehouse of facts relative to variation under domestication and kindred topics. The author announces that in a work to follow this he intends to treat of variation in a state of nature, and in yet another (may be time to complete such arduous undertakings) he proposes to try the principle of natural selection by seeing how far it will serve to explain the geological succession of organic beings, their geographical distribution in past and present times, and their mutual affinities and homologies. He briefly informs us how the foundations of the Viceroy which he has lately made so famous were laid during his voyage in the *Beagle*, many years ago:

"When I visited the Galapagos Archipelago, situated in the Pacific Ocean, about five hundred miles from the coast of South America, I found myself surrounded by peculiar species of birds, reptiles, and plants, striking

* "The Variation of Animals and Plants under Domestication," by Charles Darwin, M. A., F. R. S., 2 vols., with illustrations, New York, Houghton, Mifflin, 1868.

howhere else in the world. Yet they all have an American origin. In the song of the mocking-bird, in the harsh cry of the garden hawk, in the gross and harsh life operations, I clearly perceived the neighborhood of America, though the islands were separated by so many miles of ocean from the continent, and differed much from it in their geological constitution and climate. Still more surprising was the fact that most of the inhabitants of each separate island in this small archipelago were specifically different, though most closely related to each other. The origin, which in its innumerable cases and large streams of lava, appeared to be of recent origin; and thus I hunted myself brought near to the very act of creation. I often asked myself how many peculiar animals and plants had been produced; the simplest answer seemed to be that the inhabitants of the several islands had descended from each other, undergoing modification in the course of time; and that all the inhabitants of the archipelago had descended from those of the nearest land, namely, America, whence vicarious would naturally have been derived. But a long time passed to me as insupportable problems how the necessary degree of modification could have been effected; and it would thus have remained for ever, had I not studied domestic productions, and thus acquired a just idea of the power of selection. As soon as I had fully realized this idea, I saw, on reading Malpighi on Population, that natural selection was the inevitable result of the rapid increase of all organic beings; and I was prepared to appreciate the struggle for existence by having long studied the habits of animals.

In South America he had already been impressed with the fact of the prevalence of the same types, under different species or genera, throughout the length and breadth of the continent, and under the most diverse possible conditions; while other parts of the world, such as North Africa and Australia, although incomparably more like in parts of South America than the different parts of that continent were to each other, were entirely different in their productions. By traveling with his own hands the bones still among of extinct gigantic quadrupeds of the same peculiar type with those which now exist there, and reflecting that the equally peculiar animals of Australia were produced by forms of the same sort, the idea was forced upon him that, in time as in space, the similarity was to be explained by community of descent, the difference by modification and divergence under natural selection.

We have no intention to discuss the subject of natural selection, nor the theory with which Mr. Darwin has connected it; but we would note, both as an historical incident and a simple although restricted illustration, that anticipation of it which was made, half a century ago, by the distinguished author of the "Essay upon Dew," Doctor Wells, as announced by birth, which Mr. Huxley recently pointed out to Mr. Darwin, and which the latter, in the preface to the last edition of "The Origin of Species," promises to be the first recognition of the principle of natural selection which has been indicated. Dr. Wells, in a paper read before the Royal Society in 1818, after remarking that negroes and mulattoes enjoy immunity from certain tropical diseases, observes, "that all animals tend to vary in some degree; that agriculture improves their domesticated animals by selection; and adds that what is thus done "by art seems to be done with equal efficacy, though more slowly, by nature in the formation of the varieties of mankind. Thus for the varieties which they inhabit. Of the accidental varieties of man, which would occur among the first few and scattered inhabitants of the middle regions of Africa, some one would be better fitted than the others to bear the diseases of the country. This race would consequently multiply, while the others would decrease not only from their inability to resist the attacks of disease, but from their incapacity of coexisting with their more vigorous neighbors. The color of this vigorous race, I take for granted, from what has already been said, would be dark; but the disposition to form varieties still existing, a darker and darker race would in the course of time occur, and, as the darkest would be the best fitted for the climate, this would at length become the most prevalent, if not the only race in the particular country in which it had originated." And so, conversely, of the white race in colder climates.

The "survival of the fittest" seems to us inevitable that we are disposed to agree with Mr. Wallace when he declares that there is better evidence of such selecting power in nature than even direct observation would be, viz. the evidence of necessity. It inevitably must be operative, if animals and plants increase by reproduction in a geometrical ratio while their actual numbers remain, on the average, stationary, which is part of every day; if they tend to vary; and if variations are heritable, in other words, if offspring tends to resemble parents and grand-parents, which no broader doubts and few attentive readers of the present work will be likely to question; and, finally, if the world and the conditions of nature be subject to change, however slow; and the slower the better for natural selection.

How much of what was susceptible or sterile in natural history and biology is to be explained or founded by this principle, or in this way of viewing things, is still under question. But, quite apart from the popular

notoriety of Darwinism, it seems certain that these ideas have powerfully, and we suppose healthily, stimulated scientific enquiry; and that their introduction within the last few years marks an era in natural science. Most estimable—perhaps we should rather say most natural philosophers—who have given attention to the subject appear to acknowledge natural selection as a new force, although few are convinced of its sufficiency, unaided, for the whole work which Mr. Darwin assigns to it. A greater number believe—indeed, the prevalent philosophical natural history of the day is largely based upon the notion, expressed or covertly implied—that species of the same genus, inhabiting the same or even more widely separated regions, are likely to have had a common origin; and, equally, that the plants and animals by which we are now surrounded are the modified representatives and descendants of those most like them in the last preceding geological age. That this should have been, however, are attributable only in part to Mr. Darwin, is clear from the fact of their earlier promulgation, more or less distinctly, by such leading paleontologists as Pictet and Debeaux, and their later maintenance by Owen and De Cuvillier, quite irrespective of natural selection, which these writers make little of. So that, in fact, ideas of the derivation of present species from preceding ones are equally held by two parties—by those who offer a natural explanation of the process, and by those who have no explanation to offer for what they nevertheless appear to have been a natural occurrence.

But we are not likely to forget that all such views, under whatever form or qualification maintained, do not pass unchallenged. If the new doctrine really prove to be false and mischievous, there is no occasion, of highest prominence, whose needless should never single him of having neglected to give due warning; who, upon all occasions, has treated his own views with a persistence worthy of old Caliban—worthy, coming from such authority, of much consideration. Confident, therefore, that whatever is wrong will be duly set right, we may pass on from these details to more practical matters.

Eight chapters of the first volume and 40 of the 42 wood-cuts are given to the illustration of the varieties of dogs and cats; horses and asses; pigs, cattle, sheep, and goats; domestic rabbits; domestic pigeons, swallows, ducks, geese, parrots, turkeys, Guinea fowl, etc., and a few pages to gold fish, live bees, and silk moths. Pigeons receive the fullest consideration, two whole chapters being devoted to them. The fish and 29th chapters are occupied with the coral and some of the commonest calcareous plants, fruits, and trees; and the 11th, with bud variation and some connected matters; also with the action of foreign pollen on the fruit, seed-corn, or other organs of the mother plant, and the analogous effects in animals of a first impregnation upon subsequent offspring. In the second volume the interest, both practical and scientific, centers in the three chapters on inheritance, and in the few following upon crossing and its results, the good effects of crossing, the evil effects of close inbreeding, the advantages and disadvantages of changed conditions of life, etc. Two chapters follow upon selection by man and its consequences; then five in which the causes of variability and the laws of variation are laboriously discussed, and one in which the "provisional hypothesis of panglossism" is propounded and explained.

The object of the hypothesis designated by this new word, is to connect intelligibly in some sound conception a variety of phenomena which, as an alternative consideration shows, must stand in some sort of relation to each other; to correlate the different modes of reproduction with each other and with growth, and also, in the lower animals, with the reproduction of sex parts; to form some notion as to how not only the characters but the productiveness of parents are transmitted to offspring, and even are transmitted from a male parent through a daughter, in which they do not and cannot appear, to a grandson, in which they do; how certain diseases are heritable and may similarly pass over one generation, to be developed in the next; how even remote ancestral characters may sometimes reappear in a descendant; how it is possible that a first impregnation may vitally affect a series of subsequent births; how hybrid plants, when self-fertile, in the succeeding generations are apt to mix, as it were in patchwork, rather than to combine the characters of the two constituent species, or to divide them among the individuals of a generation, some of them thus reverting to one of the parent types and some to the other. To explain these and the like, Mr. Darwin brings forward his "hypothesis of panglossism," which implies that the whole organization, in the sense of every separate atom or unit, reproduces itself, that "ovules and pollen-grains, and the fertilized seed or egg, as well as buds, tubercles and oozings of a multitude of groups throw off from each separate atom of the organism," reproducing and multiplying themselves, like white corpuscles and cells, and aggregating by elective affinity to produce cells or organs like those from which they were derived; so that

If each cell of a plant has the actual or potential capacity of reproducing the whole plant, it has it in virtue of containing autonomous stems detached from every part. So that "the child, strictly speaking, does not grow into the man, but includes germs which slowly and successively become developed and form the man." "Evolution depends on the transmission from the ancestor to his descendants of dormant germs, which occasionally become developed." "When we least it said that a man carries in his constitution the seeds of an inherited disease, there is much literal truth in the expression." "We cannot fathom the marvellous complexity of an organic being; but on the hypothesis here advanced this complexity is much increased. Each living creature must be looked at as a microcosm—a little universe, formed of a host of self-propagating organisms, microscopically minute, and as numerous as the stars in heaven." Physiologists, who chiefly will be intrigued in it, will comprehend the hypothesis from these brief statements, and will see that its germs are the constantly modified descendants of various earlier organisms. We have no space left for extracts and illustrations even of the less readable and more practical portions of these towering volumes.

Very interesting is the discussion of the ill effects of continued close breeding, which is so necessary to perpetuate and exalt the desirable characteristics of a race, yet at length as deteriorating that a cross now needs to be resorted to; and we think that Mr. Darwin has fairly shown that the evil is not exclusively attributable to the cumulative inheritance of morbid tendencies common to both parents, but has some deeper foundation in nature: for, as he says, "It is unfortunately too notorious that men and various domestic animals, endowed with a wretched constitution, and with a strong hereditary disposition to disease, if not actually ill, are fully capable of producing their kind." Domestication and civilization have served as experiments to determine the point. Under natural selection these traits in individuals would be speedily made way with. We find in another chapter (xi, p. 114) an illustration of this, and of "second cause" from the natural selective point of view:

"Concessive selection in the strictest sense of the word—that is, the saving of the more useful animals, and the neglect or slaughter of the less useful, without any thought of the future—must have gone on occasionally from the remotest period and among the most barbarous nations. Savage often suffer from famine, and are sometimes expelled by war from their own homes. In such cases it can hardly be doubted that they would save their most useful animals. When the functions are laid prostrate by war they kill their old women or food rather than their dogs, for, as we were assured, 'old women no use—dogs catch rats.' The same would almost surely lead them to preserve their more useful dogs when all hands were pressed by famine."

While contending that no distinct line can be drawn between natural and artificial selection, Mr. Darwin attributes the usually different aspect of the two to the fact that man selects and propagates modifications solely for his own use or fancy, and not for the creature's own good, while the wild animal, struggling with its immediate competitors and enemies, has every slight variation rigorously tested and preserved or rejected, and is thus kept in full beneficial harmony with his surroundings. And he claims that the wide difference of opinion as to whether certain domestic races have descended from one or from several aboriginal stocks, is good evidence that there is no palpable difference between races and species. He effectively compares the firm belief of breeders, that the race which they are raising

and slightly modifying cannot have come from common progenitors, with that of the naturalist, who is sure of the contrary, though he knows not how nor when they arose, and who in his own opinion the notion that the closely allied natural species which by descent have even descended from a common progenitor. "Mr. Darwin is convinced that "the long-continued accumulation of beneficial variations will habitually lead to structures as diversified, as beautifully adapted for various purposes, and as strictly co-ordinated as we see in the animals all around us." The relative potency of the variation and the selection he illustrates in this way:

"If an architect were to rear a noble and commodious edifice without the use of cut stone, by selecting from the fragments at the base of a previous well-founded edifice for his arches, sculptured stones for his tablets, and flat stones for his roof, we should admire his skill and regard him as the paramount power. Now, the fragments of stone, though inappreciable to the architect, bear to the edifice built by him the same relation which the fluctuating variations of each organic being bear to the varied and admirable structure ultimately acquired by its modified descendants."

And then, on the question which must needs come up: "In regard to the use to which these fragments may be put, their shape may be strictly said to be accidental. And here we are led to face a great difficulty, in ascribing to which I am aware that I am travelling beyond my proper province. An omniscient Creator must have foreseen every consequence which results from the laws imposed by Him. But can it be rationally maintained that the Creator intentionally selected, if we use the words in any ordinary sense, that certain fragments of rock should assume certain shapes so that the builder might erect his edifice? If the various laws which have determined the shape of each fragment were not pre-determined for the builder's sake, can it with any greater probability be maintained that he specially selected, for the sake of the breeder, each of the innumerable variations in our domestic animals and plants—many of these variations being of no service to man, and not beneficial, for more often injurious, to the creature themselves? . . . If we assume that each particular variation was from the beginning of all time pre-ordained, the plurality of organisms 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 as superfluous laws of nature. [Not superfluous, surely, if 'survival of the fittest,' signifies 'co-ordination,' and all the harmonious adaptation and diversity we behold are to result from the operation of these very laws.] 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 insolvable as that of free-will and predestination." The very same difficulty, indeed, and the same impossibility as that of drawing the line between the fixed and the contingent, either in the material or the moral world, in which both volition and established order play their mingled parts. But in Mr. Darwin's parallel, to meet the case in nature according to his own view of it, not only the fragments of rock (answering to variation) should fall, but the edifice (answering to natural selection) should rise, irrespective of will and choice!

We are informed that the enterprising publishers of the *American Agriculturist* propose to reprint Mr. Darwin's new work, under an arrangement with the author. In England the first edition was exhausted within a week.

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