

THURSDAY, JUNE 12, 1879

EVOLUTION, OLD AND NEW

Evolution, Old and New; or, The Theories of Buffon, Dr. Erasmus Darwin, and Lamarck, as compared with that of Mr. Charles Darwin. By Samuel Butler. (Op. 4.) (London: Hardwicke and Bogue, 1879.)

THE present work will not add to the reputation of the author of "Life and Habit." It is, nevertheless, an interesting and useful book, inasmuch as it gives a pretty full account of the theories and opinions of several authors whose writings are almost unknown to the present generation of naturalists. The sketch of the lives, and the numerous quotations from the works of the celebrated men named in the title page, are instructive and sometimes amusing. Quotations are also given from Mr. Patrick Matthew, Étienne and Isidore Geoffroy St. Hilaire, and Herbert Spencer, illustrating their views on evolution, and giving altogether a fair idea of the progress of modern thought on this important subject. But the main object of the book is to show that all these authors have been right, while Mr. Charles Darwin is altogether wrong; and that the works of the former contain a more philosophical, more accurate, and altogether superior view of the nature and causes of evolution in the organic world than those of the latter.

Mr. Butler finds in all the writers whose views he advocates, opinions which agree more or less closely with those so ingeniously and forcibly developed by himself, and to which full justice has already been done in the pages of NATURE (vol. xix. p. 479). No one can object to his adducing these points of agreement to fortify his own position, or to his arguing that his own hypotheses, thus supported, form an important and even a necessary supplement to the theory advocated by Mr. Darwin. But he goes much further than this, and maintains that the action of external conditions, combined with the desires and habits of animals, are the all-powerful causes of evolution, and that "natural selection," or "survival of the fittest," is comparatively unimportant, and is quite unworthy of the position given to it by Mr. Darwin and his followers. In doing this he not only falls into much confusion as to the phenomena of variation, but indulges in an amount of petty verbal criticism, quite unworthy of the high reputation established by his previous work; and I believe that naturalists in general will endorse the remark in my review of "Life and Habit" (which Mr. Butler has, apparently under the impression that this volume refutes it, placed in a conspicuous position on the fly-leaf of his book), that "the want of a practical acquaintance with natural history leads the author to take an erroneous view of the bearing of his own theories on those of Mr. Darwin."

In discussing the views and arguments of Buffon, Mr. Butler suggests that the numerous contradictory statements of this eminent writer are due to the necessity he was under of not arousing the enmity of the Church. He therefore adopts the method of directly contradicting himself whenever he has been a little too advanced. Over and over again he points out the evidence of the several families of animals and plants having each had a

common ancestor, and he specially mentions the horse and the ass, man and apes, as having been thus derived. But he puts it all hypothetically, and then, to satisfy the Sorbonne and the public, he proceeds thus: "But no! It is certain from revelation that all animals have alike been favoured with the grace of an act of direct creation, and that the first pair of every species issued full formed from the hands of the Creator." These, and numerous other passages quoted, certainly support the theory that many of Buffon's statements are ironical; and that while himself a firm believer in the development of all organisms from common ancestors, he purposely contradicted himself sufficiently to prevent the suppression of his work as being opposed to religion.

Most interesting among the quotations from Buffon, however, are those which show how near he was to seizing upon the idea of "selection" as a means of modifying organisms. Thus he says:—"The dog is short-lived; he breeds often and freely; he is perpetually under the eye of man; hence when—by some chance common enough with nature—a variation or special feature has made its appearance, man has tried to perpetuate it by uniting together the individuals in which it has appeared, as people do now who wish to form new breeds of dogs and other animals." And again, in discussing the origin of our cultivated fruits, &c., he says: "It was only by sowing, tending, and bringing to maturity an almost infinite number of plants of the same kind that he was able to recognise some individuals with fruits sweeter and better than others." Here he clearly recognises the selection of individual variations as the source of varieties, and the necessity for breeding or growing on a large scale, in order to obtain such individual variations as are required. But he never laid hold of this idea with any firmness; for we find him elsewhere dwelling on the influence of change of climate, food, and treatment, as having produced the changes in domestic animals and cultivated plants; especially change of climate while accompanying man in his migrations, and the action of these changes on habits "influencing their natures, instincts, and most inward qualities."

We next come to Dr. Erasmus Darwin, of whose life, writings, and opinions a very interesting account is given, and who is an especial favourite of Mr. Butler on account of his views as to the transmission of memory and habit from parent to offspring, and as to the existence of sensation and voluntary motion in plants, although he laid more stress on imitation and instruction than on inherited habits, and in this departs widely from Mr. Butler. Dr. Darwin anticipated Lamarck in arguing that the transformations of animals "are in part produced by their own exertions in consequence of their desires and aversions, of their pleasures and their pains, or of irritation or of associations; and many of these acquired forms or propensities are transmitted to their posterity." He also had a glimpse of the mode of action of sexual selection; for, speaking of the spurs with which the males of many game birds are armed, and which they use in fighting, he says: "The final cause of this contest among the males seems to be that the strongest and most active animal should propagate the species, which should thence become improved." We cannot see, however, that he had any clear notion of the general action of the law of the

survival of the fittest, nor of the important part it necessarily plays in the accumulation and perpetuation of variations, however these may be caused. In this respect he was probably not so enlightened as Buffon.

Lamarck's writings are very largely quoted and his opinions fully illustrated; and we freely admit with Mr. Butler that, as a thorough and consistent evolutionist, he was not inferior to Mr. Darwin himself. But although he clearly saw the *fact* of evolution, and almost demonstrated the reality of the fact by a variety of arguments and a wealth of observation, yet, so far from adducing any adequate *causes* for evolution, he was actually inferior to his predecessors Buffon and Dr. Erasmus Darwin, since he appears to have had no glimpse of the way in which domestic races have actually been produced by human selection, and still less of the action of the law of the survival of the fittest on animals and plants in a state of nature. Everything he imputes to changed conditions and changed habits, developing new desires in animals and inducing new courses of action. He dwells much on the time required for these changes, and considers that we have a practically unlimited amount at our disposal, remarking that "a time infinitely great *qua* man is still infinitely short *qua* nature."

Lamarck is exceedingly vague in his statements as to the cause and mode of change. After describing the different kinds of locomotion, walking, leaping, flying, swimming, and the great need of these powers of movement to most animals, he adds: "Since, then, the power of locomotion was a matter affecting their individual self-preservation, as well as that of their race, the existence of the want led to the means of its being gratified." He does not seem to have perceived the struggle between individuals of the same species owing to their excessive numbers, but only the struggle between distinct races; as when he says: "The strongest and best armed for attack eat the weaker, and the greater kinds the smaller. Individuals of the same race rarely eat one another; they war only with other races than their own." He also refers to the excessive multiplication of the smaller kinds of animals, and shows how their numbers are limited, but he never observed that the race was thereby invigorated and might even be modified. He sums up his theory in the following three propositions:—

"1. That every considerable and sustained change in the surroundings of any animal involves a real change in its needs.

"2. That such change of needs involves the necessity of changed action in order to satisfy these needs, and, in consequence, of new habits.

"3. It follows that such and such parts, formerly less used, are now more frequently employed, and in consequence become more highly developed; new parts also become insensibly evolved in the creature by its own efforts from within."

These arguments are repeated in a variety of ways, and are applied to explain the origin of all our breeds of dogs and other domestic animals, as well as of all wild species; and he evidently had no notion that though these may be real causes, they would be utterly inadequate to produce any such effects as we see in nature without the accumulating power of natural selection. Mr. Butler, indeed, maintains that this power is implied in Lamarck's reason-

ing. He maintains "that one [of the most important conditions of an animal's life is the relation in which it stands to the other inhabitants of the same neighbourhood—from which the survival of the fittest follows as a self-evident proposition." And he adds: "Lamarck would not have hesitated to admit that, if animals are modified in a direction which is favourable to them, they will have a better chance of surviving and transmitting their favourable modifications."

But it is clear that Lamarck neither saw it nor admitted it; and his theory is therefore radically deficient. And he evidently sees this deficiency himself, for he says that frequent crosses with unmodified individuals will destroy the effect produced, and that therefore isolation is necessary.

We come next to Mr. Patrick Matthew, who in 1831 put forth his views on the development theory in a work on arboriculture; and we think that most naturalists will be amazed at the range and accuracy of his system, and will give him the highest credit as the first to see the important principles of human and "natural selection," conformity to conditions, and reversion to ancestral types; and also the unity of life, the varying degrees of individuality, and the continuity of ideas or habits forming an abiding memory, thus combining all the best essential features of the theories put forth by Lamarck, Darwin, and Mr. Butler himself. The following quotations illustrate Mr. Matthews's views:—"As the field of existence is limited and preoccupied, it is only the hardier, more robust, better-suited-to-circumstance individuals who are able to struggle forward to maturity, these inhabiting only the situations to which they have superior adaptation and greater power of occupancy than any other kind; the weaker and less circumstance-suited being prematurely destroyed. This principle is in constant action; it regulates the colour, the figure, the capacities, and instincts; those individuals in each species whose colour and covering are best suited to concealment or protection from enemies, or defence from inclemencies or vicissitudes of climate, whose figure is best accommodated to health, strength, defence, and support; in such immense waste of primary and youthful life those only come forward to maturity from the strict ordeal by which nature tests their adaptation to her standard of perfection and fitness to continue their kind by reproduction." He then goes on to show how this law tends to the production of almost uniform groups of individuals which we term species, and then adds: "This circumstance-adaptive law operating upon the slight but continued natural disposition to sport in the progeny, does not preclude the supposed influence which volition or sensation may have had over the configuration of the body." This, he says, is a matter to be inquired into, as well as "its dependency upon the preceding links of the particular chain of life, variety being often merely types or approximations of former parentage; thence the variation of the family as well as of the individual must be embraced by our experiments." These, and many other passages, show how fully and clearly Mr. Matthew apprehended the theory of natural selection, as well as the existence of more obscure laws of evolution, many years in advance of Mr. Darwin and myself, and in giving almost the whole of what Mr. Matthew has written on the subject Mr. Butler will have helped to call atten-

tion to one of the most original thinkers of the first half of the 19th century.

The last four chapters of the work are devoted to a critical comparison of the theories of Mr. Darwin with those of Lamarck, Dr. Darwin, and Buffon, greatly to the disadvantage (in Mr. Butler's opinion) of the former. Much of this criticism, however, is merely verbal, and is quite valueless; much of it, also, is founded on a confusion as to the meaning of such terms as "variation" and "variety," and on an inability to grasp the fact of the extent and universality of the individual variations of organisms; while another portion arises from taking the hypotheses of Lamarck as established facts. Of these several classes of unsound criticism we will give a few examples.

Mr. Butler first quotes (p. 339) numerous expressions from the "Origin of Species," referring to our great ignorance of the laws of variation, and our total ignorance of the cause of each individual difference; and then speaks of Lamarck "having established his principle that sense of need is the main direct cause of variation," and that variations thus engendered are inherited, which sufficiently accounts for all the facts. If Lamarck had "established" anything of the kind, Mr. Darwin and all evolutionists would certainly have followed him, but he nowhere proves or even attempts to prove his "principle," but merely states it as an "hypothesis" to account for facts which he saw no other way of explaining. Again, Mr. Butler himself says, that owing to the conditions of life being permanent for long periods—"The thoughts of the creature varying will thus have been turned mainly in one direction for long together; and hence the consequent modifications will also be mainly in fixed and definite directions for many successive generations; as in the direction of a warmer or cooler covering, &c. . . . It is easy to understand the accumulation of slight successive modifications which thus make their appearance in given organs and in a set direction." The passages which I have italicised look like statements of fact—of what actually occurs; yet no such facts have ever been made known. If the law thus stated had been sufficiently effective to produce any permanent variations, breeders would sometimes have made use of it. Yet they certainly do not do so, whereas they do systematically and very successfully make use of selection. According to the above theory Australian sheep must have their thoughts constantly turned in the direction of less wool owing to the great heat of the climate, and a much larger proportion of each succeeding generation should have thin and scanty fleeces than occurs in England, especially in the tropical colony of Queensland, which, in proportion to its population, produces as much wool as the other colonies. If Mr. Butler could adduce, on good authority, such a fact as this, he would have some evidence in his favour, instead of which he can only make suppositions. The fantail and pouter pigeons, the crested Poland fowls, and all other strange domestic varieties, have been produced by selection of variations or sports which occurred among animals all subject to the same tolerably uniform conditions; while no proof has ever been given that anything more than very slight changes can be produced and perpetrated by change of conditions unaided by some kind of selection.

Mr. Butler's want of appreciation of what variation and

natural selection really are, is shown by his referring to "the fact that *one* in a brood or litter, is born fitter for the conditions of existence than its brothers and sisters"—by his continually laying stress upon Mr. Darwin not having shown "how the individual differences first occur"—by his thinking that because natural selection is not the cause of "variation" it is therefore not the cause of "modification" or of a "variety" or "species"—and by his hardly ever referring to the enormous multiplying powers of animals, and the consequent extermination of a much greater number annually than the whole average living population. In my former article on the works of Mr. Murphy and Mr. Butler (NATURE, vol. xix. p. 477) I have shown how we may look at the whole population of a species at any given time as divisible, with regard to any one of its characters, into a more and a less developed moiety, and I believe that this mode of viewing the question will at once almost entirely remove the coincident-variation-in-the-right-direction difficulty, which forms the great stumbling-block of almost all the opponents of Mr. Darwin.

The difficulty as to the "cause of variation" also disappears from this point of view, for "variation" is seen to be synonymous with "want of perfect identity" between any two organisms, and this is clearly due to the almost infinite complexity of structure and minuteness of parts of all living things and the absolute impossibility that any two can have passed through an identical series of conditions or even had an origin in two identical germs. We see infinite variety arise in the inorganic world where there is a far less complexity of structure or variety of conditions. Even among the sands on the sea-shore 10 two grains are probably so nearly identical that a good microscopist could not detect a difference; while it is certain that nowhere in the world are there two hills or two rivers with any approach to complete similarity, though the entire process by which many of them have been produced must have often been almost identical. Variation, such as *always* occurs between the individuals of a species, is therefore an ultimate fact of nature which wants no further explanation than that we cannot even conceive it to be otherwise. We may indeed conceive more likeness on the average than actually exists, but we cannot really conceive of *perfect identity* between individuals formed and developed as are animals and plants. We may, on the other hand, seek for the causes of unusual or abnormal variation, and Mr. Darwin has suggested several. It is quite possible that those suggested by Lamarck and Mr. Butler may also be real causes, but they have certainly not been proved to be so; and even if they had they would not in the least affect the law of natural selection which *accumulates and perpetuates variations*, however they may have been produced.

The numerous verbal criticisms or quibbles in which Mr. Butler indulges are quite unworthy of his subject. When Mr. Darwin says, "Variation will cause the slight alterations," Mr. Butler remarks that this is the same as saying "Variation will cause the variations." Again, Mr. Butler maintains that the term "conditions of existence" is identical with or includes "survival of the fittest," which is identical with "natural selection." Therefore, when Mr. Darwin says "natural selection is

the main but not the exclusive means of modification," he must mean "the conditions of existence are the main," &c., &c.; therefore he really agrees with Lamarck, whose opinions he has called "erroneous!" Again, because Mr. Darwin has once used the term *nature*, metaphorically, for natural selection, our author seizes hold of it for a little ridicule, thus: "When, therefore, Mr. Darwin says that natural selection is the most important, but not the exclusive means whereby any modification has been effected, he is really saying that nature is the most important means of modification—which is only another way of telling us that variation causes variations, and is all very true as far as it goes." In the same style the use of the term "by means of natural selection" is criticised, and the use of "natural selection" at all, when "survival of the fittest" is admitted to be a more accurate term; and Mr. Butler seems to think that if the latter term were always used, a great deal of the force of Mr. Darwin's arguments would be lost. I venture to assert, however, that every argument can be stated with equal accuracy and effect, using only "survival of the fittest;" but there is this great advantage in using the term "natural selection," that it keeps before the mind the striking analogy and almost identity between the action of man and of nature in modifying species, an identity that was never seen by any of the older writers, but which was first clearly apprehended by Mr. Patrick Matthew, and first fully worked out by Mr. Darwin himself.

In the last chapter Mr. Butler takes the celebrated case of the Madeira wingless beetles to test the respective theories of Lamarck and Charles Darwin, and he could hardly have made a more unfortunate choice. According to Lamarck, he says, when a beetle found the wind taking it in a wrong direction, *which it knew would be fatal to it*, it ceased flying, and thus, by long-continued disuse, gradually lost its wings. Here we have the assumption that such insects as beetles know beforehand that if blown out to sea they will be drowned, an assumption for which not one particle of evidence is adduced, while, as every entomologist knows, pages might be filled with facts proving that insects of various orders do not possess any knowledge of the kind, but year after year go recklessly to their death by myriads.

Hardly less weak than this statement of the Lamarckian theory is the objection to that of Mr. Darwin, which is as follows:—"For Mr. Darwin cannot mean that the fact of some beetles being blown out to sea is the most important means whereby other beetles come to have smaller wings—that the Madeira beetles, in fact, come to have smaller wings, mainly because their large-winged uncles and aunts go away." Though Mr. Butler has tried to put this so as to look like an absurdity, it is strange that he cannot see that it contains an important truth. If the "large-winged" beetles go away, the small-winged remains to breed, and each succeeding generation will have, on the average, smaller wings than the last; and if, so long as any fly at all, the larger-winged continue to "go away," at last none will fly, and then, the wings being unused, will become abortive and rudimentary. As a crucial case, and to compare the power of the two theories as agents of change, let us suppose them both applied to the human inhabitants of Britain. First we will suppose all the men and women above the average height to

go away year by year to Australia or elsewhere, while those under the average height remained. Does Mr. Butler doubt that at the end of, say, ten generations, the average height of English men and women would have been considerably reduced? This would be selection pure and simple. Now for the Lamarckian theory. Let all the people be taught (and believe) that to be short is to be beautiful and virtuous, and let all doors and all public vehicles be made low to suit short people and inconvenience tall ones, and moreover, let short people alone be eligible for a number of posts of honour and dignity, there would thus be created a general desire to be short oneself and to have short children, and the Lamarckian principle would be brought fairly into play. Now supposing that no artificial selection of any kind was practised, and that, owing to the prevalence of high moral principle, the health, lives, and affections of tall people were valued and cared for as much as those of their more favoured short fellow-countrymen, does Mr. Butler seriously maintain that at the end of ten generations any perceptible effect would be produced on the average height of the people; or that anything like the same amount of effect would be produced as by the other experiment? But if not, then "selection," whether natural or artificial, is the *main cause* or *means* of modification; the plain reason being that it accumulates differences which actually exist, whereas, by the other mode, you must produce an increase or diminution of these differences by causes which have not been proved to act at all, and which, even if they do produce any effect, can only do so with extreme slowness.

In conclusion, then, we may admit the possibility that the causes of variation adduced by Lamarck, as well as those so well set forth by Mr. Butler in his "Life and Habit," are real causes; we may further admit that some or all of these causes are essential to the origin and development of the more important organs of animals, and that they constitute the chief supplementary agencies the existence of which Mr. Darwin himself recognises; but, even admitting all this, we still maintain that they would be all powerless to effect great or permanent modifications without the accumulating action of natural selection, which may therefore be truly described as the "means" by which alone the "origin of species" has been actually brought about.

ALFRED R. WALLACE

OUR BOOK SHELF

Elementary Arithmetic and How to Teach It. By George Ricks, B.Sc. (London: Isbister, 1879.)

MOST school-books, especially those of an elementary character, are mere poison, and very disagreeable poison too. But Mr. Ricks has supplied us in this volume with really healthy food. We heartily recommend it to all young teachers, and believe, moreover, that many who deem themselves experienced may obtain from it several useful hints. In Part I. the teacher of an infant school is shown how to proceed with his pupils; in Parts II. and III. similar information is afforded to the teacher in a junior school; Parts IV. and V. relate to senior schools; Part VI. is devoted to advanced scholars. We have discovered nothing very remarkable in the latter half of the book; indeed, Mr. Ricks seems to get a little beyond himself as soon as he advances from the juniors to the seniors. This, however, is a matter of small consequence.