

THURSDAY, FEBRUARY 14, 1901.

DARWINISM AND LAMARCKISM,
OLD AND NEW.*Four Lectures by Frederick Wollaston Hutton, F.R.S., &c.*

Pp. x + 171. (London: Duckworth and Co., 1899.)

THE first of the lectures printed in this volume is entitled "Darwinism," and it was delivered at the Philosophical Institute of Canterbury, New Zealand, in 1887; the second, delivered in 1898 to the same Institute, is upon "The New Darwinism"; the third, "Darwinism in Human Affairs," was given in 1882 to the students of Canterbury College, University of New Zealand; while the fourth and concluding lecture, "The New Lamarckism," has been added to render the "treatment of the subject more complete."

The author's object has been to make a clear statement of his subject, suitable for readers who are not specialists and "have no time to study more elaborate works." Throughout a large part of the work he has succeeded in this attempt, although there are passages the meaning of which is not carried on the surface. Thus, at the beginning of the Introduction, a quotation from Darwin is concluded with the words, "This, which was published in 1859, is strictly correct at the present day"; while the next sentence, opening the succeeding paragraph, reads, "In 1899 things are different." By reading on, and then turning back to the preceding page, the apparent confusion is removed, but this is hardly the way to make things easy. Similarly, on p. 9, the word "transmitted" is used in a context which seems to imply heredity, and when the conclusion has been assimilated, the next sentence informs us that the word is not used exclusively in this sense.

The author considers that the increased prominence given to isolation "is the only real advance that has been made since Darwin's death" (p. 5); but surely the question of the hereditary transmission of acquired characters is in a totally different position to-day from what it was in 1882; and the change as regards this subject from the old uncritical, somewhat slipshod attitude of the past must be counted as a very real advance. Although Lamarck receives generous treatment in the book, Buffon is altogether neglected, his suggested causes of change in the direct influence of the environment being set down to the later zoologist.

Romanes' term, "physiological selection," is criticised because, "except in the bacteria, species are not founded on physiological characters." The suggested cause of evolution is more than doubtful, but the phrase is certainly a descriptive and appropriate one to express the idea that physiological incompatibility between the germ-cells of certain individuals and those of the rest of the species may be an agency which determines the splitting of a single species into two. The suggested substitution of the phrase "progressive infertility" (p. 12) by no means expresses Romanes' idea; for he conceived of the infertility arising, ready-made and complete, as the result of spontaneous variation. When the author states that species are not founded on physiological characters he forgets (although he himself recognises it elsewhere) that

the physiological characters of fertility *inter se* and of infertility with other species have been very widely looked upon as among the most important attributes of a species. Thus Huxley's criticism of the evidence for the acceptance of natural selection may be summed up in the words of his letter to Charles Kingsley:

"... if Carrier and Tumbler *e.g.* were physiological species equivalent to Horse and Ass, their progeny ought to be sterile or semi-sterile. So far as experience has gone, on the contrary, it is perfectly fertile. . . It has been obvious to me that this is the weak point of Darwin's doctrine. He has shown that selective breeding is a *vera causa* for morphological species; he has not shown it a *vera causa* for physiological species." ("Life and Letters," 1900, vol. i. p. 239.)

This quotation is introduced merely to show that there is good warrant for Romanes' use of the term "physiological" in this connection, not because the present writer believes that the suggested difficulty is insuperable.

One of the reasons given for the inference "that the object of physiological evolution was the development of man" seems to be very far-fetched, viz. the existence of a number of elements

"in the world which appear to be of no use except to man: for example, gold, silver, lead, zinc, &c. . . . Not only were these made for man, but they appear to have been made as rewards for the exercise of his intellect. There are other substances, such as the rarer elements, of which no use seems ever likely to be made except the important one of stimulating enquiry" (p. 19).

A similar conviction as to the meaning of the beauty and variety of organic forms is expressed on p. 107.

In the first lecture, "Darwinism," the interesting history of the author's personal experience of evolution is recorded. He had read the "Origin" on its first appearance with avidity, and could detect no flaw in it, but thought that this must be due to his own ignorance. He was soon afterwards convinced by Sir Andrew Ramsay, with whom he went on a geological excursion to the Isle of Wight. In 1861 he wrote an article on the "Origin" in the *Geologist*, and received an extremely kind and interesting letter from Darwin (p. 34).

In criticising Darwin's statement that he owed the idea of natural selection to Malthus, a very interesting passage from the "Journal of a Naturalist" is quoted, apparently proving that the fundamental ideas about natural "checks" and "constant food supply" were clearly fixed in his mind at a very early period (pp. 40-41). The reference is not given, but the important passage should be compared in the different editions of the "Journal."

The statement that Darwin abandoned his hypothesis of pangenesis, "or thought lightly of it" (p. 51), is erroneous. The great "Life and Letters" shows clearly enough that he retained considerable confidence in it even when friends whose opinion he valued very highly did not agree with him. The chief experimental difficulties which oppose it are not alluded to (pp. 59-60), viz. the fact that mutilations, even when continued for a long series of generations, are not inherited, and that transfusion of blood and transplantation of tissue do not produce any hereditary influence.

The second lecture, "The New Darwinism," contains at the outset (p. 63) an entirely new and erroneous definition of the term "Neo-Darwinian." "The Neo-Darwinians, as we are sometimes called, accept Darwin's teaching, and supplement the theory of natural selection with *methods of isolation*" (italics the author's). As is well known, the term was really applied to those who accepted only that part of Darwin's teachings which was originated by him, and excluded that small but distinct element of Lamarckian doctrine which he incorporated with his own. The history of the use of this term and "Neo-Lamarckian" is as follows. A school of Lamarckian evolutionists grew up in the United States, and reached its maximum about the time that the question of the hereditary transmission of acquired characters became acute, viz., 1887 and the following years. It consisted of Cope, Hyatt, Ryder and several other naturalists; W. B. Scott and H. F. Osborn belonged to it in those days. The members of the school chiefly looked at evolution from the point of view of palæontology. They called themselves Neo-Lamarckians, because they rejected Lamarck's more extravagant suggestions, but believed that in the remainder they had found a satisfactory basis for evolution. When, owing to Weismann's writings, the scope of heredity began to be rigidly investigated, many naturalists quickly recognised that grave doubt was thrown upon the whole of Buffon's and Lamarck's suggestions as to the causes of evolution, and they took their stand on natural selection alone among all hypotheses as yet proposed. In this they followed Weismann and Wallace, and they were called by those who did not agree with them "Weismannians" or "Neo-Darwinians," the term "Darwinian" being reserved for those who believed the whole of Darwin's teaching—the extrinsic element as well as that peculiar to him. This at any rate, was the attempted achievement of the labellers. The naturalists in question had never selected the label which it was sought to affix to them, nor were they pleased with it, as were the Neo-Lamarckians with their invention. They, or at any rate many of them, protested against the term "Darwinism" being used necessarily to include an element extraneous to Darwin, although accepted by him, of very doubtful validity, and liable, if entirely abandoned, to drag down with it the historic title derived from the name of the great English naturalist. "Darwinism," applied, as Wallace applies it, to the hypothesis which was originated by Darwin, is liable to no such objection, and these naturalists maintained that it is in every way appropriate to thus describe natural selection, the one and only suggested cause of evolution which seemed to them to possess any significance or value. The history of the whole controversy is to be found in letters and articles printed in this journal for several years following 1887.

In this second lecture many examples are given of what are believed to be useless specific characters (p. 69-73). The exigencies of space prevent any detailed criticism, but it may be generally stated that many of the cases cited are extremely unconvincing. The question of incipient variations is briefly alluded to without any reference to Dohrn's principle of "change of function," which offers so probable an explanation of many difficulties.

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One of the best features of the book is the use made of the natural history of New Zealand and the southern seas (as on pp. 87, 90, 91, &c.).

In the third lecture, "Darwinism in Human Affairs," there is a clear statement of the way in which selection acts on a group of competing individuals distinguished by variation (pp. 110, 111). The concluding sentence of the lecture, on p. 133, is distinctly out of place in a work of this kind. Those who have written on the relations of religious thought and doctrine to the teachings of science have always been welcomed by a large body of readers. But it is unwise, and, fortunately, rare, for the two sets of ideas to be jumbled together haphazard, so that in a professedly scientific work we are suddenly brought up with a shock by some short sentence expressing a religious conviction. The object which the author probably has in view is not advanced by such a method.

The concluding lecture, on "The New Lamarckism," contains much cautious and interesting reasoning upon various instances which are believed to prove the existence of the Lamarckian factors of evolution; although the part which the nervous system probably plays in many of the changes, such as those of pupæ (p. 141) and of mammalian hair (p. 142), is neglected. The opinion that retrogression follows as a natural result of the cessation of selection is rejected by the author (p. 157), as we might expect, seeing that he does not allude to the conception of a condition of unprogressive equilibrium still requiring the unremitting aid of selection for its support. In this lecture, too, there is a further dogmatic statement as to the uselessness of certain structures or features. Among these the white under-side of flat fishes is instanced as probably due to disuse-inheritance (p. 160); but Abbott H. Thayer's interpretation of white under-sides generally may very probably be applied (as, indeed, Mr. Thayer believes) during the movements of these fish. The statement that "the thickness of the legs of the moas was of no advantage to them. On the contrary, it was distinctly a disadvantage" (p. 160), is an example of dogmatism concerning conditions of life of which we are extremely ignorant.

The author is inclined to believe in certain examples of "disuse-inheritance," although he generally criticises the evidence for "use-inheritance." He forgets that passive structures which are useful, but not physiologically altered by their own utility, degenerate when they cease to be useful, no less than the active structures which are modified by their own use. This argument, *mutatis mutandis*, affects equally the supposed use-inheritance.

In the case of certain New Zealand alpine plants, it is contended that there is good evidence for the transmission of an acquired character. *Olearia nummularifolia*, var. *cymbifolia*, produces leaves characteristic of the local alpine plants, but "the leaves on new shoots revert to the ordinary form if the plant is removed to the low land; thus showing that the peculiar shaped leaf is an acquired character and not inherited." On the other hand, the alpine *Veronica lycopodioides*, having a leaf similar to that of the *Olearia*, does not change when grown at a low level, "and we must, therefore, assume that an acquired character has here become congenital" (p. 165). The probable explanation is that natural selection has rendered the former species susceptible to

the influences of two very different sets of conditions, while the latter has been led by it to a single fixed form suitable to a single set of conditions. This is only a suggestion, and might require modification after a special study of the circumstances of the two species; but it is sufficient to show that we require far more evidence before it can be conceded that such transmission had been made in any way probable.

The book is well and clearly printed. A portrait of Lamarck forms the frontispiece. E. B. P.

THE RATIONAL TEACHING OF MATHEMATICS.

The Teaching of Elementary Mathematics. By David Eugene Smith, Principal of the State Normal School at Brockport, New York. Teachers' Professional Library. P. xv + 312. (New York: The Macmillan Company. London: Macmillan and Co., Ltd., 1900.)

IN many training colleges for primary school teachers there are elaborate courses of study on psychology and ethics. Surely a knowledge of morals and of the mental machinery of boys and girls would be more certainly and more easily acquired incidentally during other studies, such as the natural sciences; but at these colleges there is seldom any attempt to educate through the natural sciences. We have, though not to the same degree, the same feeling about courses of instruction in mathematics. There is a cold-blooded formality about the mere name which tells all children truly that they are being offered stones for educational bread. But if there must, unfortunately, be separate courses of instruction in mathematics, we should, if we were children, dearly love to be taught by Mr. Smith. He is well read in his subject, and teachers who are also well read will take pleasure in seeing the best views so clearly put forward; teachers who are not learned in the subject will benefit greatly by reading this book. Short sketches of the histories of arithmetic, algebra and geometry are woven into the text in such a pleasant fashion that one reads and understands without much effort. The merits and demerits of various systems of teaching mathematics to very young children are clearly stated, but we cannot help thinking that too much is made of the philosophy of the numerous German exponents of pedagogy. There is no system which will give good results in the hands of a fool; there are many systems which will work fairly well in the hands of the average teacher; a thoughtful man who is in sympathy with his pupils will succeed with any method that he is likely to adopt.

Philosophers are too fond of distinguishing between teaching for *utility* and teaching for *culture*. We take it that even if we teach mathematics for its "bread-and-butter-value," if we teach so that a pupil really understands what he does, then we are really training his logical powers and giving him help in his ethical, religious and philosophical ways of thinking. The more we try to teach merely for culture the more do we make the reasoning obscure and difficult. As if a good teacher could possibly give sordid notions to his pupils! What we really want is that all teachers shall know their business, and then, however quickly they may

make their children cover the ground of elementary mathematics, and we say the quicker the better, the children will be taught as rational beings. Much of the arithmetic taught in schools is really the teaching of a trade. A particular rule like *Practice* is merely the application of arithmetic to the trade of a grocer. So also rules like *Interest* or *Discount* are labour-saving rules, useful when one has thousands of calculations of the same kind to make, easily learnable by a boy after he leaves school if he has a knowledge of simple arithmetic and if his common sense has had a fair chance of development. Children may be kept for years at "rules" of arithmetic which they never understand, by an unscientific teacher, and this is what the philosophers condemn as utilitarian teaching. There is as little *utility* about such teaching as there is *culture* in that of the equally unscientific follower of the greatest psychologist. Of the two, however, the unscientific utilitarian does least harm, for he makes least pretence; he only stupefies the brain, the other destroys the soul.

Indeed, the man who aims exclusively at culture always hurts the soul of his pupil, for he teaches that what is useful must be low, and that the study of it must lead to sordid thought. We can no longer afford to laugh when men assure us that they scorn the results of their studies when these results prove to have useful applications. So long as these men were few in number they might be laughed with; we laughed because they were paradoxical and because we did not fear that the utility of a study could really be lost sight of. We are always grateful to philosophers who discover new truths, whatever their notions as to their utility may be. But when the stupid admirers of these men erect their paradoxes into articles of belief; when headmasters with much capital invested in teaching machinery find that such articles of belief give a fictitious value to their invested capital; when as a result, 98 per cent. of the boys leaving school at seventeen to nineteen years of age know no mathematics, although they are supposed to have been studying mathematics for many years; when we have overwhelming proof from the fields of war and commerce and manufacture that the best race of men in the world is held by want of education, as if by enchantment, from exercising its natural powers—then we feel that the time has come when a crusade ought to be preached against the pestilent heresy.

We are very glad to think that Mr. Smith gives great weight to the opinions of Profs. Henrici and Minchin about mensuration and geometrical teaching. Lacroix expressed them clearly, so did Clairaut and Voltaire and Hôüel and Spencer and Langley, and many another educationist. Laisant says, "But just as there must be a preliminary preparation for arithmetic—namely, practical calculation—so theoretical geometry should be preceded by the practice of drawing." Rousseau said that for young pupils "geometry is merely the art of handling the rule and compasses." Mr. Smith describes the use of shears and cardboard, and he suggests how to follow Galileo's experimental and inductive methods in mensuration, even with boys of intermediate grades. As for demonstrative geometry, Mr. Smith says that in America it usually begins in the tenth or eleventh school year.