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*DARWIN AND DARWINISM.*

*Charles Darwin and the Theory of Natural Selection.*

By Edward B. Poulton, M.A., F.R.S., F.G.S., F.L.S., &c., Hope Professor of Zoology at the University of Oxford. Pp. 224. (London, Paris, and Melbourne: Cassell and Company, Ltd., 1896.)

AFTER the one-volume "Life and Letters" by Francis Darwin, and the admirable little book by Grant Allen in the "English Worthies" series, there seemed to be little room for another English work upon the same subject; yet the present small volume is markedly original, and while following pretty closely the general lines of the "Life and Letters," introduces much new matter, and gives a fuller account of what may be termed the critical points of Darwin's theories than are to be found in any of the works here referred to. It is written in a thoroughly sympathetic, though impartial, spirit; and without introducing any actual criticism, either of the views of Darwin or of his opponents (which would have been manifestly out of place in a popular work), it yet makes clear the differences of opinion that now exist as to some of Darwin's most cherished theories, and, while briefly stating the main facts and hypotheses on both sides, leaves the reader in no doubt, both as to the exact nature and importance of the opposing views and the kind of evidence that is required in order to decide which is most in accordance with the facts of nature.

The first seven chapters deal with Darwin's life down to the year 1856, the facts of which are so widely known that they call for no special notice. Though much condensed, they supply all the information needed by the general reader; and we will only quote the following estimate of character as due to heredity, which is very suggestive:

"It appears probable that Charles Darwin's unique power was largely due to inheritance of the imagination of his grandfather, combined with the acute observation of his father. Although he possessed an even larger share of both these qualities than his predecessors, it is probable that he owed more to their co-operation than to the high degree of their development."

While believing this estimate to be generally correct, it appears to the present writer that two other important factors have been usually overlooked—the solitude of the five years' voyage and the persistent ill-health. During a very large portion of the five years with the *Beagle*, Darwin must have been practically alone and thrown on his own mental resources, not only on the ship when all the officers would be engaged on their duties, but during his numerous land-journeys and excursions on shore; and this mental solitude of an active mind, furnished continually with new and interesting facts on which to exercise the imaginative and reasoning powers, led to the formation of those original and suggestive ideas which were the foundation of his greatness. Hardly less important was the almost continuous ill-health, which, while not preventing work or shortening life, obliged him to live in the country, free from the dis-

tractions of society, and where his active mind could only be satisfied by continual study and experiment. Without the solitude of the voyage the fundamental idea of natural selection might never have been attained; with vigorous health that wonderful series of experimental observations in the quiet and solitude of Down, without which the "Origin of Species" would have lost much of its convincing power, would almost certainly not have been made.

Chapters viii. to xii. are devoted to the relations between Darwin and the present writer, about which nothing need be here said, except that they contain some new matter, and while too flattering to myself, appear to be quite accurate as to the facts.

The next six chapters are devoted to a sketch of the writing and publication of the "Origin," and the influence of Darwin upon his more eminent friends and correspondents; and of these chapters the most original and important is the eighteenth, on the "Influence of Darwin upon Huxley." Prof. Poulton here points out the misconceptions prevalent as to Huxley's exact views, showing that the one and only point on which he considered the theory to fail in logical completeness was the absence of proof of infertility arising among the most divergent races of domestic animals, a difficulty which still exists, but which may possibly be set at rest by systematic and long-continued experiment. This difficulty, however, applies equally to all other theories; while, if the argument of the present writer is sound—that, under certain conditions which are frequently present, the variations in fertility which undoubtedly occur will be accumulated by natural selection, we not only have the general occurrence of infertility between allied species explained, but we also see why such infertility does not arise among varieties due to man's selection, since he has never attempted to produce it. A more thorough examination of this problem seems, therefore, to be called for.

Chapters xix. and xx. are devoted to an interesting exposition of the various misconceptions and misrepresentations of the theory of natural selection, which caused so much trouble and annoyance to Darwin, misconceptions which are still prevalent, as shown by Lord Salisbury's recent address, and by passages in Prof. Cope's last book (see NATURE, vol. liii. p. 554). These chapters are therefore very opportune, and may do something to show the public that a large proportion of Darwin's critics have not taken the trouble to understand the theory to which they take exception.

The next two chapters are perhaps the most original and important in the volume, since they contain a very careful summary of Darwin's celebrated theory of Pangenesis. To most of the readers of this work these chapters will be entirely new, and will give them in a very readable form some idea of the exceedingly varied and complex phenomena of "inheritance" which the theory was formed to explain. Among these are sexual and asexual reproduction, the complex phenomena of variability and inheritance, the diversity of embryonic changes during development of allied groups, the phenomena of graft-hybrids, the reproduction of lost parts, the sterility of hybrids, reversion to ancestral forms, and many others. Besides these there are the

doubtful phenomena of the inheritance of the effects of use and disuse and of other acquired modifications of the individual by external conditions, which Darwin accepted as a fact, though he remarked upon it: "Nothing in the whole circuit of physiology is more wonderful."

Every one who reads this account of Pangenesis will feel admiration for its ingenuity, and surprise at the completeness with which it can be made to explain all the varied phenomena of inheritance, though some of these explanations seem more verbal than real. Readers will also understand the fundamental difference between this theory and that of Weismann; and will see, that in order to decide which best explains the whole series of phenomena, the inheritance or non-inheritance of acquired characters, as a matter of fact, must first be settled.

The difficulty of conceiving the actual operation of the theory of Pangenesis may be best illustrated by an example. Taking a bird, such as a peacock, the theory implies that not only every cell and fibre of bone, muscle, skin, and all internal organs gives off gemmules which all find their way into every one of the cells constituting the sperm or reproductive fluid, but that every one of the feathers also sends gemmules from each of the cells that build up its wonderfully complex structure, not only in the adult stage, but in the condition they assume in the young and adolescent birds; and further, that every detail of varying colour of the barbs of these feathers send off their gemmules, and that all this inconceivable number of gemmules must travel through the whole structure of the quill, and through all the tissues of the body, till they reach the reproductive organs, and every one of these gemmules must reach all or most of the sperm-cells, failing which there would be a corresponding deficiency in the offspring. But as important deficiencies of feathers, or of colour on the various feathers, which produce the beautiful patterns and ornaments of a bird's plumage only rarely occur, we must assume that the passage of the millions of gemmules from the ends of the feathers of a peacock's train through the whole length of the shaft, and then to the sperm-cells, is almost always successfully accomplished. In addition to the enormous difficulty, on any theory, of conceiving the processes of growth and development of the complex parts of living organisms, we have, on this theory, an equal or greater difficulty in the reverse process, by which the gemmules from every cell get back again to the sperm and germ cells. Without asserting that this process is impossible or inconceivable, it is well to endeavour to realise what it really is and its almost incredible complexity.

Prof. Poulton gives a brief account of the experiments made by Mr. Galton and the late Mr. Romanes to test the theory of Pangenesis, by the transfusion of blood and the transplantation of skin, from one variety of animal to another, and then breeding from the modified individuals; but in no case was any effect produced on the characters of the offspring. Though, perhaps, not quite conclusive, these experiments indicate that there is no such continuous transference of gemmules as the theory requires.

The remaining three chapters deal with the descent of man and sexual selection, the various botanical works,

and a series of hitherto unpublished letters to Prof. Meldola, chiefly interesting as illustrating Darwin's kindness to all students of natural history, and the amount of trouble he took to be of use to them.

On the whole, Prof. Poulton is to be congratulated on the production of so interesting a book, which in a wonderfully limited space gives a connected account of Darwin's life and work, and especially of some portions of his theories which have been almost neglected by other writers. A good print, from a photograph, of Darwin's statue in the Natural History Museum, forms the frontispiece of the volume.

ALFRED R. WALLACE.

#### LIFE OF BRIAN HOUGHTON HODGSON.

*Life of Brian Houghton Hodgson, British Resident at the Court of Nepal.* By Sir William Wilson Hunter, K.C.S.I., M.A., LL.D. Pp. 389, 8vo. (London: John Murray, 1896.)

IN this charming volume Sir William Hunter has compiled a worthy memorial of one of the most famous of our Indian civilians, one of the very few who have been able to rise above the details of their daily work, and to take a real intellectual interest in the history or the science of the strange people and lands in which their life is cast.

Born in 1800, young Hodgson, who had influential relatives, was in 1816 offered a nomination to the East India Company's service, and entered Haileybury College, where all the civilians were then trained. Malthus was then Professor of Political Economy in the college, and happened to be an old college friend of an intimate friend of the Hodgsons. Advantage was taken of this to introduce the new scholar, and Malthus not only made him his guest during the first session, but remained throughout the lad's college residence his constant friend. Henry Walter had also just joined the college as Professor of Chemistry and Natural History, and Sir James Mackintosh became Professor of Law two years afterwards. No doubt the future scholar and collector owed very much to the teaching of Malthus and Walter, and to the personal friendship of the former; though the traces of their influence on any other of the collegians of the time are not conspicuous.

In December 1817 Hodgson passed out of Haileybury as gold medallist and head of his term, and sailed in the following year, round the Cape, to Calcutta. Sir Charles D'Oyly, the Controller of Customs, a connection of Hodgson's family, and a man of much artistic and literary culture, welcomed him, and made his house his home. Not only were the D'Oylys leaders in Calcutta society, but Sir Charles had only lately brought out a book on the antiquities of Dacca. And it was through the influence of Lady D'Oyly, a near connection of the Governor General's, that young Hodgson was shortly appointed assistant to the Commissioner of Kumaun—one of those appointments in the hills, then very few in number, reckoned among the prizes of the Service.

Kumaun had only just been taken from Nepal by the English; and the duties of the new Assistant consisted chiefly in helping to make a revenue settlement in the new province. The fine air of those lofty valleys soon