

THURSDAY, NOVEMBER 25, 1909.

## THE "ORIGIN OF SPECIES" AND ITS LESSONS.

*Charles Darwin and the Origin of Species; Addresses, &c., in America and England in the Year of the Two Anniversaries.* By Prof. E. B. Poulton, F.R.S. Pp. xvi+280 and index. (London: Longmans, Green and Co., 1909.)

ON November 24, 1859, appeared the first edition of that immortal work—the outcome of twenty years' research—which was destined to revolutionise scientific thought, first in the domain of organic nature, and ultimately in every department of intellectual activity. The celebrations of the jubilee of this publication and of the centenary of the birth of its illustrious author, held at Baltimore in January, at Oxford in February, and at Cambridge in June of the present year, have been the means of directing public attention in such detail and in such forcible terms to the magnitude of Darwin's achievements and to the far-reaching consequences of his labours that it may well be doubted whether any further tribute can be paid to the memory of our great countryman. Nevertheless, on the present occasion, practically coincident with the fiftieth anniversary of the publication of the "Origin," it is only appropriate that we should direct attention in these columns to the latest contribution to Darwinian literature, the above work by Prof. Poulton, which the author has happily contrived to issue on the exact date of the anniversary. The readers of NATURE may be reminded that in these pages, to which Darwin himself was a rare contributor, some of the greatest questions raised by the publication of the "Origin" have been fought out by the leaders of science in that field of natural knowledge which, at the touch of what Helmholtz designated the "new creative thought," became reduced from a state of chaos to one of scientific order.

Of that generation of naturalists who were active workers before the publication of Darwin's book, there are but few survivors. Alfred Russel Wallace, to whom the present volume is appropriately dedicated, Sir Joseph Hooker and Sir Francis Galton are happily with us. But the later generations, who have been taught to accept organic evolution as an established doctrine, are apt to overlook the extent of their indebtedness to that memorable publication of Darwin's half a century ago. Before the appearance of that work the group of sciences now comprised under the general term Biology were still under the thralldom of an ancient cosmogony from which the physical sciences had been emancipated, if not completely at least to a very large extent. The year 1859 marked the beginning of what may fairly be described as the Reformation Period of biological science. At some future period, when the progress of knowledge shall have enabled a still later generation to obtain a just perspective of the bearing of Darwin's work upon the current thought of his time, a re-publication of some of the arguments that were urged against his teachings will furnish most instructive material for the

historian of science. What impression would be produced now, for example, by a critic who in a scientific journal gravely opened an attack upon the "Origin of Species" with the remark:—

"It will not be denied, we presume, that animals were created for the use of mankind. Man was to have dominion over them" (Edinburgh New Philosophical Journal, 1860, vol. xi., p. 283).

The reviewer concludes with a general appeal to the churches to unite in demolishing the new heresy.

The work now under consideration which has prompted the foregoing retrospection is by an author so well known as one of the soundest of the modern interpreters of Darwinism that a brief summary of its contents will suffice to commend the book to the serious consideration of all naturalists. More especially do we commend this, as also Prof. Poulton's other writings, to those who have caught up the cry, popular in some circles, that although evolution is established Darwinism is dead, or, to quote from the preface, to those who "recognize a prophet in every reed shaken with the wind." Of the seven chapters in this new memorial volume, the first ("Fifty Years of Darwinism") is revised and extended from the address given at the centenary in Baltimore in January; the second ("The Personality of Charles Darwin") is compiled from notes of a speech delivered on the same occasion; the third gives an account of the centenary celebration at Oxford and the speeches made on that occasion; the fourth gives the speech delivered by the author at the banquet at Cambridge in June, and the fifth ("The Value of Colour in the Struggle for Life") is reprinted from the Cambridge memorial volume, which was noticed in these columns at the time of the international celebration last June vol. lxxx., p. 481). Chapter vi., which will be new to most of our readers, is on the mimicry in the butterflies of North America, and is compiled from notes of the anniversary address delivered to the Entomological Society of America at Baltimore in December, 1908. The seventh chapter contains a number of letters written by Darwin to Mr. Roland Trimen and hitherto unpublished. As with all Darwin's correspondence, it is perhaps hardly necessary to say that these letters will be found most delightful reading, and their interest is enhanced by Mr. Trimen's own reminiscences of Darwin and by the recording of the most severe and perhaps the only severe thing that our magnanimous leader ever said of a scientific contemporary.<sup>1</sup>

In addition to these chapters, there are four appendices which are by no means the least interesting sections of the work. In the first of these, Darwin's views on the hypothesis of multiple origins are summarised, and in the second his conclusions with respect to what are now called "mutations" are marshalled in systematic order, and leave no doubt that this mode of evolution had over and over again been considered by him and always rejected as a *modus operandi* in nature. The mutation theory is happily paraphrased by Prof. Poulton in the preface

<sup>1</sup> The remark referred to (p. 28, note) is quoted from Prof. Poulton's article in the *Quarterly Review* of last July.

as "based on the conception of an inborn transforming force violently discharged at regular intervals by every species of times past, present and to come"—a view on all fours with that upheld by the late Duke of Argyll, and which formed the subject of a criticism in these columns by the present writer at the time of its promulgation ten years ago (vol. lix., p. 217). It is the old "internal developmental force" let off sporadically instead of continuously, only subject, according to the founder of the theory, to control by natural selection.

In the third appendix, as in his Oxford speech, the author refutes once and for all the absurd and unwarrantable conclusions respecting the mental degeneration due to the exclusive pursuit of science which certain writers have based upon Darwin's description of his declining artistic faculties with the advance of age. The last appendix is particularly striking, as it brings out for the first time a remarkable discrepancy between the views of the founder of the modern theory of mutation (de Vries) and certain English supporters of that theory (Bateson and Punnett) respecting the fundamental question of the transmissibility by inheritance of individual differences or "fluctuations." According to de Vries these fluctuations are transmissible; if they are not, the whole fabric of the Darwinian theory is, it is needless to point out, overturned. The elucidation of this point seems to be one of the most urgent problems awaiting attack by experiment.

The valuable contributions to the Darwinian theory with which the author of the present work has been for so many years identified have been mainly in that most fascinating field of the relationship between the colours of animals and their environment—a subject which first led the present writer to the serious study of the "Origin of Species" more than thirty years ago. In this class of phenomena, adaptation is obvious to those who do not wilfully close their eyes to the evidence. If this adaptation is not explicable by natural selection, then that principle can be applicable in no other department of organic nature. It is not going too far to say that with the proof or disproof of the utility of these resemblances in colour, form, pattern and habit which are so abundant in the insect world, the whole question of the validity of the Darwinian theory is bound up. Darwin himself foreshadowed this application; so also did Wallace. Bates, Wallace, and Roland Trimen applied it to mimetic resemblances, Thomas Belt was a contributor, and Fritz Müller in 1879 gave us a new and important lead. Its application to the development and use of the markings of caterpillars was among the early and by no means least important of the contributions to biological science by August Weismann. No writer in modern times has done more than Prof. Poulton to place this application of Darwin's theory upon a sound scientific basis, and not the least interesting of his contributions is to be found in the sixth chapter of the present work, wherein he traces with masterly hand the mimetic influence exerted by certain Old World butterflies upon the insects of the New World into which they are comparatively recent immigrants. Such a clear case as this, in which the direction of

modification is not open to doubt, disposes at once of the theory that similar environmental influences produce similarity of colour and pattern, for here it is the old inhabitants of the country and not the later immigrants that have been modified in the direction of mimetic resemblance.

It may be permissible on the present occasion to extend one's contemplation of the book immediately under notice to certain wider considerations which arise from the work which has for so many years been carried out in the Hope Department of the University of Oxford. That work bears throughout the stamp of Darwin's influence, and stands as living testimony that the central doctrine proclaimed in the "Origin of Species" half a century ago is still a vitalising power. It will not be considered presumptuous to recommend to a generation which has been told that the species question is not even ripe for discussion a critical re-perusal of Darwin's classic. Thereby it will be made evident that for the author of that work, nature was a living whole—a frame of mind from which modern specialisation is unfortunately leading many of the younger workers astray. The breadth of view which enabled the author of the "Origin" to mould whole branches of science into his service must for all time be a matter for admiration and wonderment. How comprehensive that view really is may be inferred from the circumstance that there is scarcely one modern development of the species question—perhaps none with the exception of the long neglected work of Mendel—which in principle, if not in detail, is not foreshadowed in the "Origin." Even the all-important question of the transmission of acquired characters appears to have been raised, and to have been considered by Darwin, as may be gathered from an apparently forgotten passage in the "Origin" to which the writer has directed Prof. Poulton's attention, and which is quoted fully in the last appendix to the volume under consideration (p. 273).

Some other lessons conveyed by Darwin's "Origin of Species" may perhaps be worthy of consideration at the present time. We have heard much of late years about the want of public interest in science being due to the technical and popularly unintelligible language in which investigators express their results. The answer to that charge can best be given by pointing to Darwin's writings as a whole; these, although scientific in the technical sense, being nevertheless popular in treatment and commanding a sale never before realised by any set of treatises on purely scientific subjects. From this experience it is fair to conclude that unintelligibility is at any rate not a necessary accompaniment of sound scientific exposition.

The tendency to specialisation which is becoming more and more characteristic of modern scientific work is not in itself an unhealthy sign. It is the necessary consequence of the growth of knowledge on the one hand and of the limitation of the human intellect on the other. All the good work turned out by our investigators at the present time is the result of such specialisation. As time goes on, the increase in the mass of material and in the number of workers

must reduce still further the limits within which the individual worker can hope to make substantial contributions to the knowledge of his subject. The danger to be guarded against is the unhealthy development of the effects of specialisation. Although it may no longer be possible to obtain a comprehensive grasp of a whole group of sciences, there still remains the lesson conveyed to the scientific world by Charles Darwin's work—that extreme concentration upon one particular investigation need not produce mental atrophy in other directions. There may be a narrowness of outlook produced by extreme specialisation which, if not guarded against, may easily pass from mere narrowness to actual illiberality of mind. This in its way is quite as unscientific, as it is certainly more dangerous in its immediate effect upon our younger contemporaries, as the shallowness arising from too great a diffusiveness.

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### ALPINE HYDROLOGY.

*Service d'Études des grandes Forces hydrauliques (Région des Alpes.)* Tome iii. Résultats des Etudes et Travaux au 31 Décembre, 1907. Pp. 688; with maps, photographs, and diagrams. (French Ministry of Agriculture, 1908.)

IN May of last year (vol. lxxviii., No. 2010) there were reviewed in these columns two volumes rendering an account of the initiation of a hydrological service in France, formed for the purpose of studying the rivers and watercourses of that country, which were capable of developing power for, and otherwise benefitting, industrial and agricultural pursuits. The purview of the inquiry was to be restricted, in the first instance, to the region of the Alps, to be extended later to the Pyrenees, and ultimately, no doubt, to include the Vosges and the hilly districts of the north and west. At the time of the issue of the volumes in question, the results of these investigations were only forthcoming in systematised form so far as the close of the year 1905, and operations had been confined to a certain portion of the Alpine watershed, the work being carried out under the supervision of two engineers, MM. de la Brosse and Tavernier, the former of whom reported on the basins of the Arve and the Isère, and the latter on the regions of the Durance and the Var.

The book before us is the third volume of the series, and it forms a compendium of figures and statistics no less impressive than its predecessors. It continues the account of the studies prosecuted by M. de la Brosse during the years 1906 and 1907. These relate to the northern district of the Alps, included between the bed of the Rhone and the Italian frontier on the one part, the Lake of Geneva and the basin of the Durance on the other part.

The southern district, from the basin of the Durance to the Mediterranean littoral, under the direction of M. Tavernier, is to form the subject of a subsequent volume.

M. de la Brosse commences his report with an enumeration of the gauging stations within his district of 26,000 square kilometres (10,000 square miles),

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showing that they have increased in number from 30 in 1903 to 60 in 1905, and to 100 at the present time. The number of separate gaugings taken in 1907 was more than a thousand. Nearly all the stations, he remarks, are of the foot-bridge type, the exceptions being in watercourses of considerable width, where barges were employed, and in places of considerable difficulty of access, where the only available method was to employ a skiff suspended from a cable fixed at some suitable level. The foot-bridge, from its greater security and convenience, proved by far the best system, and a number of interesting photographs show the variations in design at different stations to meet local peculiarities.

The instruments used for gauging were described in some detail in the first volume, and the only comments now made in connection with them, after some experience of their working, relate to a few trifling modifications and minor improvements in design. A calibrating station for testing current-meters was established at Grenoble in 1906, and this has been found a considerable convenience, as, prior thereto, the instruments had to be dispatched to the hydro-technical laboratories of Berne or Munich.

The station in question comprises an electrical apparatus, mounted on a framed platform, set in a quiescent sheet of water forming part of a fortification moat. The apparatus is actuated by a triphase motor of 5 horse-power, which enables various degrees of speed to be imparted to a movable arm carrying the instrument to be tested, ranging from a few centimetres to nearly 5 metres (say, an inch to 16 feet) per second. By a circuit connection the number of revolutions of the screw is signalled at periods of from 25 to 50, and a simple calculation therefrom determines the relative speed in a moving medium. The process requires the services of two operators and two assistants, lasts from one to two hours, and (including the cost of the electric current) involves an expense of 1*l.* per instrument dealt with.

During the two years 1906-7, surveys have been made of the basins of the Dranses, the Ussets, the Fier, the lake of Bourget, the Guiers, the Bourbre, the Gère, the Collières, the Galaure, the Drôme, the Roubion, the Lez, and the Eygues, all tributaries of the Rhone, and comprising an area of 918,643 hectares (2,300,000 acres). These basins are all separately delineated in the volume under review in a series of charts to a scale of 1/200,000, which are accompanied by tables recording various analytical particulars of the component sections, according to superficies and altitude.

A noteworthy feature of several of the smaller basins (especially that of the Collières) is the disappearance and reappearance of streams in and from subterranean passages, resulting oftentimes in several changes of name for a single watercourse, the identity of which can be established without serious difficulty throughout its apparently disconnected track. For example, the same waters feed successively the Reval, the Orou, and the Collières, which thus constitute really a single stream.

An interesting extension of these topographical investigations has been made in reference to some of