

revision (to our mind abundantly justified) of Herbert Spencer and Bain's theory of "overproduced movements" in mental ontogeny; and especially, perhaps, in the tracing of his own theory of knowledge to its outcome in the doctrine of "genetic modes," he often uses a notation which to biologists as such may seem somewhat unfamiliar. No one, however, who is at the pains to follow him through his chains of argument, often intricate, but with few exceptions consistent and intelligible, will be inclined to deny the great service he has done in submitting the problem of organic development to philosophical analysis.

It will be satisfactory to those biologists who still regard Darwin and Wallace as the true founders of a rational theory of evolution that the author, in demonstrating the inadequacy and improbability of use-inheritance, and in rightly laying stress on the importance of individual adjustment and of social transmission, does most explicitly assert the dominance of natural selection. "The value of accommodation," he allows, "is implicit in the theory of natural selection," and in more than one place (as in chapter xii., with its comprehensive table of the various kinds of "selection") he expresses his concurrence with Prof. Poulton's statements to the same effect. There is thus no room to doubt of his attitude towards the general question; but it is somewhat surprising, and, we think, regrettable, that in the case of the "highest and most specialised form of accommodation," viz., the intelligence, Prof. Baldwin speaks of the resulting "emancipation from the operation of natural selection and from dependence upon variations" in a way that seems open to misconstruction. There can be no such emancipation in the long run. *Naturam expelles furcâ, tamen usque recurret.* Whatever allowance we make for individual adjustment to environment, whether it be intelligent or not, there will be no reason to say that "the struggle for existence is in some degree done away with" unless we limit our outlook to variations other than variations in plasticity. It is true that the struggle is transferred "in some degree" to the sphere of the latter, but the "direct action of natural selection" is not thereby evaded. All individuals but a few (comparatively) are still eliminated in virtue of the same failure of correspondence with the environment; only this failure is, or may be, in the individual's power of accommodation, not in his invariable or fixed endowment. If, on the other hand, we were to hold, as Prof. Osborn seems to do, that this plasticity is an inherent power or function of protoplasm undirected and uncontrolled by natural selection, we should, of course, find ample reason for Prof. Baldwin's expressions. But he makes it elsewhere perfectly clear that he differs on this point from Prof. Osborn, and we therefore think that he would do well on a future occasion to avoid the appearance of putting plasticity, in its relation to selection, on a footing distinct from that of other qualities. It would be hard to show that any characteristic property of protoplasm did not take its share in the "fundamental endowment of life" and was not "part of its final mystery." Where, then, is the justification for claiming an exemption for one property which is not claimed for all?

We should have much more to say, did space permit,

in commendation of this excellent and stimulating book. Many of the points raised are enticing subjects for discussion, but those features that call for adverse criticism are few in number and of little importance. The plan of the work, several chapters of which have already appeared under other conditions, necessarily involves a certain want of system and concentration; nor must the reader expect to find all that deals with one part of the subject gathered into one place. On the other hand, the author is enabled to enforce his arguments by repetition, and, as a sentence in his preface reminds us, "to the psychologist, at least, repetition has its pedagogical justification."

F. A. D.

A HISTORY OF AËRONAUTICS.

Travels in Space. By E. Seton Valentine and F. L. Tomlinson. With an Introduction by Sir Hiram S. Maxim. Pp. 328; with about sixty illustrations. (London: Hurst and Blackett, 1902.)

IT appears to be a growing practice in this country to publish books with a preface by some man of distinction, whose name figures prominently on the cover. It is a pity that publishers cannot agree to discountenance this practice. Either a book is worth reading without the recommendation or it is not worth reading even with it. Not but what the introduction in this case is worth reading.

The task which Messrs. Valentine and Tomlinson have had before them has been no easy one. They have no doubt derived considerable help from the French "Histoire des Ballons" and other books of a similar character, but even with that help they must have had to wade through a large mass of literature and then to sum up the principal points in a very short compass, all of which takes much time. The authors are greatly to be congratulated on the success with which they have completed their undertaking. The designs of Leonardo da Vinci, the fantastic project of Lourenco, the abortive attempts at flight by Besnier and De Bacqueville, the balloon ascents of Montgolfier, Pilatre de Rozier, Blanchard, Nadar, the impossible air-ships of Pétin and De Landelle, the actual glides of Lilienthal, Pilcher, Chanute, Santos Dumont rounding the Eiffel Tower, the *Pax* disaster, all these give a very inadequate idea of the large number of designs, projects, ascents, descents, successes, failures and fatalities described in these pages. There are few people so well versed in the history of aerial navigation that they would not learn something new and interesting on reading the present volume.

The authors confine themselves to the task of chronicling and describing, and do not indulge in lengthy speculations as to the future of the flight-problem. Seeing how uncertain that future is, they have acted wisely. At the same time, Sir Hiram Maxim points out that the book may have a useful purpose in the near future in preventing others from repeating experiments that have previously been tried and failed. The list of aeronauts who have met their death as the result of their aerial experiences since 1783 should be a warning to future experimenters or would-be experimenters. Theoretical considerations, numerical calculations and mathematical formulæ lie outside the scope of this book.

A reviewer usually likes to point out omissions, but the only one as yet noticed is that of the very recent experiences of Wilbur Wright and his brother. And evidently there are two accounts of Degen's attempts, of which the more improbable one is here given. According to the other, his machine would not rise until he attached it to a balloon.

The illustrations are excellent, but it may be as well to warn the reader that when he sees a picture of an aëronaut sailing over houses, trees, mountains, rivers and even pyramids in an extraordinary looking machine, it is not to be supposed that the journey depicted was ever performed, or even that the machine was necessarily constructed in the forms shown. Readers of the "*Histoire des Ballons*" will remember the fantastic figures of flying men in that book and will not be surprised to find a few of the types reproduced here, but now that experiments have been successfully made in directed navigation through the air, it would be well if some indication could be given on illustrations in future books showing at a glance whether the flight which they depict is a real flight or a mere flight of the imagination.

G. H. BRYAN.

TERRESTRIAL MAGNETISM.

United States Magnetic Declination Tables and Isogonic Charts for 1902. By L. A. Bauer. Pp. 405. (Washington: Government Printing Office, 1902.)

THE activity of the United States Coast and Geodetic Survey Department in carrying out a magnetic survey of the States and outlying territories has long been a subject of interest to magneticians, and in this book we have the first complete information on the results of that survey up to January 1, 1902, as regards the one element magnetic declination.

Tables, giving every observation made, occupy 142 pages, including positions, date of observation, values observed and values reduced to 1902, followed by the name of the observer or authority. The succeeding 138 pages are devoted to descriptions of the magnetic stations occupied by the Survey between 1881 and July, 1902.

The accompanying chart of "Lines of Equal Magnetic Declination" is based on the results plotted at about 5000 points, embodying all the latest declination data of known value. The lines are true isogonals, drawn with considerable sinuosities, representing the results of actual observation and showing disturbances from normal values, but as these latter have not yet been calculated, the amount of disturbance and the centres of disturbance have not been ascertained. The chart for Alaska gives normal lines of the magnetic declination calculated from all available observations, there being too few of the latter from which to draw true isogonals.

A welcome addition to the tables and charts will be found in the opening chapter under the heading "Principal Facts relating to the Earth's Magnetism," showing our present state of knowledge of terrestrial magnetism and the vast field open to future observers and students of that branch of science.

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In this chapter, the evolution of the compass is treated boldly and agreeably with the evidence of the best authorities, and one rather looks for the date and the name of the first person who applied that very important addition to the mariner's compass—its suspension in gimbals. It is clear that the use of this suspension was implied by Pedro de Medina in his "*Arte de Navigacion*" of 1545, and was accurately described as part of a compass by Martin Cortés in his "*Arte de Navigacion*" of 1556, but they leave the inventor's name in obscurity.

Turning to the subject of Gilbert's work, "*De Magnete*," the author remarks on the "intolerance and lack of appreciation of the work of his predecessors" shown by Gilbert. When, however, one reads the account given by the latter of the mass of ignorance and superstition he had to battle with and relinquish to "the moths and worms"—such as the medicinal properties of the lodestone and its uses as a detector of immorality and many other "vanities"—we can hardly wonder at their begetting a spirit of intolerance in him. Even "the Onyon and Garlick myth" which he so denounced was revived in 1885 by an inventor who proposed the use of the juice of the common Dutch red onion as a magnetic screen. Possibly some readers of the present work will think the author has not quite done full justice to Gilbert.

On p. 60, the authority of the late Prof. Eschenhagen is given for the statement that the effects of earthquakes on the magnetic needle are "entirely mechanical." As the more recent investigations of Prof. Milne point to an opposite conclusion, there is evidently room for further inquiry as to how far the disturbances observed are due to magnetic causes or not.

In the article on magnetic observatories, some useful details are given of the structure of the magnetic observatory at Cheltenham, Maryland, where, although it is built entirely above ground, the diurnal change of temperature has been reduced to a few tenths of a degree, and further reduction is looked for.

In conclusion, it may be remarked that some of the illustrations are taken from rare prints, and their reproduction cannot fail to be of great interest to many who may not have the means of seeing the originals. Pleased as the investigator may be with the valuable results contained in this book, he will look forward with enhanced interest to a similar publication relating to the magnetic inclination and force, both of which have been so extensively observed in the United States.

OUR BOOK SHELF.

Letters on Reasoning. By J. M. Robertson. Pp. xxviii + 248. (London: Watts and Co., 1902.)

THIS book is in the form of letters addressed to the author's children, and is lucidly and fluently written. Mr. Robertson's counsels upon the duty and importance of clear thought and scrupulous candour in reasoning are excellent, and it is to be hoped the children to whom the letters are addressed will profit by them. It is a pity Mr. Robertson does not always follow his own good advice. In the constant polemic against theism, to which he recurs in chapter after chapter, he often unconsciously misrepresents the case against which he is