

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

arguing, and his own reasoning is not unfrequently vicious. Thus it is hardly fair to the advocates even of the crudest form of the "design" hypothesis to meet Paley's argument about the traveller who finds the watch in the desert with the retort that the argument assumes the desert at least to be "undesigned." All that is assumed is that the desert, whether "designed" or not, does not, like the watch, exhibit design of a specific kind recognisable by the traveller. And Mr. Robertson's own chief argument against theistic design, that an infinite series, such as the "totality of events," cannot have any specific predicates beyond the one predicate of "infinity," is surely very doubtful. If I can make predications about the infinite series of the natural numbers (such as, *e.g.*, that every member of it has a next term, that every member is commensurable with every other), why not of the infinite series of "events?" Similarly, the argument used in discussing psychological determinism, that no one predicate, such as, *e.g.*, "free," can be applied to all volitions, since they are an infinite series belonging to no wider species, is really fallacious. For in psychology the very need of a precise definition of a volition compels us to distinguish volitions from other psychical states, such as impulses, cravings, resolutions, and volitions thus come to be an infinite series, no doubt, but an infinite series of which the law of formation is known. The infinity of such a series in no way excludes specific predication about it. Mr. Robertson presumably thinks that the "totality of events" is a series of which we do not know the formative law. But this is just what he has to *prove* against the theist. He is not entitled to assume the point at issue as if it were a self-evident axiom of thought.

It is much to be regretted that the author allows himself to exhibit a zeal which too often degenerates into partisan rancour against his "religious" opponents. A man is not necessarily either dishonest or stupid because he holds opinions on these subjects other than those of Mr. Robertson, and Mr. Robertson does not strengthen his case by writing as if he were so. A. E. T.

Electro-plating and Electro-refining. By A. Watt and A. Philip. Pp. xxiv + 680. (London: Crosby Lockwood and Co., 1902.) Price 12s. 6d. net.

THE late Alexander Watt's book on electro-deposition was well known as a standard work on the subject, but for some time it has been out of date both in subject-matter and in method of treatment. Mr. Arnold Philip, in editing and largely rewriting a new edition, has performed a service which was much required, but it is to be regretted that he has not been sufficiently thorough in his work of revision. Perhaps this is due to a desire on his part to retain as far as possible the form of the original book, but there can be little question but that by entirely recasting it and putting the vast amount of useful information it contains in a form more suited to modern ideas and developments he would have been performing a more valuable service. It is, for example, rather out of date to give instructions for carrying out different operations in terms of Wollaston, Smee, Daniell or other batteries. We hope that the number of electro-platers using such sources of electricity is at the present day small, but even if it is considerable it is eminently desirable that a book such as this should make use of scientific units. To take one other example, we were surprised to find that the section devoted to nickeling bicycles described the operations to be performed in taking to pieces an old-fashioned "ordinary" and entirely disregarded the existence of the modern safety or pneumatic tyres. Such a fault as this, possibly not of much importance in itself, has the grave defect of destroying the reader's confidence in the rest of the work; how is the student to feel sure that the numerous recipes

and instructions are not as much things of the past as the solid-tyred ordinary?

Mr. Philip has, however, done much to improve Watt's book, especially in the chapters which he has added. Chapters ii. and iii. of the second part, dealing with the cost of electrolytic copper refining and with the many important details of that industry, are particularly to be commended. Taken altogether, this new edition is, like the older ones, a good and valuable book, and our only cause of complaint against Mr. Philip is that he has somewhat missed the opportunity of bringing it properly up to date. M. S.

The Teaching of Chemistry and Physics in the Secondary School. By Alexander Smith, B.Sc., Ph.D., and Edwin H. Hall, Ph.D. Pp. xiii + 377. (London: Longmans, Green and Co., 1902.) Price 6s. net.

THIS book, which belongs to the American Teachers Series, is well worthy of the attention of those who are engaged in the teaching of chemistry and physics, whether in schools or universities. It contains an able and temperate discussion of nearly every important question of method that arises in connection with the teaching of chemistry and physics, and it has the great merit of being neither wordy nor pedantic. It will be a surprise to many English teachers to see how thoroughly this subject is being handled in America.

It is, unfortunately, not possible in the limits set to this notice to give illustrations of the treatment of the subject by the two American professors. If the book is read in this country as it deserves to be, it will tend to induce a more philosophical attitude towards the extremely difficult and important question of teaching physical science in the earlier stages. A. SMITHELLS.

Index Zoologicus. By C. O. Waterhouse. Edited by D. Sharp. Pp. xii + 421. (London: Zoological Society, 1902.)

FOR the last twenty years, the "Zoological Record" has contained an appendix of the new generic and subgeneric names recorded annually in its pages. These lists have been combined, with the addition of such names of earlier date as were omitted from Dr. Scudder's "Nomenclator Zoologicus," published in 1882, and the result is the present volume, which includes the period from 1880 to 1900. The value of such a compilation to working zoologists cannot be overestimated, and the author and editor, as well as those gentlemen by whom they were assisted, by the completion of their laborious task have earned a debt of gratitude beyond the power of thanks to repay. The present volume includes about 40,000 names, of which some 6000 belong to the period before 1800; an idea may therefore be formed of the enormous rate at which new names are growing. Many of these, like those in earlier lists, are, of course, synonyms, but the editor is of opinion that some 80,000 generic and subgeneric names are actually used in zoology. A glance at almost any page in the volume before us will show that much still remains to be done in purging the list on account of the same name being used for two or more groups, but this did not come within the province of the compilers.

How near the list approaches completeness must depend to a great degree on the thoroughness, or otherwise, with which the various contributors to the "Zoological Record" have done their work. Personally, the writer feels responsible for at least one omission—the genus *Dinocynops*, proposed by Ameghino in 1898—and probably he is not the only offender. Such omissions detract, however, in no way from the careful and painstaking manner in which the compilers have executed their task, and we can but repeat our sense of the obligation under which they have placed all working naturalists. R. L.