

the suggestion should meet with a generous response. The project already has the support of Profs. Tait and Laisant and will, no doubt, be aided by the leading advocates of Quaternions everywhere. The movement should be encouraged in every possible way.

VICTOR C. ALDERSON.

ARMOUR INSTITUTE OF TECHNOLOGY, CHICAGO.

SCIENTIFIC LITERATURE.

The Forces of Nature. By HARROP and WALLIS.

Published by the same, Columbus, Ohio. Pp. 160, 12 mo.

The reading of this book gives rise to a feeling of wonder; wonder that it was ever written; wonder that it was ever published and wonder that it should ever be read. About half of it is included in five chapters on 'The Solar System;' 'The Atmosphere—Sound;' 'Chemistry—The Structure of Matter;' 'Radiant Energy—Light, Heat and Actinism;' 'Electricity—Magnetism.' These are large subjects, but the authors of this book do not shrink from the task, self-imposed, let us hope, of treating them in about seventy pages of large type and fair leading. Their aim has been, as stated in the introduction, to present 'the great fundamental principles of the Earth's science and the laws which govern the operations of Nature.' The importance of this presentation is forcibly shown in the following paragraph from the preface of this book: "All natural phenomena are explainable upon the simple laws of mechanics. These laws govern alike the systematic motions of worlds and the complicated functions of organic life. It only remains, then, for the reader to make himself conversant with the fundamental principles upon which the system hinges to comprehend the harmony of all things in nature." The preface further recognizes 'a class of persons who have acquired a thorough knowledge of their special callings' who unquestionably hunger after a knowledge of these fundamental principles and who desire to satisfy their ravenous appetites 'without tedious delving amongst learned volumes which they have probably neither the time nor the inclination to read.' For these the authors have written this book. It is not worth while to consume time and space in giving extensive references to its con-

tents. Nine of its pages suffice for the consideration of the solar system, including a special study of the Earth. In the chapter on chemistry one or two great fundamental principles are let loose, including the statement that ice continues to expand as its temperature is lowered, and it is on account of this expansion that water pipes are burst. In the chapter on Radiant Energy we are distinctly, almost defiantly, informed that "Polarized light has some application in Optics and Qualitative Analysis," and also that when air is compressed "the molecules are moved into such close proximity as to be unable to retain all their former motion—heat—a portion of which is delivered up to external objects either by conduction or radiation." In accordance with the plan outlined in the introduction, having in the first seventy pages disposed of the 'general aspects of nature,' the remainder of the book is devoted to a 'more particular exposition of underlying principles' as put forth in 'a series of disconnected paragraphs and essays.' Here the authors toy with 'Life on the Planet Mars;' 'Spontaneous Generation;' 'The Incandescent Lamp;' 'Argon,' etc., etc., etc., forming almost as great a variety as the contents of a modern Sunday newspaper.

In their introduction they remark that 'the necessity for *consecutive* reading' cannot be too strongly urged; the common tendency to 'skip' is deplored and the reader is urged 'to proceed slowly, being sure that he understands each paragraph before leaving it.' That interesting class for whom the book is intended, 'persons who have acquired a thorough knowledge of their special callings,' will doubtless be able to understand the, to others rather obscure, relation between 'Life on the Planet Mars' and 'Death by Lightning,' which makes a certain order of reading necessary. To the ordinary reader of the Astronomical news of the past year or two, the latter might be chosen first, last and all the time.

A really serious aspect of this case is the announcement that the authors have in press a second volume on 'The Forces of Life,' which is to be 'a study of Organic Nature,' and which is to discuss the Classification of Species, Evolution, Paleontology, Morphology, Embryology, the origin of cell life, etc. If these youthful

Encyclopædists (it is difficult to imagine them to be anything else than youthful, no matter how many years they may have lived), will hold themselves in check until they learn something that other people do not know, or until they learn what other people do know so well and so clearly that they can claim some right to classify, edit and arrange existing knowledge, they will *confer a favor upon themselves* the magnitude of which it is difficult to estimate.

Alternating Electric Currents. By EDWIN J. HOUSTON and A. S. KENNELLY. New York, The W. J. Johnston Co. Pp. 225. Price \$1.

This little volume forms one of the "Electro-Technical Series," of which nearly a dozen volumes have been prepared by Messrs. Houston and Kennelly. It treats of one of the most important and most prominent departments of applied electricity. The development of the theory of Alternating Currents and their practical utilization is of comparatively recent date. The large pecuniary interests involved in the various processes by which energy is transformed have put a premium upon the exploration and exploitation of this branch of physical science such as no other has ever felt. Workers in science generally are sustained by that motive and inspiration which compels the practical geographer to force his way into and through unknown regions, his reward being the knowledge of their nature and inhabitants, with which he is laden when he returns. In electricity there is the additional powerful incentive that gems and precious metals are tolerably sure to be met with. The science of electricity has prospered, therefore, during the last decade in a manner only equaled or excelled by its practical applications. Even the expert now finds it difficult to keep thoroughly informed of the rapid and often far-reaching advances that are continually being made. To the layman, or even to the general physicist, who has not been forced as, alas! nearly all have, to 'specialize' in electricity, any book which summarizes this progress in an intelligent and scientifically correct manner will be welcome. To such this book will be of much use. The conception of the alternating current is well worked out in the first chapter, and in those following its ap-

plication to the transmission of power and to electric lighting is discussed in a popular readable form, including a discussion of diphasé, triphasé and monocyclic currents and transmission. The principle criticism that may be applied to the book is the unnecessary presentation of a great deal of elementary matter, concerning which the reader is almost sure to be already well informed. It does not seem likely that any one who undertakes to read a book, be it ever so simple, on 'Alternating Electric Currents' will be entirely ignorant of a simple primary battery, of the form of an electric magnet, of the appearance and construction of an incandescent lamp, of which there is a long and elaborate description. The amount of ignorance which is here assumed is not quite in harmony with the amount of technical information which the reader must possess in order to understand other portions of the book. The volume could have been made more valuable by assuming on the part of the reader that knowledge of direct current electricity which he is tolerably certain to possess or which he can readily obtain from other volumes of the same series. There are certain advantages, it is true, in having each volume complete in itself, but these are greatly exceeded by the disadvantages growing out of the enforced buying, owning and reading the same matter over and over again.

THE MAGNETIC RESURVEY OF AUSTRIA AND HUNGARY.

FROM a recent report* by Dr. Liznar, of the 'Central Anstalt für Meteorologie und Erdmagnetismus' of Vienna, we find that the recent magnetic resurvey of Austria and Hungary (1889-'93) has been brought to a termination. An earlier magnetic survey had already been made by Karl Kreil between the years 1843 and 1858, which was repeated a few years later,

* J. Liznar: Die Vertheilung der erdmagnetischen Kraft in Österreich-Ungarn zur Epoche 1890.0 nach den in den Jahren 1889 bis 1894 ausgeführten Messungen. 1 Theil, Erdmagnetische Messungen in Österreich ausgeführt auf Kosten d. Kais. Akad. d. Wiss. in d. Y. 1889-'93, von J. Liznar. Wien, 1895, 4°, 232 pp. Repr. Denk. d. Wiener Akad. Math. naturw. Cl. Bd. LXII.