

isms in question were Protozoa. The interpretation of Huygens's figures of Protozoa as "various forms of *Stentor*" (p. 401) cannot be accepted, and Leeuwenhoek's "small" fluke in the sheep (p. 419) may have been *Dicrocoelium*; but a second infection of *Fasciola* is an equally if not more probable explanation. Both are known to occur in the sheep. The statement that the host "swallows the larvæ, the so-called rediæ, swimming in the flooded grass" will astonish the helminthologist. The following notes are suggestions for the file of addenda and corrigenda: p. 277, Roemer's English translation of letter 35, 1921, is omitted; p. 293, and elsewhere, Dalenpatius' name is misspelt; p. 303, the two references to Hooke relate to one and the same book with an added title in 1679; p. 411, line 7, for "suct" read "suet" (a baffling misprint); p. 449, Cl. Galen = clarissimus Galen, not Claudius; p. 453, the pulmonary circulation was known in the thirteenth century, Harvey is not responsible for the dictum "omne vivum ex ovo", he did not "discover the preformation theory" (which he would certainly have repudiated), nor (unhappily) did he "absolutely" reject spontaneous generation.

F. J. COLE.

¹ *Nature*, 144, 956 (1939).

COSMIC RAYS

What are Cosmic Rays?

By Pierre Auger. Revised and enlarged American edition. Translated from the French by Maurice M. Shapiro. Pp. vii+128+22 plates. (Chicago: University of Chicago Press; London: Cambridge University Press, 1945.) 12s. net.

THIS little book gives a fascinating account of cosmic ray research, its results and its unsolved problems; the book is, indeed, an outstandingly attractive work on science for the non-specialist, and should appeal to the educated public that in recent years has so eagerly welcomed accounts of relativity, stars and atoms. Translation from the French has not obscured the clarity of the original version. The style is attractively light, with occasional wit, and thoroughly respectful to the intelligence of the reader—that is, it is sincere and free from any attempt at bemusement by paradoxes and verbal sleights; instead the author has striven with all needful skill and patience to enable the reader really to understand, not merely to create a fleeting illusion of understanding.

The story describes thirty years of research on a branch of science perhaps even more 'pure' than astrophysics, though like astrophysics it has made valuable contributions to general physics—in this case by the discovery of the positive electron and of mesons. Its sources in the depths of space are still mysterious, but great progress has been made in the study of the distribution of its impact upon the earth and of its transformations in the atmosphere and the ground; Nature has thus provided a laboratory for the study of particles and photons of the greatest known energy. Investigation of these natural experiments will incidentally lead to new advances in geophysics, and perhaps also in solar physics through the relationship of cosmic rays to the geomagnetic field and its disturbances, and to the changes of height-distribution of the air in the atmosphere; some of these topics already deserve more attention

than is given in the book, though the original Paris edition of 1941 has been revised to bring it up to date, and new photographic illustrations have been added.

The book is well printed and produced, and to many readers its price, though much greater than that of the French edition, will seem extremely modest considering the charm and enthralling interest of the contents.

S. CHAPMAN.

ELECTRICITY FOR ENGINEERS

Elementary Electric-Circuit Theory

By Prof. Richard H. Frazier. Pp. ix+434. (New York and London: McGraw-Hill Book Co., Inc., 1945.) 4 dollars.

THE first difficulty with this text is its title; the author has gone so thoroughly into basic circuit theory that the term 'elementary' cannot be justified. A considerable experience of elementary circuits, both in theory and practice, by the student would, in Great Britain, be considered essential before this particular text could be accepted.

The very real and useful approach to the relationship between the fundamental essentials of electricity, as a subject in physics, and their application in the work of engineering is indicated by the following quotation from the book: "The engineer should be skilled in leading a double life—one in the concrete world of physical apparatus and one in the abstract world of ideas—and in interpreting each realm in terms of the other. If he can think only in terms of physical apparatus, he may become a useful mechanic but he lacks the analytical ability and the broad scholarly understanding of his field that should characterize a professional man. If he can think only in terms of abstractions, he may become a visionary whose ideas occasionally have practical possibilities but too often are nothing but play manoeuvres with symbols."

The author certainly carries out these precepts in a highly personal way in the present text, which has none of the dry-as-dust explanations often regarded as desirable in a formal text-book. He is very apt in his applications, and the student is not spared any of the required processes of differentiation and integration; he has to take them in his stride. Vectorial treatment and even filter sections are not excluded, and there are numerous practical problems with which to exercise students.

It is extraordinary, however, that the general appreciation of such a text-book is marred by the observation that the author has certainly got Ohm's Law wrong, although the original publication of 1827 is quoted. At the top of p. 21 the sentence "Hence Ohm's Law and Joule's Law are interdependent; either can be derived from the other" cannot be accepted. Ohm's Law has nothing to do with circuits or the power-loss therein, which merely requires a definition of resistance as the voltage divided by the current. Surely Ohm's Law merely describes the physical phenomenon that for certain materials, in specified circumstances, such as constant temperature, no magnetic field, etc., the resistance of a conductor is constant and independent of the current therein. Perhaps in future editions Prof. Frazier will correct this slip, and while he will not make the volume perfect, nevertheless a striking imperfection will be removed.

L. E. C. HUGHES.