

and the author has succeeded in bringing together a mass of useful information and presenting it in an interesting form to the reader. A valuable feature in so new a subject is that full references are given for all the data, and at the end there is a bibliography.

E. J. R.

MATTER AND THE STRUCTURE OF THE ETHER.

The Universe and the Atom. By M. Erwin. Pp. 314. (London: Constable and Co., Ltd., 1915.) Price 8s. 6d. net.

THIS work is divided into two parts, the first being devoted to a general discussion of wave motion, and the second to a special theory as to the structure of the ether and its consequences. The theory called "the pan-cycle hypothesis" deals with "invisible composition light waves, the warp and woof of the ether structure and of all things material."

In spite of some inaccuracies, the first part contains quite an interesting account of the nature of wave motion, although the long and frequent quotations from other text-books make the style somewhat disjointed. In some places too much stress is laid on the obvious, which indeed at times is so over-elaborated as to lead to absurdities. It is worth quoting one such passage, for the deductions drawn are used later to explain the theory of the mechanical structure of the ether. "Thus if a force of 5 units is operating in one direction, and another force of 3 units is operating on the same particle in the opposite direction, we say they are equivalent to a force of $5 - 3 = 2$ units of force operating in the first direction. We mean by that the particle would move from its first position, in the direction impelled by the greater force, and behave as if it were acted on only by a force of 2 units. This is all that composition of force gives us, but it does not speak the full event. It makes 3 of the greater units of force annihilate the 3 units of force operating in the opposite direction. Now force represents energy, and energy is never destroyed" (p. 74).

The second part deals with a new theory of ether structure, the nature of electrons, atomic theories, gravitation, and other fundamental questions based on a conception of the ether organised by so-called "force rays" resulting from trains of waves proceeding in different directions through the ether and producing stationary waves. The ideas involved do not seem very helpful in throwing light on these fundamental questions, and in many cases there is a marked lack of adequate discussion of existing theories. Thus the modern attempts to explain the Balmer series is dismissed with the following short paragraph:—"This formula by Balmer was derived entirely by trial from the observed wave lengths of the first fifteen lines of the hydrogen series. It has so far been regarded as entirely an empirical formula which expresses a fact, without anyone being able to state why the relation expressed by the formula should exist" (p. 102). The recent work of Bohr and others in this field might at least have been

mentioned. Even facts are sometimes misstated, as will be seen from the two following passages: "The amplitude of some rays, such as X-rays, goes down to the infinitesimal" (p. 84); and ". . . gravitation itself has its limitations, in respect of the distance through which it can effectively operate, and its power is also affected by the internal heat or temperature of the body" (p. 125). Many of the fundamental conceptions in the theory are at fault, and these insecure foundations cannot support the elaborate superstructure built upon them.

FLOTATION OF ORES.

(1) *Concentrating Ores by Flotation.* By T. J. Hoover. Pp. vi + 320. Third edition. (London: *The Mining Magazine*, 1916.) Price 12s. 6d. net.

(2) *The Flotation Process.* Compiled and edited by T. A. Rickard. Pp. 364. (San Francisco: *Mining and Scientific Press*, 1916.) Price 8s. 6d. net.

THE subject treated in these two books is one of great and rapidly increasing importance. The practical application of flotation methods is only about thirteen years old, and already the quantity of ore treated by them must amount to little, if any, less than 30,000,000 tons. When it is borne in mind that a large proportion of this quantity consists of slimes and complex ores that had defied all known methods of treatment until flotation processes were introduced, the economic importance of the subject can be readily appreciated. Furthermore, as Mr. Hoover points out in his book, this method is still in some respects in its experimental stage, and its limits of applicability are being rapidly widened, so that there are very good grounds for the opinion expressed by him:—"It would seem at the present time a justifiable prophecy that flotation methods of concentration will in the not distant future very largely displace gravity methods."

(1) The mere fact that the third edition of Mr. Hoover's work has been called for within four years of the appearance of the first edition is sufficient testimony to the value attached to it by the mining profession. It has from the first been accepted, and still remains to-day the standard work on the concentration of minerals by flotation methods.

As regards this third edition now before us, this has simply been produced by reprinting the second edition just as it was, without even attempting to correct any mistakes, but merely with the addition of a new chapter, so as to bring it up to date. It is difficult to justify such a method, seeing that some of the mistakes that have been allowed to stand are really serious. Thus it comes as a severe shock to find that Mr. Hoover should not only have written, but have allowed to remain, such a wholly indefensible chemical equation as " $KCy + Au = KAuCy$ "; or to find him stating that "the horizontal surface of a liquid at rest" may be considered "the limiting surface of a bubble of infinite radius,"