

Modern Applications of the Kinetic Theory.

Kinetic Theory of Gases: being a Text and Reference Book whose Purpose is to Combine the Classical Deductions with Recent Experimental Advances in a Convenient Form for Student and Investigator. By Prof. Leonard B. Loeb. Pp. xvi+555. (New York: McGraw-Hill Book Co., Inc.; London: McGraw-Hill Publishing Co., Ltd., 1927.) 27s. 6d. net.

PROF. LOEB'S book is very similar in appearance to the well-known Monograph Series of the American Chemical Society; but, although the kinetic theory of gases has always occupied a very important place in physical chemistry, the book is from first to last a 'text and reference book' of pure physics.

The author claims with justice that the kinetic theory of gases "is to-day perhaps the only field in which the mechanical picture has not been dimmed by the breakdown of our mechanical concepts"; but it is a surprise to find how the scope of the theory has widened since the outlines of the picture were drawn by Joule, Clausius, Maxwell, and Boltzmann. New developments began in 1908, when the brilliant experiments of Perrin brought to an abrupt end the Ostwald system of energetics, which professed to reduce the atom and molecule to the position of superfluous hypotheses. The proof given by Perrin of the real existence of molecules, and of their incessant jostling with one another, has been accompanied by a second line of development, in which ions and electrons play the part of molecules and atoms. These charged particles provide new opportunities for studying the kinetic phenomena of gases by electrical methods, as in Millikan's determination of the Avogadro number from the movement of electrified oil-drops in an electrical and gravitational field. In the same way, Blackett's study of forked α -particle trails is cited, with Aston's experiments on the mass-spectrograph, as confirmatory evidence of the atomic and molecular weights deduced in the first instance by means of Avogadro's hypothesis. An account is also given of measurements of the mean free path of *electrons*, projected with a wide range of velocities through gases at very varied pressures, and of the application of these electrical methods (as alternatives to observations of gaseous viscosities) for determining molecular areas.

Another unexpected but very welcome feature of the book is an account (covering about twenty

pages) of Debye's work on molecular moments. The inclusion of Debye's "beautiful explanation of the paradoxical situation, . . . where the second equation held whilst the one from which it was derived failed," is justified by the author by reason of its relation to the kinetic theory, and of the desirability of making it familiar to American students, to whom it might otherwise be inaccessible on account of language difficulties and its omission from the usual reference books; but English readers will be equally glad to read so clear an account of a rather complex problem in optics.

The eleven chapters of the book are followed by half-a-dozen appendices. Most of these are tables giving the numerical values of various constants and functions, but there is also a very valuable summary of the methods that have been used to determine the diameters of molecules, together with the data obtained for nineteen of the simpler gases.

T. M. L.

Our Bookshelf.

Annual Survey of American Chemistry. Vol. 2: July 1, 1926, to July 1, 1927. Edited by Clarence J. West. (Published for National Research Council.) Pp. 415. (New York: The Chemical Catalog Co., Inc., 1927.) 3 dollars.

THE series of annual volumes constituting this survey was inaugurated in order that chemists in the United States of America might be given a perspective view of the advance made in their various fields of research (subject, of course, to the very limited horizon defined in the title), and in order that the importance of certain prospective researches might be adequately emphasised. The first volume, covering the fiscal year July 1925-July 1926 of the National Research Council, evidently proved acceptable, since the second volume, that for 1926-27, has undergone (together with its price) an expansion of 50 per cent.

In addition to recording achievement, many of the fifty-one contributors offer suggestions for research in various directions. The omission of an author index from vol. i. is now repaired by the provision of separate author indexes for both volumes; in addition, a brief résumé is given of the researches actually undertaken under the plan outlined in the former issue for promoting co-operative researches between industries and universities. It is, however, somewhat surprising to learn that "the laboratory facilities for chemical studies in colleges and universities, outside of the leading institutions, are abominable and a disgrace to learning. Among the leading institutions . . . the great majority are not keeping abreast of the times." The present volume contains 44 chapters, and deals with an extensive range of subjects in pure and applied chemistry.

A. A. E.