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THEORIES OF SOLUTIONS.

Theories of Solutions. By Svante Arrhenius. Pp. xx+247. (New Haven: Yale University Press; London: Oxford University Press, 1912.) Price 12*s.* 6*d.* net.

THE publication of Prof. Arrhenius's Silliman lectures on "Theories of Solutions," delivered at Yale in the spring of 1911, will be welcomed by all who are interested in the present position of physical chemistry. The book is of special value because the author has dealt very lightly with those aspects of his theory of "electrolytic dissociation" which have been discussed over and over again during the last twenty-five years and have occupied so large a space in nearly all recent text-books of physical chemistry. Thus, although many of his illustrations are drawn from electrolytic solutions, only three of the eleven lectures deal specifically with such solutions, namely, those on "The Theory of Electrolytic Dissociation," "Conductivity of Strong Electrolytes," and "Abnormality of Strong Electrolytes."

A special feature of the lectures is the historical method of treatment, which is adopted, not only in the first lecture, on "The History of the Theory of Solutions," but throughout the whole course. The author is, indeed, anxious to demonstrate that the newer views of the nature of solutions were a natural and logical development from those that had been in vogue previously, and seeks to disclaim the ide that he and his co-workers in this field originated a revolution which was in any sense a complete break with the past

The most fascinating lecture of the series is that on "The Modern Molecular Theory." To the average chemist it will be a complete revelation to know how accurately the actual masses of the molecules have been determined in recent years. These masses are recorded most conveniently by determining the magnitude of the constant N, the number of molecules in a gram-molecule, which is, naturally, the same for all molecules. Three methods used by Perrin and based upon the behaviour of minute suspended particles gave for N the values 68×10^{22}, 65×10^{22} and 71×10^{22}; three methods based upon the study of radio-active substances, including, for instance, the actual counting of α-particles, have given the figures 62×10^{22}, 71×10^{22} and 71×10^{22}. Other methods have given 71×10^{22}, 62×10^{22} and 62×10^{22}. It is indeed remarkable that nine series of determinations should agree thus together, the extreme range being only ±6 per cent.

Other topics dealt with are "Suspension," "Adsorption," "Velocity of Reaction," "Equilibria in Solutions," and "The Doctrine of Energy." In the introduction, the author expresses the view that modern physical chemistry is largely synonymous with "theoretical chemistry," one of its chief functions being to express in mathematical form the experimental measurements of physicists and chemists; that he himself has not lost his skill in this art is shown by the introduction of some new formulæ in the present volume; that even more far-reaching results may flow from this method of working is clear from the use which has been made by Perrin, Lindemann and others of the formulæ developed within the last five years by Einstein.

It is a matter for regret that a book of small dimensions should have been issued at so prohibitive a price as to confine it very largely to reference libraries. The trustees of the "Silliman Foundation" would fulfil the purposes of the trust with much greater efficiency if they could arrange to circulate the printed lectures on more reasonable terms to a much larger circle of readers.

T. M. L.

INTRODUCTIONS TO BIOLOGICAL STUDY.

(1) *A Guide for the Study of Animals.* By Worrallo Whitney, Frederic C. Lucas, Harold B. Shinn, and Mabel E. Smallwood. Pp. ix+197. (Boston, New York, Chicago: D. C. Heath and Co.) Price 2*s.*

(2) *College Zoology.* By Prof. Robert W. Hegner. Pp. xxv+733. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1912.) Price 11*s.* net.

(3) *Einführung in die Biologie.* By Prof. Karl Kraepelin. Dritte, verbesserte Auflage. Pp. viii+356. (Leipzig and Berlin: B. G. Teubner, 1912.) Price 4.80 marks.

(1) THE teaching of biology is much more widely spread amongst American than among British schools, and the need for systematised courses of instruction in natural history is there greater than with us. In this work compiled by science teachers of Chicago high schools a graduated course of zoological teaching is drawn up, beginning with observations on house-flies and ending with some very good suggestions on the use of domestic breeds of animals as object lessons. So far as this suggested course goes, the book may be of considerable help to teachers in search of a suitable curriculum. The greater part of the work is, however, devoted to lists of questions that any good teacher could draw up without assistance. Some of the questions are badly worded or unanswerable; for example, "Compared with a hydra, how many cells has an earthworm?"