

NEW BOOKS

Das Buch der grossen Chemiker. (The Book of the Great Chemists.) Vol. II. From Liebig to Arrhenius. Edited by Dr. Günther Bugge. Verlag Chemie, G. m. b. H., Berlin W 10, Germany, 1930. x + 559 pages. 16 × 23.5 cm. Illustrated. Price, bound, M. 32.

This fine book is in every way a proper sequel to the first volume. The twenty-seven chapters, written by twenty different scholars, cover the history of chemistry from the beginning of organic synthesis to the triumphs of Fischer and Ehrlich, from the discovery of colloids and of the spectroscope to the periodic table and the theory of electrolytic dissociation. The two volumes complete the story to the point where the accomplishments of chemists now living must be discussed.

The work comes much nearer to being a history of chemistry than its title indicates, not because "history is a series of biographies" but, rather, because the authors of the various chapters have not confined themselves to biography but have placed each chemist in a setting of the chemistry of his time and have discussed his work in relation to the work of other chemists. The work is scholarly, attractive, readable and authoritative.

In addition to its own indexes, the second volume contains lists of the Nobel Prize winners in physics and chemistry, 1901-1930, and an extensive bibliography supporting the material of both volumes.

TENNEY L. DAVIS

A Short History of Atomism. By JOSHUA C. GREGORY, Lecturer in Chemistry in the University of Leeds. A. & C. Black, Ltd., London; New York Agents, The Macmillan Co., 60 Fifth Avenue, New York, 1931. 258 pp. 14 × 22 cm. Price, \$3.50.

Due to the enormous flux of recent theory and experiment in the field of atomic structure, there exists a definite need for an historical survey of the entire subject. Unfortunately Professor Gregory's offering cannot be said to satisfy this need.

The subject matter of the present volume is delimited by the sub-title "From Democritus to Bohr," but the last chapter, entitled "Recent Atomism," is concerned with the developments of the last five years. An attempt has apparently been made to present an up-to-the-minute account in that the author mentions a number of researches that have been reported during the past year.

The description of Greek thought on atomism, its introduction into European philosophy, and finally its incorporation into chemistry to explain the laws of stoichiometry, have all been treated admirably. The author has taken pains to stress both the philosophical difficulties of the atomic concept and the large amount of coöperative research that was required to establish a detailed atomic theory. These chapters are clearly the product of a broad and well applied knowledge of the subject.

As the narrative proceeds to the closing decades of the nineteenth century, however, one feels that the author is about to commit two rather serious faults. The concluding chapters amply confirm these premonitions. In the first place, it seems that the author has shown greater partiality to the discoveries of British scientists than to those of other nations. For example, the names of Clausius, von Laue and Kossel do not appear in the book and, in general, non-British work is treated from the comments of English contemporaries rather than from the workers' own writings.

Rather more serious than this criticism, however, is the fact that Professor Gregory has neglected the more physical evidence in support of the atomic theory. The determinations of the Avogadro number are omitted and the results of the kinetic theory and of crystal structure are dismissed in a few paragraphs. These omissions assume even more startling proportions in the last chapter, which is composed for the most part of not too well selected excerpts from the recent popular books of Jeans and Eddington. Most surprising of all, the author barely mentions the corpuscular theories of light and confines the wave properties of matter to a single paragraph. Indeed, the problem of the dual aspects of both light and matter receives but casual mention. The discussion of recent work is confused and cannot but leave a blurred and uncertain picture in the mind of the reader.

Professor Gregory has written an excellent and scholarly account of the chemical aspects of nineteenth century atomism. The deficiencies of the remainder of the book lead one to suspect that the subject is now too extensive to allow comprehensive treatment by a single author. Perhaps it is too early to expect a balanced history of this field of thought, including the recent developments, but it is to be hoped that a complete account will be available in the near future.

HUGH M. SMALLWOOD

Inorganic Qualitative Chemical Analysis. By ALLAN R. DAY, Ph.D., Assistant Professor of Chemistry, University of Pennsylvania. The Chemical Publishing Company, Easton, Pennsylvania, 1930. ix + 197 pp. 15.5 × 23.5 cm.

This textbook can perhaps be best characterized as corresponding to an abbreviated compromise between the well-known textbooks of Stieglitz and of Treadwell-Hall.

The reviewer fails to see that the author has achieved what he intended to do as expressed in the Preface, namely, "to realize a closer relationship between fact and theory." Though he treats, very briefly to be sure, oxidation-reduction from the ionic standpoint, the reactions in the laboratory section are written in the molecular form, just as they were written thirty years ago. This is not correlation of theory but, rather, neglect of it. This textbook also does not consider the modern aspects of the theory

of electrolytic dissociation. Indeed, the author contends that "the student is unable to cope with the advancements which have been made in recent times in the theories of solutions." This has not been the reviewer's experience nor, judging from the numerous thoroughly modern texts that have appeared in the last few years, that of other teachers in Qualitative Analysis.

This book has no distinctive features to differentiate it from many similar manuals in existence. It will doubtless be useful in connection with a set of explanatory lectures and close laboratory supervision such as is evidently contemplated by the author, but can hardly be recommended to those who are looking for guidance in the newer paths.

The book is well printed and bound and free from typographical errors.

J. ENRIQUE ZANETTI

The Conductivity of Solutions and the Modern Dissociation Theory. BY CECIL W. DAVIES, M.Sc. (Wales), A.I.C., Senior Lecturer in Physical Chemistry, Battersea Polytechnic. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1931. viii + 204 pp. 22 figs. 14.5 × 22.5 cm. Price, \$4.00.

This is the first textbook on a branch of Electrochemistry in which the interpretation of the experimental facts is based mainly on the Debye-Hückel theory instead of on the older theory of Arrhenius, van't Hoff and Ostwald and should therefore be a distinct advance. The author apparently assumes that his readers are unacquainted with the calculus—at any rate no differential equations or integral signs appear in the entire book. To attempt an advance into the new realms of thought opened up by the Debye-Hückel theory with a mathematical equipment limited to algebra and analytical geometry can only result in a superficial and inadequate view. This method of treatment is defended by the author on the ground that "the chemist will judge the Debye-Hückel-Onsager equations not by the manner of their derivation, but by the degree of success with which they interpret and predict the results of experiment." Although, of course, the theory must meet this test if it is to survive, nevertheless the reviewer believes that the student should not be encouraged to ignore the derivations of the formulas merely because they are difficult, involve calculus and vector analysis and some principles of physics not familiar to most students of chemistry but should be aided in understanding the derivations.

The discussion of interionic attraction is by no means comprehensive. The Onsager modification of the conductance equation is discussed at considerable length; the variation of conductance at very high frequencies and the failure of Ohm's law at very high field strengths are also discussed. But very little is said about the application of the theory to solubility, or to the colligative properties of solutions, or to the viscosity of solutions. The early form of the equation for the activity coefficient of an ion which is applicable only to extremely dilute solutions is given but the

modified form later derived by Hückel, which is apparently valid up to three normal solutions, is not mentioned.

The discussion of experimental methods is brief and lacks detail as to design of apparatus. The differences in technique required for direct current and alternating current bridges are treated in a most sketchy manner. The author apparently assumes that his readers are ignorant of alternating current theory and makes very little attempt to supply the deficiency. The figures given are purely diagrammatic. They show no arrangement for grounding the bridge, which is a matter of considerable importance for precise work. Nearly a page is devoted to a description of induction coils as a source of current while audion tube oscillators receive only a bare mention with a few references, although anyone who had ever used an audion tube oscillator would regard an induction coil as junk.

The discussion of polarization is especially weak. Kohlrausch developed a mathematical theory of polarization based on the idea that the electrode effects of alternating current electrolysis were electrically equivalent to a perfect condenser in series with the electrolytic resistance being measured. If this were the whole truth the effects of polarization could be compensated wholly by introducing a condenser into another arm of the bridge. Kohlrausch found experimentally that this device, although extremely helpful, is not a sufficient means of avoiding error due to polarization and suggested and used other experimental devices to minimize this error, but without revising his mathematical theory of polarization. Other investigators, some of them contemporaneous with Kohlrausch, including Wien, Warburg, Neumann, Reichinstein, Miller, and Haworth, have added much to our knowledge of the phenomena and have developed a theory which goes far beyond Kohlrausch. In this book the discussion of polarization is based on the ideas of Kohlrausch, although his mathematical theory is omitted, and contains no hint of the advances made by other authors.

In spite of its defects this book has points of merit. There is a good discussion of the correction for the conductance of the solvent, of the problem of the extrapolation of the conductance to infinite dilution, and of the application of conductance measurements to the solution of many chemical problems. The style is clear. It may be recommended to students ignorant of the calculus as interesting, instructive and easy reading.

GRINNELL JONES

Electrolytic Conduction. BY F. H. NEWMAN, D.Sc., A.R.C.S., F.Inst.P., Professor of Physics, University College of the South-West of England, Exeter. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1931. xii + 441 pp. 70 figs. 14.5 × 22.5 cm. Price, \$6.50.

The title of this book is similar to Davies' "The Conductivity of Solutions" reviewed above, but the books are very different. Newman has

chosen his title poorly because his work covers a far wider field than is indicated by the title. This book includes, in addition to subjects clearly covered by the title, a discussion of the first, second and third laws of thermodynamics, Clapeyron's equation, the phase rule, the colligative properties of solutions, the law of mass action, Gibbs' adsorption equation, the factors influencing the potential of voltaic cells, hydrogen electrodes, quinhydrone electrodes, the determination of the transference numbers by electromotive force measurements, oxidation-reduction potentials, dropping electrodes, electrocapillarity, overvoltage, passivity and some technical applications of electrolysis. Considered as a textbook on Electrochemistry the most serious omission is the absence of an explanation of the P_H scale and a discussion of its significance in many diverse fields of science.

The book also differs radically from that of Davies in that the treatment is much more mathematical. Newman clearly prefers to state relationships and laws in mathematical form whenever feasible and the book gains in precision, clarity and brevity thereby. Of course he uses the calculus freely.

To write a textbook on Electrochemistry, which this book really is in spite of its title, or to teach the subject is especially difficult at the present time because the science is in a transition period. The older books and nearly all of the original literature are based on the classical theory. Now, thanks to the genius of Debye, we have a radically new point of view and method of attack which gives great promise of transforming the science. But the new theory is complicated and difficult mathematically—so much so that Debye and his school have been forced, or at least tempted, to introduce inexact mathematical procedures and approximate or incomplete premises for the frankly avowed purpose of simplifying the mathematics, with the result that the equations derived are in most cases only valid as limiting laws for extreme dilution or for "slightly polluted water." But the theory is yet in its infancy and it is to be hoped and expected that later developments will give equations which are valid in much more concentrated solutions and that the theory will be extended to problems, such as the electromotive force at liquid junctions, which have not yet been treated by the new method. In the meantime students must be taught the old theory in order that they may be able to understand the great bulk of the chemical literature and because of the considerable remnant of truth in the older although imperfect views. They must be taught the new point of view in order to move with the procession. This book by Newman gives a clearer and more nearly complete presentation of the newer theory than is available in any other book; nevertheless, large portions of the book are written from the old point of view. Thus, for example, there is a table occupying almost a full page comparing percentage ionization as computed from the freezing point and from the conductance for a large number of

salts over a considerable range of concentration. This table is discussed at considerable length in a manner which might have been written twenty years ago. However this is not intended as a serious criticism because it is probably at least a decade too early to present the entire subject of electrochemistry in a logical and consistent manner in accordance with the theory of interionic attraction.

To an unusual degree this book by Newman gives the impression that it was written from the original literature rather than from older books. It has a wealth of tables of numerical data and of well-selected reading references. It may be recommended to students familiar with the calculus as interesting and instructive but not easy reading.

GRINNELL JONES

Theoretical Mechanics. The Theory of the Potential. By WILLIAM DUNCAN MACMILLAN, A.M., Ph.D., Sc.D., Professor of Astronomy, The University of Chicago. McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York, 1930. xiii + 469 pp. 112 figs. 15.5 × 23.5 cm. Price, \$5.00.

This is an extensive and thorough treatment of one of the older and well-known branches of theoretical physics. The earlier chapters are elementary in their form of presentation and should provide a good introduction for the student, and the later chapters provide an enormous amount of useful material. The volume will be of use for chemists only in so far as they are working on the border line of physics. The book is well printed and arranged, and is provided with a bibliography and index.

RICHARD C. TOLMAN

An Outline of Wave Mechanics. By N. F. MOTT, Lecturer in Theoretical Physics, The University, Manchester. Cambridge, at the University Press; The Macmillan Company, 60 Fifth Ave., New York, 1930. 155 pp. 21 figs. 14 × 21.5 cm. Price, \$2.80.

It has apparently been the author's aim in this outline to stress the physical aspects of the new quantum theory rather than the mathematical technique involved in its applications. Following a general discussion of waves and particles, the Schrödinger equation is introduced and used as a basis for a brief treatment of the scattering and reflection of electrons. Succeeding chapters deal with the uncertainty principle, radioactivity, absorption of radiation, the helium atom, the hydrogen molecule and a number of collision problems. The discussion of electron spin is postponed to the last chapter. No mention is made of topics chiefly of interest to the spectroscopist, that is, energy levels of atoms and molecules and intensities of spectral lines.

The developments of those subjects that are included are brief in the extreme, as may be judged from the size of the book. More disappointing,

however, is the fact that the author has nowhere given a correlation between the theory and experiment. Some of the outstanding experimental work is mentioned but one is left with the feeling that the author has followed in the footsteps of the legendary mathematician who concluded a series of lectures with the remark: "And now gentlemen, since we see that the problem *has* a solution, we lose all further interest in it."

Dr. Mott has addressed his book primarily to physicists familiar with the older quantum theory and the classical theory of wave motion. To those who have this background, this outline will afford an excellent means of acquiring a general acquaintance with some of the methods and results of the new theory.

HUGH M. SMALLWOOD

Naphtenverbindungen, Terpene und Campherarten inkl. Pinusharzsäuren sowie Körper der Kautschukgruppe. (Naphthene Compounds, Terpenes and Camphors, Including the Rosin Acids and Substances in the Caoutchouc Group.) By OSSIAN ASCHAN. Walter de Gruyter und Co., Genthinerstrasse 38, Berlin W 10, Germany, 1929. xv + 378 pp. 17.5 × 25.5 cm. Price, unbound, RM. 30; bound, RM. 32.

The contents of this book are adequately summarized in the sub-title which is "Original contributions to the chemistry of alicyclic compounds dealing in part with industrial applications and supplemented with suggestions concerning further research problems." The four main divisions of the work are: (1) alicyclic compounds with a simple carbon ring; (2) saturated bicyclic compounds; (3) alicyclic compounds with a tricyclic nucleus; (4) studies of caoutchouc and other condensation products of isoprene of high molecular weight (including a consideration of the possibility of large-scale manufacture). Among the many topics considered under these main divisions may be mentioned: naphthenic acids and their isolation from petroleum, naphthenes, camphoric acid and its relatives, dipentene, sylvestrene, camphor (including its synthetic production), the composition of crude wood spirits, the rosin acids, the artificial production of rubber. None of the topics mentioned are treated in a systematic or complete fashion and the volume will therefore be of little use to one who wishes to familiarize himself with any particular branch of alicyclic chemistry. It will be of interest, however, to investigators who themselves are working in any of the many fields of alicyclic chemistry which the author's manifold interest has embraced. The treatment consists of a discussion of each problem from the point of view of the author's own work, which in part has been published and which in part is given for the first time. The discussion is full and many of the suggestions concerning further work very interesting, but the lack of experimental detail would force many readers back to the author's original papers. This relatively small volume is not a collection of papers but rather a

discussion of the results of the author's long years of research in alicyclic chemistry.

JAMES B. CONANT

BOOKS RECEIVED

May 20, 1931–June 15, 1931

- HUGO BAUER. "Dehalogenieren." Handbuch der biologischen Arbeitsmethoden, herausgegeben von Emil Abderhalden. Abt. I, Chemische Methoden, Teil 2, 2. Hälfte, Heft 8. Urban and Schwarzenberg, Friedrichstrasse 105b, Berlin N 24, Germany. 108 pp. RM. 5.50.
- ERNST BERL. "Liebig und die Bittersalz- und Salzsäurefabrik zu Salzhausen (1824–1831)." Nach neuen Funden herausgegeben von Prof. Dr. Ernst Berl im Auftrag der Vereinigung Liebighaus E. V., Darmstadt. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany. 65 pp. M. 3.50.
- JACQUES CORBIÈRE. "Sur la Fixation des Matières Émulsionnées par les Fibres Textiles." Société Anonyme de l'Imprimerie A. Rey, 4 Rue Gentil, Lyon, France. 125 pp.
- J. DAVIDSOHN. "Die Bleichung der Öle, Fette, Wachse und Seifen." Verlag von Gebrüder Borntraeger, W 35 Schöneberger Ufer 12a, Berlin, Germany. 269 pp. M. 18, unbound; M. 21, bound.
- JOHN C. KRANTZ, Editor. "Fighting Disease with Drugs. The Story of Pharmacy." A Publication of the National Conference of Pharmaceutical Research. The Williams and Wilkins Company, Baltimore, Maryland. 230 pp. \$2.00.
- P. H. PRAUSNITZ AND J. REITSTÖTTER. "Elektrophorese, Elektroösmose, Elektrodialyse in Flüssigkeiten." Wissenschaftliche Forschungsberichte Naturwissenschaftliche Reihe, herausgegeben von Dr. Raphael Ed. Liesegang. Verlagsbuchhandlung Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 307 pp. RM. 18.50, unbound; RM. 20, bound.
- LEOPOLD SCHMIDT. "Bernstein." Sonderausgabe aus Doelter-Leitmeier Handbuch Mineralchemie. Verlagsbuchhandlung Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 101 pp. RM. 7, unbound.
- ROGER J. WILLIAMS. "An Introduction to Biochemistry." D. Van Nostrand Co., Inc., 250 Fourth Ave., New York. 501 pp. \$4.00.
- "Annual Reports on the Progress of Chemistry for 1930." Vol. XXVII. Issued by the Chemical Society, Burlington House, Piccadilly, London W 1, England. 389 pp. 10/6, net.