
NEW BOOKS

Elektrische Leitfähigkeit. (Electrical Conductivity.) By W. HANLE, Jena, H. ULICH, Rostock and W. FLECHSIG, Berlin-Charlottenburg. Band 6, Abschnitt II, Eucken-Wolf, "Hand- und Jahrbuch der chemischen Physik." Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany, 1933. xii + 342 pp. Illustrated. 17.5 × 25 cm. Price, RM. 32.

This treatise on "Electrical Conductivity" is divided into three parts, each written by a different author. The first part (116 pages) by W. Hanle, deals with conductivity in gases. The purely theoretical aspects of the subject are treated with typical Germanic system and with as much thoroughness as is feasible in such a short account. The engineering applications of the phenomena in vacuum tubes, photoelectric cells and the cathode ray oscillograph are ignored with equal thoroughness.

The second part (155 pages) on conduction in liquids and solutions will be interesting and stimulating to chemists because it is written from the point of view of the physicist. More emphasis is given to Stokes' law and to the effect of variations in the pressure and in the temperature than is common in books written by chemists. As in the first part, details of experimental technique are excluded and industrial applications are ignored. The theoretical treatment is so completely modern that the classical theory of electrolytic dissociation is not even given as historical background or for comparison with the newer views. Indeed, if the author index may be relied on, the name of Arrhenius only appears once, and then only as authority for the statement that the viscosity of a solution may be changed enormously by the formation of a gel without any appreciable change in the conductivity. A discussion of the Debye interionic attraction theory is given but it is so brief that it does not compare favorably with Falkenhagen's treatise in clarity and completeness.

The third part (61 pages) by W. Flechsig deals with the conductance of non-metallic crystals. The complications of mixed ionic and electronic conduction found in crystals are treated with clarity. Less than two per cent. of the citations to the literature given in this part are to articles in American journals, which gives some indication of the great neglect of this branch of electrochemistry by American investigators.

GRINNELL JONES

Molekül- und Kristallgitterspektren. (The Spectra of Molecules and Crystal Lattices.) By R. FINKELNBURG, Karlsruhe, R. MECKE, Heidelberg, O. REINKOBER, Greifswald and E. TELLER, Kopenhagen. Eucken-Wolf, "Hand- und Jahrbuch der chemischen Physik," Band 9, Abschnitt II. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany, 1934. x + 408 pp. 198 figs. 17 × 25.5 cm. Price, RM. 34; bound, RM. 36.

The scope of this book is shown by the titles of the sections which compose it: the experimental methods of in-

fra-red spectroscopy (Reinkober, 42 pp.); the theory of long-wave molecular spectra (Teller, 118 pp.); the theory of crystal-lattice spectra (Teller, 28 pp.); the photography and analysis of band spectra (Finkelburg, 13 pp.); the theoretical treatment of molecular spectra (Finkelburg, 74 pp.); experimental results (Mecke, 37 pp.); the structure of polyatomic molecules on the basis of their spectra (Mecke, 80 pp., three sections).

In general, the theoretical discussions are clear, reliable and complete. Wave-mechanical treatments and arguments are given whenever necessary for clarity, but usually in as simple a form as possible. The book can be recommended strongly for reference regarding any practical question in the fields treated. The more difficult theoretical subjects, such as Λ -type doubling, are not discussed.

The tabulation of experimental results is extensive but not complete (for example, no data are given for the helium molecule), and is based on other review articles, the original references as a rule not being given. The accompanying discussion of representative spectra is devoted largely to the formal characteristics of the terms and the dependence of internuclear distances and binding constants on the position of the atoms in the periodic system.

LINUS PAULING

The Diffraction of X-Rays and Electrons by Amorphous Solids, Liquids and Gases. By J. T. RANDALL, M.Sc., A Member of the Staff of the Research Laboratories of the General Electric Co., Ltd., Wembley, England. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1934. xii + 290 pp. 197 figs. 14.5 × 22.5 cm. Price, \$5.75.

The book is a summary of the large body of recent work which has extended the methods of x-ray diffraction study to include the non-crystalline forms of matter; amorphous solids, liquids, and gases and the intermediate forms; the pseudo-crystalline, and micro-crystalline materials. The more important points covered include: x-ray diffraction by minute crystals, x-ray and electron diffraction study of gases, liquids, and amorphous solids, the structure of organic fibers, x-ray and electron diffraction study of surface structure, and the transition from solid to liquid. The book contains a large number of very excellent reproductions of diffraction patterns. Much of the work is necessarily presented in very sketchy form, but this is partially compensated by a very complete bibliography. The book is definitely a summary; it is not a textbook. The discussion is impartial; where conflicting theories exist each is fairly presented. In some parts, however, the impartial presentation leaves the reader without any clear-cut conclusions, and a more critical discussion would have been welcome. The statement on page 120 that Ω/V can never equal unity is incorrect. To the general reader interested in finding out what is going on in this new and rapidly developing field of physical chemistry, and to the

research worker in this field, the book is to be highly recommended.

B. E. WARREN

Oberflächenlösungen. Zweidimensionale Flüssigkeiten und monomolekulare Schichtungen. (Surface Solutions. Two Dimensional Liquids and Monomolecular Layers.) By ANDRÉ MARCELIN, Director of the Faculty of Sciences, Paris. Translated from the French by Dr. Rudolf Köhler, Leipzig. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1933. iv + 160 pp. 81 figs. 16 × 23.5 cm. Price, RM. 8.

This book is mainly of interest because of the many fascinating and clever experiments on oil films that are described. One of the chapters gives the history of the development of methods of studying oil films on water. There are in all 16 chapters upon different phases of this work.

On the theoretical side, however, the treatment is inadequate. Although the orientation of molecules at the surface is discussed, the author does not seem to be aware of the important role played by orientation in determining the properties of oil films. Gibbs' equation is treated in one chapter, but the discussion that follows suggests that this equation is of doubtful accuracy and importance in practical problems.

IRVING LANGMUIR

A Study of Crystal Structure and its Applications. By WHEELER P. DAVEY, Ph.D., Research Professor of Physics and Chemistry, The Pennsylvania State College. McGraw-Hill Book Company, Inc., 330 West 42d Street, New York, 1934. xi + 695 pp. Illustrated. 15.5 × 23.5 cm. Price \$7.50.

The first eleven chapters of this book are concerned with the fundamental concepts and the methods of crystal analysis. The reviewer objects to the order of presentation of the material in this section. For example the interpretation of the diffraction patterns is taken up for detailed treatment before the reader has been introduced to the theory of space groups and before the intensity of reflections has been adequately discussed. There are also other objections which must be made. For example, the chapter on the Bragg method ignores the developments during the last 15 years. The chapter on the powder method does not describe modern methods for precision measurements of spacings. McKeehan's incorrect structure for quartz is hardly suitable as an example illustrating the methods of analysis. Only antiquated intensity expressions are used in the first nine chapters.

Practically all of the theory of x-ray diffraction in crystals which the book contains is given in chapter X, which is almost identical with chapter V of Compton, "X-Rays and Electrons." Unfortunately all derivations are given for a highly specialized case (cubic crystal with one atom per unit cell). The symbol F in the equations of this chapter therefore represents the scattering power of the atom (atomic structure factor), as the author correctly points out. The author should have mentioned specifically, however, that in all actual cases the symbol F of these

equations will represent the whole structure amplitude (structure factor is the usual term), introduced in an earlier chapter. As it is, the reader is bound to get confused.

The last eight chapters deal with applications and with results obtained from crystal structure studies. One is greatly surprised to find that V. M. Goldschmidt's fundamental work has been completely ignored. The chapters on packing sizes of atoms and ions and on chemical information to be gained from crystal structure studies are particularly objectionable, since they contain so much misleading and incorrect information. In the chapter on diffraction by amorphous substances A. H. Compton's article on gas scattering [*Phys. Rev.*, **35**, 925 (1930)] is reprinted *in extenso*, while one learns nothing about the Zernicke-Prins, Debye-Menke theory of liquid scattering. The book contains nothing on the rotation of molecules and radicals in crystals.

Some of the chapters may be read with real benefit. However, throughout the book there are many errors and there is often lack of information on essential points. The reviewer therefore cannot recommend the book.

W. H. ZACHARIASEN

Erkennung organischer Verbindungen, im besonderen von Arzneimitteln. (Detection of Organic Compounds, Especially Medicinals.) By Dr. LAD. EKKERT. Verlag von Ferdinand Enke, Stuttgart, Germany, 1933. vii + 184 pp. 16.5 × 25 cm. Price, RM. 16; bound, RM. 17.60.

The identification method used in this latest contribution to the subject of qualitative organic analysis is based entirely upon colorimetric tests, a procedure which is strictly in accordance with the older pharmaceutical practice. That usage, no doubt, originated with work in the alkaloidal field at a time when the compounds were not necessarily available in appreciable amounts or even in pure form. Even today colorimetric and pharmacologic tests remain the mainstays of alkaloidal identification but for most of the common drugs simple quantitative methods coupled with the preparation of suitable derivatives identifiable by means of their physical constants, offer more accurate methods for their identification. The author establishes a worthy precedent, however, by specifying in many instances the exact sensitivity of the color test in terms of micrograms of the compound which may be detected in a given volume of solution. Such a semi-quantitative interpretation naturally removes some of the objections to colorimetric tests.

Pitfalls are avoided also by providing a considerable number of color tests for each compound, the average being six or eight. In addition to the older colorimetric tests, use is made also of the fluorescence which many compounds exhibit when viewed under ultraviolet light. That method, proposed by Kitching, *Analyst*, **47**, 206 (1922), has only recently been adopted in pharmaceutical laboratories. The author wisely avoids placing too much dependence on the procedure and applies it as only one of the series of color tests needed for the identification of a given compound.

The field of qualitative organic analysis is so extensive that reference books dealing with the main subdivisions of the subject and presenting specialized information

which normally cannot be offered in a general treatise would be quite welcome. The title of the book under examination might lead one to expect exactly that type of presentation in so far as medicinal products are concerned. One is disappointed, therefore, in finding that the treatment is limited to the identification of only 121 compounds; mainly those included in the Third Edition of the Hungarian Pharmacopoeia. They are arranged alphabetically according to their German names, followed by their scientific and official designations. The limitations of the book can be illustrated best by an example. Approximately twenty barbituric acids are on the market and yet one finds listed here only diethylbarbituric acid and phenylethylbarbituric acid.

The most valuable part of the work under review consists in the references to the original literature on colorimetric tests. Dr. Ekkert obviously has made an exhaustive study of the field and consequently from that standpoint his book will be of value in every pharmaceutical library.

OLIVER KAMM

Annual Review of Biochemistry. Volume III. Edited by JAMES MURRAY LUCK, Stanford University. Stanford University Press, Stanford University, California, 1934. viii + 558 pp. 16 × 23 cm. Price, \$5.00.

The third volume of this review of biochemistry, while following the same general plan of the two previous volumes, differs in certain particulars. Several new contributors have appeared in this latest issue, and there are new sections including the biochemistry of malignant tissue, and an all too brief chapter on biochemical and nutritional studies in the field of dentistry.

The contents of the book includes: Water in its biochemical relationships, R. A. Gortner; Biological oxidations and reductions, A. Bertho; Enzymes, E. Waldschmidt-Leitz; The chemistry of the acyclic constituents of natural fats and oils, R. J. Anderson; The chemistry of the lipins, I. Smedley-MacLean; The chemistry of the sterols, bile acids and other cyclic constituents of natural fats and oils, O. Rosenheim and H. King; The chemistry of the amino acids and the proteins, W. Pauli; The chemistry and metabolism of the compounds of phosphorus, H. D. Kay; Carbohydrate metabolism, C. F. Cori and G. T. Cori; Fat metabolism, W. R. Bloor; The metabolism of proteins and amino acids, Y. Kotake; Mineral metabolism—Sodium, potassium and chlorine, A. T. Shohl; The hormones, D. L. Thomson and J. B. Collip; Vitamins, L. J. Harris; Nutrition, S. Brody; Liver and bile, J. L. Bollman and F. C. Mann; The metabolism of brain and nerve, E. G. Holmes; The biochemistry of malignant tissue, E. Boyland; The structural chemistry of the animal pigments, H. Fischer and H. Orth; Animal pigments, A. E. Mirsky and M. L. Anson; Biochemical and nutritional studies in the field of dentistry, M. Koehne and R. W. Bunting; The terpenes, saponins and closely related compounds, L. Ruzicka; The biochemistry of the nitrogenous constituents of the green plants, H. B. Vickery; Mineral nutrition of plants, H. Lundegårdh; Metabolism of carbohydrates and organic acids in plants (exclusive of bacteria and fungi), W. Ruhland and J. Wolf; The chemistry of bacteria, M. Stephenson.

In general, the value of these reviews becomes cumulative with the lapse of time. The first volume involved a rather abrupt plunge into a mass of material in which the reader may or may not have been properly oriented. This process of orientation is facilitated by the sequence of contributions which is now in the third stage. Subsequent volumes will be of increased value if the contributors ensure that a reasonable continuity and coherence is maintained.

One is impressed by the care with which the contributors have selected the material to be presented within the narrow limits of space allotted them. The critical attitude toward current work and its interpretation which they have generally employed suggests that the editors or advisory committee have properly encouraged such a policy. This is of distinct value to the reader when followed by as distinguished a group of contributors as is here represented.

The enormous and expanding literature of biochemistry endows these annual reviews with an increasing importance to the biochemist who can thus acquire a working familiarity with the progress registered outside of his own field of specialization.

C. H. BAILEY

Carotinoide, Bakterien- und Pilzfarbstoffe. (Carotenoids, Bacterial and Fungal Pigments.) By Dr. HARRY WILLSTÄDT. Heft 22, Ahrens Sammlung chemischer und chemisch-technischer Vorträge. Verlag von Ferdinand Enke, Hasenbergsteige 3, Stuttgart, Germany, 1934. 119 pp. 16.5 × 25.5 cm. Price, RM. 9.80.

At the time the author wrote this monograph, the only comprehensive presentations of the subject were embodied in special chapters of larger treatises, or as annual reviews of progress. Since then there have appeared Zechmeister's "Carotinoide," and Lederer's "Les carotenoides des plantes," both of which books cover the carotenoids very thoroughly and are as nearly up to date as can be reasonably expected in the case of a field being developed so rapidly.

In scope, the monograph under review includes not only the carotenoids, but also those bacterial and fungal pigments whose chemical constitution has been either wholly or at least partially elucidated. Methods of separation, purification, evaluation, preparation and special technique are given, so that it should be useful in the laboratory as well.

The text is divided into three chapters: 1, Carotenoids (71 pp.); 2, Bacterial pigments (11 pp.); and 3, Fungal pigments (28 pp.), and concludes with a subject index. The bacterial pigments number only three—pyocyanin, chlororaphin and prodigiosin. Eleven pigments found in fungi are considered. The bacterial pigments are nitrogenous, the fungal non-nitrogenous. Neither group has any structural similarity to the polyene carotenoids.

In general, the subject matter is well organized, well presented, with liberal use of graphic formulas and numerous literature citations. Paper and presswork are excellent. The monograph should prove very helpful to those seeking a compact review of these interesting groups of natural pigments.

MARSTON T. BOGERT

Carotinoide. Ein biochemischer Bericht über pflanzliche und tierische Polyenfarbstoffe. (Carotinoids. A Biochemical Review of the Plant and Animal Polyene Pigments.) By Professor Dr. L. ZECHMEISTER, Director of the Chemical Institute of the University of Pécs (Ungarn). Verlag von Julius Springer, Linkstrasse 23-24, Berlin W 9, Germany, 1934. xii + 338 pp. 85 figs. 14.5 × 22 cm. Price, R.M. 28; bound, R.M. 29.40.

The monograph presents an excellent summary of recent accomplishments in this highly specialized field of research. Primary emphasis is given to the recent brilliant work from the laboratories of Karrer, Kuhn and the author, from which complete structural formulas may be definitely assigned to most of the carotinoid pigments. The author has also included references to and discussion of the many colorless hydrocarbons and their derivatives which are closely related chemically and biologically to the carotinoid pigments, *e. g.*, vitamin A, isoprene, ionone, squalene and phytol. The subject matter is well organized to include for each substance a reasonably detailed account of the occurrence, methods of isolation, quantitative estimation, physical constants and chemical characteristics. A good résumé is also given of the general types of reactions used in establishing the exact molecular structures which have been assigned. With due deference to the present lack of information, relatively little space has been devoted to the consideration of biological functions. The structural relationships of the various substances are well presented by the liberal use of graphic formulas. Citation of references is largely confined to recent papers (to the middle of 1934) in view of the earlier excellent review by Palmer (1922). The appendix includes an excellent set of microphotographs. The printing is clear and relatively free from errors, but the publisher has carelessly left for the reader the irritating task of cutting most of the pages.

C. G. KING

The Electronic Structure and Properties of Matter. An Introductory Study of Certain Properties of Matter in the Light of Atomic Numbers. Being Volume I of a Comprehensive Treatise of Atomic and Molecular Structure. By C. H. DOUGLAS CLARK, M.Sc., A.R.C.S., D.I.C., Assistant Lecturer in Inorganic Chemistry in the University of Leeds. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1934. xxvi + 374 pp. 33 figs. 14.5 × 22.5 cm. Price, \$5.50.

The author states in the preface that this book is the result of an attempt to summarize the explanations which have been advanced in connection with certain properties of matter in terms of electronic constitution. The topics discussed, as given by the chapter headings, are: the classification of the elements, the classification of atomic electrons, line spectra and multiplicity, the transitional and rare earth elements, valency and chemical combination, melting points and boiling points, atomic and molecular volumes, atomic and ionic radii, electrical conductivity, magnetic susceptibility, atomic magnetic moments, cohesive and other properties.

The book is not a textbook or a book for study; in the opinion of the reviewer a new subject could not be learned from it, the exposition being too condensed to be clear.

On the other hand, it may be very useful for reference to the literature. Over eight hundred references are given, usually in connection with a statement regarding the subject. The value of the book would have been increased by the omission of reference to numerous antiquated ideas (such as the suggestion by Debye and Vegard in 1917 that the K shell might contain three electrons), and the expansion of the discussion of the present point of view.

LINUS PAULING

BOOKS RECEIVED

October 15, 1934–November 15, 1934

H. BECHHOLD, Editor. "Einführung in die Lehre von den Kolloiden." Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 160 pp. R.M. 9; bound, R.M. 10.

WILLIAM ROBERT FEARON. "An Introduction to Biochemistry." William Heinemann, Ltd., 99 Great Russell St., London W. C. 1, England. 313 pp. 10s./6d.

HANS FISCHER AND HANS ORTH. "Die Chemie des Pyrrols. I Band. Pyrrol und seine Derivate mehrkernige Pyrrolsysteme ohne Farbstoffcharakter." Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany. 460 pp. R.M. 26.50; bound, R.M. 28.00.

F. F. E. GERMANN AND ODON KNIGHT. "Boiling Points of Ring and Chain Compounds." Available from the Authors, Department of Chemistry, University of Colorado, Boulder, Colo. Two charts, \$2.00.

BENJAMIN HARROW AND CARL P. SHERWIN. "The Chemistry of Hormones." The Williams and Wilkins Company, Mt. Royal and Guilford Aves., Baltimore, Md. 227 pp. \$2.50.

I. M. HEILBRON, Editor-in-Chief. "Dictionary of Organic Compounds." Vol. I. Abietic Acid—Dyprone. Oxford University Press, 114 Fifth Ave., New York. 706 pp. \$25.00.

E. J. HOLMYARD. "Chemistry for Beginners." E. P. Dutton & Co., Inc., 286-302 Fourth Ave., New York. 223 pp. \$1.00.

"Analar' Standards for Laboratory Chemicals." Being Improved Standards for the Analytical Reagents Formerly Known as "A. R." Formulated and issued jointly by The British Drug Houses, Ltd., and Hopkins and Williams, Ltd., London, England. 295 pp. 3s./6d. net; 4s./-postpaid.

"Premier Rapport de la Commission Permanente de Thermochemie." Union Internationale de Chimie. Texte de W. Swietoslowski et L. Keffler. (In English, German and French.) Secrétariat Générale, 49 Rue des Mathurins, Paris, France. 31 pp.

"Statistical Appendix to Minerals Yearbook, 1932-33." Bureau of Mines, Department of the Interior. Superintendent of Documents, Government Printing Office, Washington, D. C. 514 pp. \$1.00.