

aspects presented. Hence, only a few comments may be permitted: Chapter II contains a wealth of valuable information. The space saving device of presenting much of the chemical material in the form of charts makes the reading somewhat difficult. Not all of the errors appearing in this chapter have been corrected by the insertion of "Notes." The author of Chapter VIII, who has published similar review articles elsewhere, has once more succeeded in conveying a lucid picture of our present day concepts concerning the biogenesis of the steroid hormones, especially in its relationship to cholesterol. In Chapter XV the editor deals with some aspects which do not "fit in" with the foregoing chapter headings. Remark on the whole book, he aptly states, "We have been presented to a molecule which can be synthesized from small units, metabolized to a variety of compounds, is interrelated structurally and metabolically with other constituents, and which in the myelin sheath remains apparently static." The book concludes with an "Appendix of Practical Methods" (pp. 481-498), which will be of value to the clinical chemist.

In view of the wide coverage of the subject matter and the excellence of its organization, this book will doubtless be appreciated by a variety of investigators, in particular organic, biological and clinical chemists, as well as by physiologists, pathologists and clinicians. It may be added that printing and binding of this monograph are up to standard.

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MAXIMILIAN EHRENSTEIN

Handbook of Chemical Microscopy. Volume I. Third Edition. Principles and Use of Microscopes and Accessories. Physical Methods for the Study of Chemical Problems. By ÉMILE MONNIN CHAMOT, B.S., Ph.D., Late Professor of Chemistry, Emeritus, Cornell University, and CLYDE WALTER MASON, A.B., Ph.D., Émile M. Chamot Professor, Chemical Microscopy and Professor of Metallography, Cornell University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. xii + 502 pp. 15.5 × 23.5 cm. Price, \$14.00.

For investigators and advanced students in diverse fields of science and technology, wherever a critical study of the structural and optical properties of microscopic objects are called for, this volume should prove a practical handbook and an extremely valuable reference source. The handbook starts with a survey of the optical system and the mechanical attributes of the light microscope, followed by a fairly detailed discussion of the important problem of illumination. The chapter on illumination of opaque objects is especially well written, although the chapter on trans-illumination could have incorporated more reference to recent theories of image formation. Also with respect to field brightness there is a confusion between the practical and theoretical effects of the size of the source (pp. 104, 105). Principles and applications of dark-field, phase contrast and fluorescence microscopy are described in this chapter. These are followed by descriptions of a wide variety of general and specific microscopic techniques—preparation of material (not conventional histological techniques), special methods for interpreting physical (form, color, mechanical, thermal) properties of objects, ultramicroscopy or study of colloidal phenomena, photomicrography and microprojection. Then follows a short chapter on electron microscopy which may serve to introduce the reader to some general reading material on this vast topic. The latter half of the book is mostly concerned with studies of crystals and aggregates with the polarizing microscope. In addition to a well-documented chapter on the polarizing microscope and its principal applications, there are chapters dealing with the quantitative determination of the optical properties of microscopic objects and the relation of optical properties to crystal and aggregate structure. These are followed by a chapter on special methods for preparing crystals for microscopic study. The final two chapters deal with methods of measurements (linear, of area and volume, and angular) and the determination of particle size. Appended is a Michel-Levy color scale for estimation of birefringence whose usefulness is likely to be primarily educational.

Compared to the earlier edition, those portions of the text dealing with methods (but not so much on principles), the bibliography and diagrams were brought up to date and the quality of the paper improved. Very few typographical errors (page 101, page reference; page 262, particle size of polystyrene latex polymer should be in *microns* rather than in *millimicrons*; page 336, rods or plates with a dimension *about* the wave length of light should be *smaller than*) were noticed. In all, the handbook is filled with useful information not only with respect to techniques but also on such basic matters as sampling errors and problems on purity of crystals. It is, however, somewhat weak on optical theory. As in the earlier edition, the abundant source of reference material is extremely valuable, although in some chapters more reference to recent work could have been incorporated. Especially noticeable was a lack of mention of the application of the interference microscope in which Davies and others have succeeded in measuring dry mass of microscopic objects to better than 10^{-12} gram precision. Also it would have been helpful to advanced readers if initials were shown on all names of investigators referred to.

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SHINYA INOUE

Chemical Constitution. An Introduction to the Theory of the Chemical Bond. Second Revised Edition. By J. A. A. KETELAAR, Professor of Physical Chemistry, University of Amsterdam, The Netherlands. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, N. J. 1958. viii + 448 pp. 16 × 23 cm. Price, \$8.95.

J. A. A. Ketelaar is Professor of Physical Chemistry at the University of Amsterdam and is perhaps best known to American chemists for his elucidation of the structures of certain complex inorganic structures. He has written a splendid textbook of theoretical chemistry using as his Leitmotiv the four types of bonds of interest to chemists, namely, the ionic bond, the atomic bond (principally the electron pair bond), the metallic bond and the van der Waals bond (particularly of the London type).

The author recognizes at the outset that any chemical bond arises from coulombic interactions of outer electrons. After a short and rather conventional account of the periodic table (he could have discussed ionization potentials and approximate methods for many-electron atoms, for example) he launches into a superb chapter on the ionic bond. He applies elementary electrostatics to a wide variety of chemical problems including acid strengths and the solubility and hydration of salts. As the author points out, the approximations made in such problems are no worse than those made in quantum chemistry.

Nearly half the book is devoted to the covalent bond and its application to the properties of organic compounds. Quantum mechanics is neatly summarized without, as is unfortunately the common practice, devoting more time to the solutions of certain linear differential equations of early 19th century vintage than to the physical significance of the results. What few mathematical arguments are presented are confined to small type. The formalistic nature of resonance is explained in crystal clear terms. Among the features of this chapter is a very detailed account of the theory of color. Here one can successfully make reasonable predictions from rather simple theoretical arguments.

The section on the metallic bond contains a short but clear account of the Sommerfeld theory of electrons in metals and the Brillouin zone theory. There is a cursory treatment of semi-conductors which could have been considerably extended in view of the large interest which was developed in this subject in recent years.

The last section (van der Waals bonding) deals with a wide variety of phenomena including molecular compounds (clathrates, urea compounds, etc.), solubility and cohesive energies and the hydrogen bond. Although the electrostatic origin of the inverse sixth power of the distance for van der Waals forces is outlined, there is no derivation of London forces which, after all, is usually far greater than the Keesom and Debye contributions.

This book lies somewhere between Pauling's classic and the treatise of Syrkin and Dyatkina in that the physical arguments are better presented than in the former and the chemical arguments are better presented than in the latter.

It is a fine book and is warmly recommended for graduate students and for professionals who feel they may have lost touch with modern developments in theoretical chemistry.

DEPARTMENT OF CHEMISTRY
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Surface Phenomena in Chemistry and Biology. Edited by J. F. DANIELLI, Ph.D., D.Sc., F.R.S., Professor of Zoology, King's College, London, K. G. A. PANKHURST, Ph.D., D.Sc., F.R.I.C., Packaging Research and Development Division, Reed Paper Group, Formerly Senior Principal Scientific Officer, British Leather Manufacturers' Research Association, and A. C. RIDDIFORD, Ph.D., Lecturer in Chemistry, The University of Southampton. Pergamon Press, Inc., 122 East 55th Street, New York 22, N. Y. 1958. 330 pp. 15.5 × 23.5 cm. Price, \$10.00.

This collection of twenty-three essays is published in honor of Neil Kensington Adam, whose portrait appears as frontispiece, at the occasion of his retirement from the chair of chemistry in the University of Southampton. A glance at its contents shows many famous names in the field of surface chemistry. About one-third of the contributions deals with the chemistry of unimolecular layers, a field which has been greatly advanced through Adam's efforts. Not only fundamental problems are treated as, e.g., by Alexander and by Derfichian, but the application of monolayer techniques, e.g., to the theory of tanning is discussed by Pankhurst. Amongst the other articles, which cannot be completely enumerated, one deals with the peculiar surface phenomena of liquid crystals, a little known subject. Schulman describes experiments with high speed photography, elucidating the behavior of air bubbles impinging on crystal surfaces, a contribution to the theory of flotation. The last group includes among others articles by Danielli, one of the volume's editors, Frazer and Rideal; they treat of general and specific aspects of surface chemistry in biological systems. An introductory article by A.S.C. Lawrence surveys in a nostalgic mood the history of surface chemistry from 1917 to 1957 and emphasizes Adam's role in its development.

While the field has grown too wide to permit of a complete cross-section within little more than 300 pages, the volume provides valuable information on the endeavors of an important group of surface chemists, who have honored Dr. Adam by contributing their representative best. The group of his pupils and friends, found in this well prepared and handsomely bound volume, comprises primarily colleagues from Great Britain, also a few Frenchmen and Russians. Dr. Adam may be assured that his life's work is equally appreciated and admired by the rest of the scientific world.

DEPARTMENT OF CHEMISTRY
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Measurement and Calculation of Temperature and Conversion in Fixed-Bed Catalytic Reactors. By JØRGEN KJÆR. A Contribution from Haldor Topsøe, Chemical Engineers, Hellerup, Denmark. Jul. Gjellerups Forlag, Sølvgade 87, Copenhagen, Denmark. 1958. 201 pp. 16 × 23.5 cm. Price: Paperbound, 25,00 Danish Kroner; cloth-bound, 30,00 Danish Kroner.

This work is a discussion of the problems of temperature, rate and conversion calculations in reactors such as ammonia converters.

The author divides the book into two parts—theoretical and experimental. The theoretical part is concerned not with mechanisms but with detailed methods for calculating temperatures in fixed beds particularly ammonia converters. Included is an excellent review of the literature, and some of the author's own work on thermal profile calculations.

In the experimental part, Dr. Kjaer includes his work on phthalic anhydride synthesis and the analysis of data from several ammonia converters. In this he checked details carefully.

The appendices include English and Danish summaries of the book by chapter, a list of symbols, the usual pertinent conversion factors and a bibliography (380 references).

The book also includes generally useful tables of heat transfer data for packed beds containing various materials.

I was pleased with the way the author outlined what he was about to say both in the introduction and at the beginning of each chapter and then set about expeditiously to do so. The purist will object to some word usage, but there is effected no change in sense. Dr. Kjaer's formulation, at times, becomes necessarily complex, but he never assigns a symbol two meanings, whence the 213 symbols.

I felt the author was somewhat cavalier in fitting his calculations to the data. For example, on page 156 he assigns an activation energy of 45 kcal./mole for the reaction above 450° in a TVA converter. On page 163, he assigns an activation energy of 35 kcal./mole above 450° and 30 kcal./mole above 500° to get a better fit in the Montecatini converter. The apparent change in activation energy with temperature suggests that the intraparticle diffusion effects be considered more carefully at that pressure (275 atmospheres).

For those working in the catalytic reactor field, I recommend the book. Others concerned with complex heat transfer problems will find the book of interest.

GENERAL ELECTRIC CO.
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Liquid Scintillation Counting. Proceedings of a Conference held at Northwestern University, August 20-22, 1957. Editors, CARLOS G. BELL, JR., C. E. Department, Northwestern University, and F. NEWTON HAYES, Health Division, Los Alamos Scientific Laboratory. Pergamon Press, 122 East 55th Street, New York 22, N. Y. 1958. xi + 292 pp. 15.5 × 23.5 cm. Price, \$10.00.

Scintillation counting, as the term is now employed, means the detection of moving charged particles by using a photomultiplier tube in conjunction with a scintillating material. The flashes of light produced in the scintillator by the moving particles are converted by the photomultiplier tube into short intense electrical pulses which can be effectively recorded. This technique was developed over ten years ago when the photomultiplier tube replaced visual observation as the method of detecting the scintillations produced in ZnS by α -particles. The need for larger sensitive volumes to detect charged particles other than α -particles then led to the use of large single crystals of scintillating substances such as NaI and anthracene instead of ZnS. It then was found that if small quantities of organic scintillators such as anthracene were dissolved in a suitable solvent the liquid would be converted into an efficient scintillator. This made it possible to use even larger scintillating volumes. These scintillating liquids found immediate use in counters for high energy particles (Enrico Fermi was one of the early users) and these devices became known as liquid scintillating counters. The technique soon proved to be useful in a very wide range of applications and this counting technique is rapidly replacing geiger counters. In August, 1957, a Conference on Liquid Scintillation Counters was held at Northwestern University. The book reviewed here is a compilation of the reports given at this conference.

The volume is not a well rounded presentation of the subject, as might be expected from the fact that contributions from over thirty authors are included. Many specific applications of the technique are given, some of which are important and interesting, but there is little systematic discussion of the techniques involved and the book can hardly be recommended to a novice in the field who wants to know how to build a liquid scintillation counter. One would judge the title to be too ambitious and the book could more accurately be called a report of the Conference on Liquid Scintillation Counters.

Some sections are excellent. Part I, for example, is a review of the basic physical processes occurring in a scintillating liquid by the authorities on the subject, H. Kallman and M. Furst. The chapter by R. K. Swank on the limits of sensitivity is thoughtfully written and contains some very useful data. Part II on Instrumentation will be of benefit to those with a good background in electronics. Much of the book is devoted to quite special topics which extend in scope from Giant Liquid Scintillation Counters used to detect the neutrino, to an account, "The Simultaneous Use of H³ and C¹⁴