

pletely; recent halide chemistry (particularly of the fluorides) warrants review and inclusion in an encyclopedia; various interesting and important compounds such as the tellurides, phosphides, arsenides, etc., are not mentioned.

The editor, in his preface, notes the incomplete coverage. However, with the aid of "Chemical Abstracts" and "Nuclear Science Abstracts" it should be possible and worth while to make a broader coverage of even moderately current literature than has been done. The principal value of this volume thus remains as a guide to the early literature.

RESEARCH LABORATORY  
GENERAL ELECTRIC CO.  
SCHENECTADY, NEW YORK

J. F. FLAGG

**The book of  $pH$ .** A simple and complete description of the theory and practice of the measurement of  $pH$  as applied to science and industry. By R. B. WEBBER, M. A. (Cantab.), Lecturer in Physics, Cambridgeshire Technical College. The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. 1958. 111 pp. 19 × 25.5 cm. Price, \$6.00.

Following a brief introduction on what is meant by  $pH$ , ten pages give examples of the importance of  $pH$  determinations in the home, research, and industry. The next twenty pages are devoted to essential  $pH$  theory as interpreted in terms of aqueous solutions of Arrhenius acids and bases.

Two short sections summarize the principles of  $pH$  measurement. The first covers colorimetric methods, with special emphasis on the use of Lovibond glasses as standards. The second covers electrometric methods, including commonly used electrodes and measuring instruments.

Two brief sections deal with hydrogen ion activity, including the British and United States  $pH$  scales, and with acidity in non-aqueous solutions. A glossary of terms follows.

This is a very elementary presentation, written presumably for those having little chemical training. Compared to works such as those by H. T. S. Britton, J. E. Ricci and R. G. Bates, it is hardly *the* book of  $pH$ .

DEPARTMENT OF CHEMISTRY  
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M. G. MELLON

**Advances in Enzymology and Related Subjects of Biochemistry.** Volume XIX. Edited by F. F. NORD, Fordham University, New York, N. Y. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. v + 457 pp. 16 × 23.5 cm. Price, \$9.85.

This volume, in keeping with the tradition of other volumes, has continued to emphasize authoritative reviews by distinguished workers in the field. The topics on which advances are reported include Enzymatic Aspects of Photosynthesis, by Vishniac, Horecker and Ochoa; Mechanisms of Oxygen Metabolism, by Mason; Activation of Amino Acids, by T. Wieland and Pfeleiderer; The Properties of Papain, by Kimmel and E. L. Smith; Principal Pathways of Assimilation and Dissimilation of Nitrogen in Animals, by Braunstein.

In the first review, three of the outstanding workers in the field have joined together to give a most comprehensive summary of current views on the experimental data on carbohydrate metabolism, carbon dioxide fixation and light-dependent reactions in photosynthesis. The treatment of topics in this field is objective and is focused upon the experiments themselves rather than the many hypotheses with which this field is studded. The review was written on the basis of the experimental evidence that led to the general acceptance of the ribulose diphosphate pathway and does not take into consideration current thinking on the importance of other intermediates. The discussion of the role of chlorophyll in carbon dioxide fixation is of great interest in evaluating the recent hypothesis of stoichiometric relationships between carbon dioxide and chlorophyll. This review will stand as an authoritative presentation of the current status of enzymatic aspects of photosynthesis for some time to come.

In a review of exceptional length (133 pages, 842 references) H. S. Mason again puts forward his reasons for a new nomenclature and classification of a number of enzymes that would otherwise be termed oxidases, peroxidases, and in some cases dehydrogenases. As evidence for the lack of unanimity on enzyme nomenclature and classification, it is noteworthy that Dixon and Webb, in their recent text, classify as hydrogen transfer enzymes those that Mason terms oxygen transferases. The use of the words "oxygen metabolism" in the title is somewhat deceptive, for only one of the 133 pages of the article is devoted to the principal pathway of oxygen metabolism of the cell. Mason's review is extraordinarily complete in its description of the substrate specificities and organic chemistry of oxidation reactions (a 29-page table is included). There are many diagrams and tables on intermediates in the transformations of substrates involved in these reactions. Perhaps as a consequence of the ambitious scope of this review, uncertain reaction schemes are included without a full discussion of contrary evidence. In addition, an extraordinary number of typographical errors appear in the tables where substituents are lacking or are improper. In the text as well some slips have occurred: homogentisic acid is indicated a substrate and 2,5-dihydroxyphenylacetic acid is indicated to be "not attacked" by the same enzyme. It is therefore necessary to refer to the original literature for authoritative information and a complete discussion on some of the reaction schemes described.

A considerable portion of the detailed reaction mechanism for the action of peroxidase in "oxygen transferase" action requires the postulation of a ferropoxidase-oxygen intermediate which in some schemes is identified with peroxidase complex III. While this affords an interesting hypothesis, its serious consideration requires direct experimental answers to certain questions: whether complex III can be converted directly in ferropoxidase-CO, and whether the light sensitivity of the CO-inhibition of the dihydroxyfumarate oxidase activity corresponds to the spectrum of ferropoxidase-CO. Currently available evidence on the first point is contrary to the proposed hypothesis.

T. Wieland and Pfeleiderer have given an authoritative and concise report on the activation of amino acids. Their chapter covers detection of activated amino acids, their synthesis and their reactions. The role of ATP in the biological activation of amino acids is also discussed. The report ends with a summary of the newer aspects of the biological reactions of activated amino acids. The contribution is of special interest because it contains reports on syntheses and other data that come largely from the authors' unpublished work.

The essay on papain by Kimmel and E. L. Smith is a model of a complete and authoritative study of an enzyme. The details on the purification of the physical properties of papain and the criteria for homogeneity, together with the progress made on the amino acid sequences in this catalyst, are indeed striking. Furthermore, studies on specificity and reaction kinetics give considerable insight on the mechanism of action of this enzyme.

The volume is concluded with a competent and imaginative review of the principal pathways of assimilation and dissimilation of nitrogen in animals by Braunstein. This review is of interest since it gives, in addition to the purely biochemical aspects, an interpretation of the results on the basis of comparative biochemistry.

In summary, this volume continues in most respects the tradition of excellence of the "Advances in Enzymology." A suggestion of the reviewer, however, is that a stronger editorial policy might lead to more concise and thus more effective presentations.

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BRITTON CHANCE

**Chemistry of Carbon Compounds. Volume IV, Part A. Heterocyclic Compounds.** Edited by E. H. RODD, D. I. C., D.Sc., F.C.G.I., F.R.I.C. D. Van Nostrand Company, Inc., 126 Alexander Street, Princeton, N. J. 1957. xxvi + 808 pp. 15.5 × 23 cm. Price, \$28.00.

This volume, the first of three dealing with heterocyclic substances, continues the monumental treatise on organic chemistry being prepared under the editorship of E. H.

Rodd. Compounds containing three- to five-membered heterocyclic rings and those with six-membered heterocyclic rings containing one nitrogen atom are surveyed. Contributors to this volume are T. S. Stevens, J. O. Landau, E. Hoggarth and N. Campbell. Their efforts deserve the strongest support from organic chemists everywhere.

DEPARTMENT OF CHEMISTRY  
UNIVERSITY OF ROCHESTER MARSHALL GATES  
ROCHESTER, NEW YORK

**Cahiers de Synthèse Organique. Méthodes et Tableaux D'Application.** Vol. IV. LÉON VELLUZ, Editor. By JEAN MATHIEU et ANDRE ALLIAS, Ingénieurs-Docteurs. Masson et Cie., 120 Boulevard Saint-Germain, Paris VI<sup>e</sup>, France. 1958. 272 pp. 15.5 × 22 cm. Broche: 5.000 frs.; Cartonnette: 5.500 frs.

This fourth volume continues the survey of organic reactions and has three main chapters. Chapter 9 deals with Acylation in the Aliphatic Series, by which title is meant the reactions which result in attachment of an acyl group to an aliphatic carbon atom (*not*, O- or N- acylation). Formation of imino compounds which are hydrolyzable to a keto group is also covered. Chapter 10 concerns acylation of aromatic compounds leading to alkyl aryl ketones or diaryl ketones. Chapter 11 describes bifunctional condensation reactions leading to 1,2-glycols,  $\alpha$ -ketols and  $\alpha$ -diketones.

The presentation is quite different from "Organic Syntheses" and "Organic Reactions." Each chapter has: (1) a table of the symbolic structures with citation to pages and divisions; (2) a short discussion of the reactions according to types of products; (3) a brief statement of mechanisms; (4) applications; (5) extensive discussion of each reaction with references; and (6) tables showing starting materials, products, reagents, yields and references. These tables are quite complete and are very useful.

At the end of this volume, there is a tabular summary of all the reactions presented in Volumes I through IV, giving the divisions, volume numbers with pages for discussion and pages for the tables. It is quite easy to locate products or reactions.

The material is thoroughly organized and well written. It is necessary for the reader to become familiar with a number of abbreviations in order to decipher experimental conditions given over the arrows in the reactions. This reference book can be recommended to all organic chemists. It is an especially fine book for graduate students to read for practice in learning chemical French as well as organic reactions.

DEPARTMENT OF CHEMISTRY  
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**Principles of Geochemistry.** Second Edition. By BRIAN MASON, Curator of Physical Geology and Mineralogy, The American Museum of Natural History, Professor of Mineralogy, Columbia University, New York. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. vii + 310 pp. 15.5 × 23.5 cm. Price \$8.50.

This book appears in a second edition after the relatively brief period of six years which speaks well for the original presentation. The second edition is called for largely because of the rapid advance in geochemistry. The author states in the preface: "Under these circumstances a revision of 'Principles of Geochemistry' has become highly desirable. Many of the data in the first edition have been superseded by more reliable figures, and there has been a concomitant development in the theoretical framework of the subject."

The organization of the book follows that of the first edition, but each of its eleven chapters shows careful revision, and the material is presented in critical fashion throughout the book. The style is clear and crisp, as if each word were carefully weighed before being put down.

The book begins with an introductory chapter concerned with definitions and scope of present day geochemistry as distinguished from that of F. W. Clarke ("The Data of Geochemistry," fifth edition, U. S. Geological Survey, Bull. 770, 1924). The next chapter deals with the earth as a

planet and its relation to the solar system as a whole and is followed by one discussing the internal structure of the earth and its composition. From the data in these two chapters an account is given of the relative abundance of the elements and isotopes both in the earth and in the universe.

After this background material comes a brief interlude concerned with the principles of thermodynamics and the physical chemistry of the solid state. The remainder of the book treats of materials and processes at and near the surface of the earth. Several chapters discuss the geochemistry of igneous, sedimentary and metamorphic rocks and the hydrosphere, the atmosphere and the biosphere. A final summary is given in terms of the geochemical cycle, tracing the migration of the elements under the influence of processes effective in the outer parts of the earth. The chapters on the igneous, sedimentary and metamorphic rocks should be of value to chemists seeking acquaintance with geochemistry and an introduction to the terminology and mode of thought in the geological sciences.

As a warning to a chemist accustomed to exact determinations in the laboratory, the wide generalizations of cosmochemistry or those dealing with the earth's interior may appear as giant steps into the unknown but, on the other hand, the same chemist may be mollified by the exact laboratory work requisite for arriving at these and other generalizations of geochemistry. It is an indication of the author's ability to organize and present such complex material in precise and understandable terms, that he can do this without filling the pages with a rash of mathematical formulas. The presentation is greatly facilitated by the numerous carefully designed diagrams and tables.

The author rides no hobby-horses, but presents geochemistry in a factual and highly readable manner. Only one misprint was noted, and the technical execution of the book is beyond reproach.

U. S. GEOLOGICAL SURVEY  
GEOPHYSICS BRANCH FRANK C. KRACEK  
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**Solid State Physics. Advances in Research and Applications. Nuclear Quadrupole Resonance Spectroscopy.** Supplement 1. BY T. P. DAS, Saha Institute of Nuclear Physics, Calcutta, India, and E. L. HAHN, Department of Physics, University of California, Berkeley, California. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. ix + 223 pp. 15.5 × 23.5 cm. Price \$7.00.

The nature of this book is best revealed by its pre-publication history. It was intended to be a chapter in one of the volumes of the regular Solid State Physics series. However, the literature on the subject is extensive and it was covered so thoroughly by the authors that the manuscript would have filled half of one of the regular volumes. Therefore, it was published as a Supplement and is, in fact, a very complete monograph on nuclear pure quadrupole resonance phenomena and their utility in the study of the solid state.

The first successful pure quadrupole resonance experiments were reported in 1950, and this area of radiofrequency spectroscopy is the youngest addition to the art. Also, it is the area least well known to chemists. Unfortunately, the casual chemist cannot remedy this deficiency by a quick and easy reading of the book. It is a high-level treatise rather than an introductory survey. Familiarity with quantum mechanics and the general principles of magnetic resonance is assumed. On the other hand, those actively engaged in research bearing upon quadrupole interactions will find the book an indispensable reference and bibliography.

The book is divided into three parts: Theory, Instrumentation, and Applications of Interest to the Solid State; but unlike Gaul, it is very well organized. The range and completeness of the coverage of these topics is suggested by the sub-headings of Part I: Frequencies and Intensities of Pure Quadrupole Spectra, Static Splitting and Broadening of Quadrupole Spectra, Effects of Internal Motions in Molecular Solids on Nuclear Quadrupole Resonance, and Theory of Transient Experiments on Pure Quadrupole Resonance. The quality and usefulness of the book is extended significantly by the inclusion of considerable original