
 BOOK REVIEWS

Methods of Experimental Physics. Volume 6. Solid State Physics. Part A. Preparation, Structure, Mechanical and Thermal Properties. Edited by K. LARK-HOROVITZ and VIVIAN A. JOHNSON, Purdue University, Lafayette, Indiana. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1959. xvi + 466 pp. 16 × 23.5 cm. Price, \$11.80.

One suspects that books like this are conceived in a publisher's office and brought to press through a reliable process for the accelerated gestation of scientific literature. As von Braun remarked apropos of rocket research, "They think they can produce a baby in a month by putting nine women on it." The present volume had thirty-two authors and four editors. Since the authors are all highly competent in their fields, and most of them write clearly, the final result is a readable collection of personal essays on various kinds of experimental work. The diversity of approach and lack of organization that make the book inadequate as a reference work make it interesting, and sometimes even entertaining, to read.

Here is an innocent account by three physicists of the purification of sodium chloride. "Table salt is an appreciably better starting point than most C.P. reagents. After solution and filtration a dithizone extraction removes most of the ever present lead. Bromide and iodide are removed with chlorine, and potassium by ion exchange chromatography. . . . Iron, magnesium, sulfate, and materials such as silica introduced by previous purification steps are removed by HCl precipitation, gentle drying minimizes hydrolysis, and vacuum fusion and Czochralski growth reduce oxygen and other adsorbed gases."

Many chapters are so short (5 or 6 pages) that most value has been squeezed out (electron microscopy, thin films, ceramic techniques), and some of the longer chapters (30 to 40 pages) contain little but standard textbook material (X-rays, thermal properties). Three articles stand out by their excellence: Faust on surface preparation, a model of organization that indicates what the entire book might have achieved through competent editing; Amelinckx on dislocations, a 36 page introduction dealing mostly with descriptive theory; and Jamieson and Lawson on solid state studies under high pressure.

Other major articles discuss electron diffraction and mechanical properties. There is a contribution from the Bell Telephone Laboratories on control of impurities in semiconductor materials, and one on the growth of single crystals that is disappointing in its lack of specific details. One short section, on density measurements, provides formulas for estimating the errors of the different methods discussed. How useful to have had such information on all the other measurements described!

The book has a complete author index and an inadequate subject index. The production is good, with numerous clear line drawings.

Despite its shortcomings, this is a book that scientific libraries should provide so that research workers can read it through to glean new ideas. It is not, however, the kind of book that deserves a place in the working library of a thrifty scientist, nor is it likely to achieve status among standard reference handbooks and encyclopedias.

DEPARTMENT OF CHEMISTRY
INDIANA UNIVERSITY
BLOOMINGTON, INDIANA

WALTER J. MOORE

Advances in Enzymology and Related Subjects of Biochemistry. Volume XXI. Edited by F. F. NORD, Fordham University, New York, N. Y. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1959. v + 521 pp. 16 × 23.5 cm. Price, \$12.50.

This volume is composed of eight chapters on various topics in enzymology. The first chapter by Walter C. Schneider entitled *Mitochondrial Metabolism* is a well-written and painstaking review of a great deal of modern work on mitochondria, and thus should be very useful to most read-

ers. In the opinion of the reviewers, however, many may wish to substitute their own analysis of the data for that of the author since the latter leaves one confused, particularly concerning the presence or absence of a number of enzymes in mitochondria. More attention might have been given to the problem of apparent loss of high-molecular weight enzymes such as catalase from the mitochondria during various isolation procedures, and, in general, a more penetrating analysis of a smaller number of points than are considered might have been desirable.

The second chapter, by D. E. Green, entitled *Electron Transport and Oxidative Phosphorylation*, gives Green's interesting and challenging analysis of the interlinking of enzymes and cofactors in the electron transport system. The role of copper and nonhemin iron in the electron transport system is examined, the functions of prosthetic groups and cofactors are discussed, and finally the probable reaction sequences of components in the system and its subdivisions are given. The interesting suggestion is made that lipoprotein serves to keep the prosthetic groups of the enzymes dissolved in lipid and thus isolated from the aqueous phase, and also possibly serves to stabilize sensitive phosphate esters.

The first part of the chapter is concerned with a discussion of the physical nature of the mitochondrion and the isolation of various types of subparticles from it which have different enzymatic activities. Here unfortunately a number of concepts are presented which do not seem to bear close analysis, such as the idea that the mitochondrion is a giant molecule. The probable existence of a soluble internal phase in the mitochondrion seems to have been overlooked. The symbols used by Green are not the easiest to keep in mind. The diagram on page 122 is obscure in regard to the function of cytochrome b.

The chapter covers much constructive thinking by the author about his work and the work of others, and undoubtedly will contribute to an improved understanding of the electron transport system.

The third chapter, by Bo G. Malmstrom and Andreas Rosenberg, entitled *Mechanism of Metal Ion Activation of Enzymes*, reviews a fair amount of literature on this topic. The first few pages which are concerned with classification of metallo-enzymes might have been condensed. The chapter contains material on possible enzymatic reaction mechanisms involving metals, ways in which the metal might complex with enzymes and substrates, and factors which may account for metal specificity such as stereochemistry, size of the metal in question, charge, and electronic properties. The mechanism of action of metallo-coenzymes is considered.

The chapter presents worthwhile material but it appears to the reviewers that it does not offer a great deal in regard to the planning of future experiments. Two possible types of mechanism for metal action in metallo-enzymes suggested by the senior reviewer have not been considered (A. L. Dounce, *J. Cell. Compt. Physiol.* 5, Suppl. 1, 235 (1956); *Enzymologia*, 17, 182 (1955); see also *ibid.*, 18, 390 (1956)).

Chapter 4 entitled *Durch Metall-Ionen Katalysierte Vorgänge, Vornehmlich im Bereich der Seltener Erdmetalle* by Eugen Bamann and Heinz Trapmann presents much material on the splitting of organic phosphate esters of various types by rare earth metals such as cerium and lanthanum, as well as something concerning the catalytic action of these

metals in breaking other types of bonds (N-P, C-C, $-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}$,

and $-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{C}-$). The considerable similarity of the behavior of the rare earth metals to the behavior of the natural phosphatases is surprising and leads one to question a statement in the previous chapter to the effect that the protein component of a metallo-enzyme cannot function by enhancing the catalytic effect of the metal itself. Mechanisms are included for some of the catalytic actions of the rare earth metals. The use of rare earths gas tools in analytical chemis-

try is discussed briefly. Finally, it is suggested that the toxicity of injected lanthanum salts is explainable on the basis of the phosphatase action of the metal in splitting ATP, AMP, sugar phosphates, etc., and a similar action of newly formed monomolecular silicic acid is suggested to explain the mechanism of toxicity of silica in silicosis.

This chapter is well written and presents material of considerable interest that is not well known to biochemists in general. It appears to the reviewers that a careful study of the chapter would be very worthwhile for those interested in the role of metals in metallo-enzyme catalysis.

Chapter 5 entitled *Enzymatic Reactions in the Synthesis of the Purines* by John M. Buchanan and Standish C. Hartman is divided into two principal sections, the first part comprising a detailed and well authenticated account of purine synthesis from the standpoint of the individual enzymes and substrates involved, and the second part dealing with the details of mechanism of certain of the reactions, such as the formation of glycineamide ribotide from A.T.P., glycine and phosphoribosyl amine. A "concerted" mechanism is proposed wherein the reactants are held on the enzyme surface in the proper orientation so that the proper groups can interact directly without previously having to form bonds with groups in the enzyme. The enzyme is described as a polyfunctional catalyst with template properties. Simultaneous acid and base catalysis is involved. The authors might have included reference to Michaelis regarding the role of the protein component in enzyme catalysis (L. Michaelis, in "Currents in Biochemical Research," D. E. Green Ed., Interscience Publishers, Inc., New York, N. Y., 1946, p. 225, *et seq.*), and to Laidler (K. J. Laidler, "Introduction to the Chemistry of Enzymes," McGraw-Hill Book Co., Inc., New York, N. Y., 1954, p. 165 *et seq.*) regarding simultaneous and acid-base catalysis.

Aside from the inclusion of a small amount of possibly irrelevant material this chapter in the opinion of the reviewer is extremely well written and is a contribution of a high order of excellence.

Chapter 6 entitled *The Enzymic Synthesis of Pyrimidines* by Peter Reichard is constructed in the style of the first part of the preceding chapter. Details of the paths of synthesis of the pyrimidines, the pyrimidine nucleosides, and the pyrimidine nucleotides are presented in a lucid and authoritative manner. Although new ideas on reaction mechanism are not presented, this chapter in the opinion of the reviewers is also excellent.

Chapter 7 entitled *The Biosynthesis and Function of the Carotenoid Pigments* by T. W. Goodwin contains much material of a physiological nature on the synthesis of carotenoid pigments in various plants and lower organisms of the plant kingdom, including bacteria. Although the chemistry of carotenoid synthesis is discussed as such, it appears to the reviewer that the chapter because of the inclusion of much biological material may be of somewhat more interest to the plant physiologist than to the biochemist. Some of the discussion concerning chemical factors affecting the synthesis of carotenoid pigments do not seem to contribute greatly to an understanding of what is occurring. Some statements are made which appear to be only very weakly supported, such as a statement indicating an attachment of carotenoid to protein. An occasional inappropriate expression occurs such as "an ultrasonic sunflower mutant."

In spite of the above remarks it must be stated that the author of this chapter has approached the problem of carotenoid biosynthesis on a very broad basis, attempting to bring all possible types of information to bear on the problem, and although the analysis does not appear to contribute many ideas for future research, the material included appears to constitute a valuable review of what is known in the field.

Chapter 8, by F. M. Huennekens and M. J. Osborn, entitled *Folic Acid Coenzymes and One-Carbon Metabolism*, is an authoritative review concerned chiefly with the role of folic acid and its active coenzyme derivatives in the transfer of 1-carbon fragments. The chapter starts with the chemistry of folic acid and related compounds, proceeds to the coenzyme derivatives and the biosynthesis of these compounds, and finally takes up in detail the role of the folic acid coenzymes in metabolic reactions. There is a slight overlap of material in chapter 5 with the material in this chapter. The chapter is well organized and well written and in the opinion of the reviewers is an excellent contribution.

In considering the Vol. 21 of "Advances in Enzymology" as a whole it appears to the reviewers as being a very worthwhile publication. The authors have been well selected, they have done their work with care and thoroughness, and the editing has been very good. Typographical errors are very rare. The book will undoubtedly prove to be a worthwhile addition to the libraries of those interested in enzymology and metabolism.

DEPARTMENT OF BIOCHEMISTRY

UNIVERSITY OF ROCHESTER MEDICAL CENTER

ROCHESTER 20, NEW YORK

ALEXANDER L. DOUNCE

NIRMAL K. SARKAR

Gmelins Handbuch der Anorganischen Chemie. Achte Völlig Neu Bearbeitete Auflage. Silicium. Teil C. Organische Silicium-Verbindungen. System-Nummer 15. E. H. ERICH PIETSCH, Editor. Verlag Chemie, G.m.b.H., (17a) Weinheim/Bergstr., Pappelallee 3, Germany. 1959. xii + 501 pp. 17.5 + 25.5 cm. Price, Kart. DM 276.—; Geb. DM 281.—.

This eagerly-awaited volume on organic derivatives of silicon is an impressive book which accurately reflects the rapid growth of the various phases of organosilicon chemistry in recent years. Whereas the seventh edition (Gmelin-Kraut, 1912) summarized all of the contemporary information on organic compounds of silicon on a single page, the new eighth edition contains four hundred pages of very compact discussion in which are listed 9,597 specific compounds, each with physical properties and pertinent literature references. In addition, seventy-eight pages are devoted to a summary of the production, properties and structure of the various types of silicone polymers, most of which cannot be described in terms of individual compounds. The result can best be described as a one-volume reference library on organosilicon chemistry, dependably complete through the literature of 1953. As such, it warrants the equally impressive price (approximately \$65) for those who work in this field, as well as being a traditional and thoroughly justified "must" for libraries.

The major part of the book is devoted to compounds in which hydrocarbon groups are bound directly to silicon, in keeping with the main emphasis over the past twenty years. This part, the work of Gerhart Hantke and Ulrich Krücker, takes up the silicon tetraalkyls (10% of the entire book length), the tetraaryls (6.2%), silicon heterocyclics (0.2%), silicon-carbon chains (2.4%), alkylsilanes with Si-H bonds (2.4%), the alkyl and aryl halogenosilanes (14%), the silicon esters of inorganic acids (1.2%), the silanols (8.4%), the alkylalkoxysilanes (2.0%), the linear and cyclic siloxanes (11.2%), the silthianes (0.4%), the silazanes (1.8%), the polysilanes (1.8%) and the silyl-metal compounds (0.4%). The subsequent portion of the book, devoted to compounds without direct Si-C bonds, is the work of Gerhart Hantke and Gerd Huschke. It takes up the esters of orthosilicic acid (7.2% of the total book), the alkoxyhalogenosilanes (4.2%), the alkoxy-siloxanes (3.4%) and the aminosilanes (0.9%). The section on silicones, for which Dr. S. Nitzsche of Wacker-Chemie was advisor, takes up the structure of silicone polymers (1.0% of total), methods of production (3.2%), the silicone oils and greases (4.8%), silicone resins (2.4%), silicone rubber (2.0%), antifoams (0.4%) and water-repellent silicone films (0.8%). A comprehensive alphabetical index of fourteen pages follows. The proportionate space devoted to a topic does not necessarily indicate its relative importance, of course, because some topics lend themselves better than others to the presentation of data in tables.

It is pertinent to inquire whether the Gmelin editors ever miss anything, despite their reputation for thoroughness. A considerable number of checks on the part of your reviewer failed to reveal one single juicy omission to write about. In each instance where a bond angle, bond distance, viscosity, surface tension, molecular weight, crystallographic constant, molar refraction or other such specific datum was known, it was given. Infrared and other spectral absorption frequencies also are included, or the spectra themselves are printed. At first there seemed to be a paucity of information on reaction mechanisms and stereochemistry of organosilicon compounds, but further check indicated that this impression arose from the fact that most of the work in these areas has appeared since 1953. Those