

Though the above-named articles have been singled out for special emphasis, it is not meant to imply they occupy a unique position in this volume. Rather, it is the reviewer's opinion that these particular articles seem to be especially topical in that they present a highly competent survey in a form, readily understandable by all, of a subject matter not elsewhere readily available. Of the many different review volumes now on the market, this particular one certainly should be high on the list of the reader who wants to keep informed of the broad aspects of nuclear science and the manifold directions in which it is developing and being applied.

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**Crystal-Structure Analysis.** By MARTIN J. BUERGER, Professor of Mineralogy and Crystallography, Massachusetts Institute of Technology. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1960. xvii + 668 pp. 16.5 × 23.5 cm. Price, \$18.50.

Professor Buerger has written four books (the others are "X-ray Crystallography," 1942; "Elementary Crystallography, 1956; and "Vector Space and its Application to Crystal Structure Investigation," 1959; John Wiley and Sons, Inc., New York) which deal with various aspects of crystallography. The purpose of this latest volume is to acquaint the student of crystallography with the different techniques of determining the positions of the atoms in the unit cells of crystals from the intensities of the X-ray diffraction maxima. The book fulfills the author's purpose in a most satisfactory manner. It can be read with profit by the student whose preparation in mathematics and physics is limited; a knowledge of elementary calculus, the algebra of complex numbers and vectors, and perhaps a year of college physics are the main prerequisites.

Chapter 1, a brief historical introduction, is followed by an elementary treatment of diffraction by periodic arrays and crystals in Chapters 2 and 3. The next few chapters are mainly concerned with the experimental measurement of diffraction intensities and the conversion of these data into the squares of the structure factors, which are the numerical quantities the crystallographer uses for structure determination. These chapters include extensive discussions of twinning, experimental measurement of intensities by film and counter methods, the Lorentz factor, and effects arising from extinction and absorption. The actual procedure of structure determination is first considered in Chapter 9, which is a discussion of special and general positions in the various space groups and the distribution of the atoms on these sites. The remainder of the book is devoted to descriptions of the various techniques of structure determination interspersed with chapters on important theoretical concepts, such as the structure factor, Fourier series and Fourier transform. The dependence on the space group of the form of these functions is discussed in considerable detail. Refinement of atomic positions and calculation of interatomic distances and angles are discussed in the last two chapters (22 and 23). The very important applications of Patterson synthesis and vector space to problems in structure determination are discussed only very briefly in this book, since Professor Buerger has devoted a separate volume to this subject (see above).

In solving a crystal structure, from collecting the original data to the final refinement of atomic positions, there is no uniquely correct method. Thus, different "schools" of crystallography tend to follow rather different procedures. Although in places Professor Buerger's preferences are apparent, he has generally succeeded in being comprehensive. I believe that most crystallographers who are faced with the problem of teaching graduate students the art and science of crystal structure determination will be grateful to Professor Buerger for writing this book. Most of the mathematical formulas and techniques (such as finding the proper form for the Fourier series for a given space group) which are commonly encountered in crystal structure determination are explained in considerable detail. The important methods of structure determination are illustrated by examples from the literature, and the logic of the solution is explained with the aid of a large number of excellent drawings. Several topics in the book—for example, the section

dealing with the effects of twinning on the observed intensities and the discussion of high absorption and surface reflection—are not discussed in other books and will be of interest to many experienced crystallographers.

The workmanship of the book, particularly the illustrations, is outstanding. The book contains approximately 900 references to the literature. These are listed, often under topic headings, at the ends of the chapters and are chosen to illustrate the corresponding discussion. Although the references to the periodical literature are generally more than adequate, there is no reference to several important books.

The book has been proof-read by several experienced crystallographers, and there are few errors. However, the statement concerning the inequality at the top of p. 561 is incorrect, and the description of a "structure seminvariant" at the bottom of p. 573 is wrong. Also, it seems to me that the characterization of the visual method of measuring intensities as a "peak intensity" method does not do justice to this important technique. In fact, the general discussion of the visual method is inadequate compared to the extensive discussions of the photometric methods.

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**Comparative Biochemistry. A Comprehensive Treatise. Volume II. Free Energy and Biological Function.** Edited by MARCEL FLORKIN, Department of Biochemistry, University of Liège, Liège, Belgium, and HOWARD S. MASON, University of Oregon Medical School, Portland, Oregon. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y., 1960. xix + 685 pp. 16 × 23.5 cm. Price, \$18.00 (Subscription price); \$20.00 (Non-subscription price).

This book contains articles on the thermodynamics of organic phosphates by M. R. Atkinson and R. K. Morton; on the reactions of saccharide biosynthesis by L. F. Leloir, C. E. Cardini and E. Cabib; on some reactions of protein synthesis by H. Chantrenne; on ammonia metabolism and urea biosynthesis by P. P. Cohen and G. W. Brown, Jr.; on contractility by S. V. Perry and also by H. Hoffmann-Berling; on active transport by B. Andersen and H. H. Ussing; on material balance by F. Brown and W. D. Stein; on osmoregulation by J. Shaw; on nerve action by M. Gerebtzoff and E. Schoffeniels; and on bioluminescence by E. N. Harvey.

Although they are greatly outweighed by its virtues, this book has certain faults, and for some of these faults the editors and the publishers—not the authors—must accept responsibility. Perhaps the most serious is that due to intentional (to preserve order) delays in publication the authors were unable to consider adequately the most recent developments; in reviewing swiftly-moving fields, *e.g.*, protein synthesis, such delays were damaging. Another fault common to compendia of reviews and evident here is lack of uniformity. The book begins with an excellent thermodynamics chapter (Atkinson and Morton); it would have been well to ask subsequent authors to conform with the framework developed in this beginning; instead, the usual untidiness in regard to standard and actual states, influence of pH, efficiency, and so on, was subsequently allowed to creep in. Persons looking for an exposition of the truly "comparative" point of view in the sense of, say, tracing biochemical evolution, will often be disappointed with mere cataloguing of phenomena in diverse species (the articles by Cohen and Brown, by Hoffmann-Berling, and by Shaw are shining exceptions to this criticism). However, this was not a disappointment shared by this reviewer, who is quite content to regard the book as a collection of excellent articles on "interesting topics in cell biochemistry and physiology." Finally, if taken too literally, the sub-title, "Free Energy and Biological Function," will seem a little ambitious, for in dealing with some processes, say secretion or nerve conduction, there is insufficient information even to warrant the formulation of the free energy efficiency.

Perusal of the author list will show that the editors, M. Florkin and H. S. Mason, were singularly successful in recruiting famous writers to their cause. This reviewer found all the articles to be of high quality, and, within bounds of delay, all the articles were accompanied by useful bibliog-

raphies. Without casting aspersions on the unmentioned, the reviewer would draw special attention to the superb article on bioluminescence which closed the career of the late Professor E. N. Harvey, to the clear, objective review of muscle contraction by S. V. Perry, and, as already mentioned to the Atkinson-Morton article on the thermodynamics of the phosphate compounds. This book has also provided a valuable summary of much recent work on carbohydrate biochemistry by the distinguished Argentine school.

The subject matter of this book lies in the frontier between biochemistry and cell physiology, and it seems reasonable to consider it required reading for all such frontiersmen, provided they can afford the wampum.

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**Encyclopedia of Chemical Technology.** Edited by RAYMOND E. KIRK, Head, Department of Chemistry, Polytechnic Institute of Brooklyn, and DONALD F. OTHMER, Head, Department of Chemical Engineering, Polytechnic Institute of Brooklyn. Second Supplement Volume. ANTHONY STANDEN, Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. xv + 970 pp. 19.5 × 26.5 cm. Price, \$25.00.

The Second Supplement Volume of Kirk and Othmer's "Encyclopedia of Chemical Technology" is now available to take its place on the library reference bookshelf beside the original 15 volumes and the First Supplement Volume which was published in 1957. The intent of this new volume, like that of the First Supplement Volume, is to keep the Encyclopedia up to date. This is done not by merely summarizing new material of minor importance on the subjects of the original volumes, but to introduce new subjects on prominent developments in the fields of chemistry and chemical engineering. It appears that this objective has been achieved in the new supplement.

The Second Supplement Volume contains articles on 59 subjects covering chemicals, materials, methods, processes and equipment. Each is written by an authority in the field following the same general format and purposes prescribed by the Editors for the original works. The articles are arranged in alphabetical order and contain cross refer-

ences to the original volumes. The index covers this volume alone, but an integrated list of the articles in the first 15 volumes, together with the two supplements, are included at the end of this Second Supplement Volume.

The subject headings of the articles appearing in the Second Supplement Volume are

Acetylene	Oxo process
Acetylenic alcohols	Penicillin
Ammonium nitrate	Perchloryl fluoride
Analgesics	Polycarbonates
Beryllium and beryllium oxide	Poly(ethylene oxide)
Borazines	Polymethylbenzenes
Boron compounds	Polyoxetanes
Cells, electric	Polypropylene
Ceramics	Polyvinylpyrrolidone
Cesium and cesium compounds	Radioisotopes
Chemical coding	Rocket propellants, solid
Chitin as a chemical raw material	Rubber, halogenated butyl
Coffee, instant	Rubidium and rubidium compounds
Complexometry	Solid state, dislocation theory
Corrosion	Solions
Cryogenics	Stereoregular and linear addition polymers, synthesis
Cyclopentadiene and dicyclopentadiene	Sugar derivatives
Diffusion separation	Sulfur hexafluoride
Electrodeposition of metals from nonaqueous media	Synthesis gas
Epoxydation	Tantalum
Free radicals	Thermodynamics—irreversible processes
Fuel cells	Thermoelectric power conversion
Gas chromatography	Titanium and titanium alloys
Geochemical prospecting	Tool materials for machining
Glass	Ultraviolet absorbers
Helium	Unsaturated polyester resins
Laminated products	Index to Second Supplement Volume
Magnetic materials	Scope of the Encyclopedia—Integrated List of Articles
Mica, synthetic	
Nitric acid concentration	
Nonionic surfactants	
Organotin compounds	

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