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Joel S. Miller,* Arthur J. Epstein
Xerox Webster Research Center, Xerox Corporation
Rochester, New York 14644
Received June 27, 1977

Book Reviews

Electronic Structure and Magnetism of Inorganic Compounds. Volume 4. By P. DAY (University of Oxford). The Chemical Society, London. 1976. ix + 277 pp. $45.50.

This volume in the series contains four chapters on Electronic Spectra, Magnetic and Natural Optical Activity, Magnetic Susceptibility Measurement and, new this year, Luminescence Properties of Inorganic Compounds. The high standards of previous volumes are more than met by Volume 4. The coverage of the literature, primarily for 1973, appears comprehensive. The three-year delay between the time the work appears in the journals and the publication of this work is unfortunate but probably unavoidable. Particularly appreciated by this reviewer is the range of topics covered in most chapters including monographs and reviews as well as journal articles, on theory, experimental techniques and instrumentation, and results. The writing is concise yet still very readable and relatively free of typographical errors. The authors have understandably but regrettably limited critical analysis of results and conclusions to a small number of cases. When they have chosen to comment their remarks are very useful. All in all this is an excellent piece of work and the authors deserve much credit for a massive undertaking so well done.

W. A. Baker, *The University of Texas at Arlington*

Carbohydrate Chemistry. Volume 8. Senior Reporter: J. S. BRIMACOMBE (University of Dundee). The Chemical Society, Burlington House, London. 1976. 485 pp. $66.00.

This is another of the Specialist Periodical Reports and covers the literature available to the group of seven reporters from mid-January 1974 to mid-January of 1975 in admirable fashion. Part I, concerned with mono-, di-, and trisaccharides and their derivatives, contains 27 chapters on such topics as amino sugars, ethers, cyclitols, glycosides, nucleosides, NMR spectroscopy, and conformational analysis. Articles dealing with microbial polysaccharides, enzymes, glycoproteins, and glycolipids are among the eight chapters concerned with macromolecules in Part II. There are more than 3100 references (mainly to papers published in 1973 and 1974), and many useful diagrams. The reporters have managed the difficult task of presenting indepth coverage of an impressive number of topics in a clear and concise manner. The reviews demand considerable background from the reader; they should be valuable to the research worker, to the faculty member wishing to organize a course, and to anyone interested in really digging into this area. Ideas for further research turn up continually. A detailed list of contents helps to compensate for the lack of an index. Volume 8 is a stimulating and detailed account of advances in carbohydrate chemistry during the period surveyed.

Robert A. Weisman, *Wright State University*

Beam-Foil Spectroscopy. Edited by S. BASHKIN (University of Arizona). Springer-Verlag, Berlin–New York. 1976. xiv + 318 pp. $28.30.

This book presents a remarkably complete introduction to and survey of the current status of beam-foil spectroscopy (BFS). It consists of ten chapters by eleven different authors, all of whom are recognized authorities on BFS. Bashkin's introductory chapter on experimental methods in BFS sets the tone for the remainder of the book—a lucid presentation rich in information about BFS. Topics covered include hydrogenic and multiply-excited levels populated in BFS; mean life measurements utilizing BFS; oscillator strengths; applications of BFS in astrophysics; Lamb shift and forbidden decay studies; coherence, alignment and orientation of the BFS source; and fast projectile electron spectroscopy via beam-foil excitation. Throughout the book, care is taken to balance the experimental discussions with theoretical calculations. The relative advantages and disadvantages of BFS compared to other methods of obtaining information about monatomic systems are also discussed. Ample suggestions for BFS studies remaining to be made are sprinkled throughout the book. Perhaps the strongest point of this work is the extensive reference list provided at the end of each chapter and in the appendix. These alone make this book an excellent source work on BFS.

Arlen R. Zander, *East Texas State University*

Physicochemical Methods of Mineral Analysis. Edited by A. W. NICOL (University of Birmingham, England). Plenum Press, New York, N.Y. 1975. xv + 508 pp. $34.80.

The book originated from a university course in England which presented an account of new physicochemical methods applicable in

mineral analysis. An introductory chapter deals with basic principles, atomic theory, bonding, crystal field theory, the interaction of energy with matter, and an introduction to the detectors used in instrumental methods. The next four chapters discuss elemental analysis by optical absorption and flame spectrometric methods, x-ray fluorescence methods, radiotracer techniques, and spark source mass spectrometry. A chapter on the application of x-ray methods to automatic control is followed by chapters on phase analysis using x-ray diffraction, electron microscopy, thermal methods, infrared spectroscopy, and a composite chapter devoted to electron probe microanalysis, scanning electron microscopy, Auger spectroscopy, and the field ion microscope. An excellent final chapter reviews the various analytical methods and relates the position of physicochemical methods to absolute, wet chemical techniques and assesses the usefulness of these new methods in a variety of situations.

The nits to pick at are concentrated wholly in the first two chapters which fall well below the standards attained in the remainder of the book. The chief failing of the first chapter's overview is that a large number of topics are covered in such a superficial fashion that they will surely remain meaningless to the uninitiated. In Chapter 2 one would never grasp the usefulness of flame emission and atomic absorption spectrometry for mineral analysis from the poor treatment of these topics; the electrothermal nonflame method is not discussed. Emphasis throughout the second chapter is on prism instruments which are now largely replaced by their grating counterparts; the coverage of gratings and associated problems is almost nonexistent.

Except for the first two chapters, each of the contributors has given a technically competent and lucid presentation of his subject. The material is, in general, well integrated. The level of material is suitable for those desiring a rather thorough view of an individual topic, as well as for those who simply want to ascertain items of a more practical and application-oriented nature. Apparently editing and printing consumed about three years time, for seldom is found a reference more recent than 1972; in fact, some standard reference works cited in the bibliographies of Chapters 1 and 2 are not the editions extant even in 1973. The index is rather poor with its lack of subject entries and emphasis on word entries.

Errors seem to be concentrated in the first two chapters. For example, on page 29 the red portion of the spectrum is stated to extend from 4000–9000 Å, and there occurs a misleading statement concerning the construction of a photoemissive cell; on page 31 the statement appears that a photomultiplier dynode is coated with a material emitting 4 electrons per incident photon; and on page 77 the author is apparently unaware that a 5-cm long-path flame gives about 4.5 times the signal from a 1-cm flame which is not serious attenuation.

In conclusion, the book provides a greater depth of treatment on each topic than the usual textbook on instrumental methods of analysis (except for optical and flame spectrometry). However, often "dated" equipment will be described and this feature detracts somewhat from current relevance. Individual chapters would be ideally suited for outside reading assignments by upperclass and graduate chemistry students.

John A. Dean, *University of Tennessee (Knoxville)*

Handbook of Biochemistry and Molecular Biology: Lipids, Carbohydrates, Steroids. 3rd Edition. Edited by GERALD D. FASMAN (Brandeis University). CRC Press, Inc., Cleveland, Ohio. 1975. viii + 570 pp. $40.00.

This volume is the third edition of "Handbook of Biochemistry" originally edited by Dr. H. A. Sober. The title has been changed to indicate relevance to the field of molecular biology, as well as biochemistry.

The third edition is published in four sections, each as a separate volume, i.e., Proteins (amino acids, peptides, polypeptides, and proteins); Nucleic Acids (purines, pyrimidines, nucleotides, oligonucleotides, tRNA, DNA, RNA); Physical and Chemical Data, Miscellaneous (ion exchange, chromatography, buffers, miscellaneous, e.g., vitamins); and Lipids, Carbohydrates, Steroids. The latter section is the subject of this review.

The first 136 pages of this volume represent an excellent and generally useful synopsis of recent recommendations of the IUPAC–IUB Commission on Biochemical Nomenclature, with detailed discussions and examples relative to carbohydrates and steroids.

The subsection on carbohydrates is comprehensive, occupying 350 pages of the total volume. The data include melting points and specific rotation values for each compound. In many cases there is also information on mobility in a variety of chromatographic systems, optical rotatory dispersion and circular dichroism values, as well as x-ray crystal structure. The classes of compounds covered include monosaccharides, disaccharides, oligosaccharides, phosphate esters, amino sugars, and glycolipids. There are also parts on glycohydrolases and the isolation and synthesis of sugar nucleotides. This subsection is excellent and should be a highly valuable reference for workers in the area of carbohydrates.

The subsection on lipids is not as extensive as the one on carbohydrates, but it should be most useful to lipid chemists. For example, there are physical and chemical data on fatty acids and triglycerides, composition of fats and oils, lipid composition of selected tissues, and NMR and mass spectral information for a number of lipids. There are little physical and chemical data on phospholipids.

The final subsection on steroids (plus sterols and bile acids) is merely a reprinting of the information which appeared in the second edition (1970) of this volume. The subsection is thus not up to date; however, the data presented should be of use to steroid chemists.

Mary E. Dempsey, *University of Minnesota*

The Alkaloids. Volume 6 (Specialist Periodical Reports). Senior Reporter: M. F. GRUNDEN (New University of Ulster). The Chemical Society, London. 1976. x + 310 pp. £19.50.

This volume contains 14 chapters reviewing the alkaloid literature published between July 1974 and June 1975; 15 reporters took part in this review. Chapter 1 (53 pages and 233 references) is well presented and deals with the biosynthesis of alkaloids, in which 26 schemes are shown. The other 13 chapters are also well presented and deal with the chemistry of various types of alkaloids and contain very many schemes and references.

In general, this book, along with the other volumes of the series, will save a lot of time for researchers in the areas of alkaloids.

Mustafa I. El-Sheikh, *University of Michigan*

Insecticide Biochemistry and Physiology. Edited by C. F. WILKINSON (Cornell University). Plenum Press, New York and London. 1976. v + 768 pp. $49.00.

This book is an excellent compilation of comprehensive up-to-date reviews covering the biochemistry and physiology of insecticides.

It contains five parts written by various experts studying the penetration and distribution of insecticides in vertebrates and insects. The second part provides background information on insecticide metabolism and discusses microsomal oxidation, cytochrome, and extramicrosomal and enzymatic conjunction.

There are six chapters of target-site interactions, including the physiology and pharmacology of the nervous system, the biology, inhibition, and recovery of acetylcholine esterase, and the interactions of acetylcholine receptor with insecticides.

The fourth part introduces selective toxicity, which deals with the occurrence, significance of, and reasons for the variations in toxicity of insecticides between different organisms. Also, resistance and its mechanisms are discussed on a biochemical and physiological basis, in order to be helpful for critical evaluation of the available information.

The last part is concerned with toxicology of carbamates, chlorinated hydrocarbons, and organophosphorus compounds used as insecticides, and includes the proper methods of treatment. Furthermore, their teratogenic, mutagenic, and carcinogenic effects are discussed. In addition, it treats environmental toxicology, including the laws and regulations of using pesticides.

I recommend this book to be added to libraries as a good reference for researchers in the field of insecticides.

M. Farghaly, *Insecticide Laboratory National Research Centre, Dokki, Cairo, Egypt*

Electrochemical Stripping Analysis. By F. VYDRA (J. Heyrovsky Institute, Prague), K. ŠTULÍK (Charles University, Prague), and E. JULÁKOVÁ (State Institute for Control of Drugs, Prague). Halsted Press, John Wiley & Sons, New York, N.Y. 1976. xiii + 270 pp. $40.00.

Stripping Voltammetry in Chemical Analysis. By KH. Z. BRAININA (Sverdlovsk Institute of the National Economy, U.S.S.R.). Halsted Press, John Wiley & Sons, New York, N.Y. 1974. xii + 222 pp. $23.00.

These two short books concerning the important techniques of stripping analysis have recently been made available in translation. The first will be of more general use to the analytical chemist. It includes chapters on fundamentals of electrode reactions, deposition processes, stripping processes, apparatus and techniques, and practical applications. The coverage is both more current and more extensive than the Brainina book. Though they disavow any intention of providing a theoretical presentation, Vydra, Štulík, and Juláková begin the book with a quite thorough review of fundamentals and, upon reaching the applications section, they present numerous procedures and useful literature citations. The discussion of instrumentation is useful and modern though most readers will be surprised by the meager treatment of differential pulse stripping voltammetry, a variant highly popular in the United States. The chapter on apparatus and techniques is notable for its extensive practical information about electrodes, cells, and procedures, and the applications chapter includes data concerning determination of most of the elements.

A surprising aspect of the Brainina book is the absence of anodic stripping voltammetry of amalgam-forming metals, a subject which the author defines as "amalgam polarography with accumulation" and consequently excludes it from consideration. Thus the discussion emphasizes anodic stripping at solid electrodes. The longest and most interesting chapter has as its subject the stripping voltammetry of variable valence ions. Typically the element is electrochemically deposited on the electrode as an insoluble oxide prior to the stripping step. The book provides a good review of this class of applications which should arouse the interest of those of us who are less familiar with this promising variation.

Dennis H. Evans, *University of Wisconsin—Madison*

Dynamics of Molecular Collisions. Part B. Edited by WILLIAM H. MILLER (University of California, Berkeley). Plenum Press, New York, N.Y. 1976. xv + 380 pp. $39.50.

This collection of seven review articles, in conjunction with Part A of the set, represents an attempt to summarize the current status of the theory of molecular collisions in the language with which chemists are most familiar. Part B of the two-volume set addresses itself mainly to classical and semiclassical descriptions of collision processes. The intent of each of the reviews is to introduce students who have had only the rudiments of potential scattering theory as taught in a graduate quantum mechanics course to the literature of molecular collisions without requiring extensive background reading.

Richard N. Porter and Lionel M. Raff begin the collection with a very useful chapter on classical trajectory studies of reactive collisions. This chapter is particularly valuable because of its "nuts and bolts" approach to an area of computational chemistry with a well-developed technology. Continuing in the vein of classical trajectories, P. J. Kuntz has contributed a chapter which discusses the relationship between the topology of potential energy surfaces and the details of reactive collisions. This chapter summarizes the results of Kuntz, J. C. Polanyi, and collaborators and their extensive correlations of potential barriers, mass combinations, and product energy distributions in bimolecular exchange reactions. The emphasis in this chapter is on collinear collisions with brief discussions of more recent studies of more complicated systems.

William Hase offers a concise chapter on unimolecular dynamics, an area of kinetics currently receiving substantial attention from experimentalists and theoreticians. This chapter surveys the history of our understanding of unimolecular kinetics as formulated in RRKM (Rice-Ramsperger-Kassel-Marcus) theory and as probed by chemical activation, molecular beam studies, infrared chemiluminescence measurements, as well as by trajectory studies.

A chapter on semiclassical methods with primary emphasis on elastic and inelastic scattering has been contributed by M. S. Child and includes clear discussions of important topics such as the JWKB approximation, uniform approximations, and the classical S- Matrix. This chapter does an admirable job of summarizing the important results of this branch of theory.

John Tully's chapter on nonadiabatic collision processes is most welcome in this volume. His general discussion of the curve-crossing problem and classical, semiclassical, and quantum mechanical approaches to scattering from strongly coupled potential surfaces is quite lucid; his critical discussion of the various approximations employed in these approaches is helpful in allowing one to follow the progress in this developing area of theory.

A general discussion of statistical approximations in collision theory is contributed by Philip Pechukas. This review includes a discussion of Transition State Theory from the traditional classical mechanical viewpoint as well as a development of the problems to be solved in implementing a quantum mechanical form of the theory.

Richard Bernstein and Raphael Levine close this volume with a chapter on information theoretic approaches to molecular reaction dynamics. During the past five years, chemical dynamicists have begun to use these concepts to systematize the results of experiment and calculations, particularly with regard to product state distributions and branching ratios. While these authors have published other such reviews in the past few years, the inclusion of this review is appropriate in making the volume a comprehensive discussion of semiclassical and classical approaches to molecular collision theory.

The chapters are well written, literature citations are quite useful, and each of the reviews succeeds admirably in developing a clear perspective of a particular facet of molecular collision theory such that a novice can profit from reading the articles. This reviewer endorses the volume enthusiastically and would recommend it to beginning graduate students and others seeking to become aware of the current status of molecular collision theory.

James M. Farrar, *University of Rochester*

Gmelin/Handbook of Inorganic Chemistry. 8th Edition. Rare Earths. System Number 39. Part B1: Scandium, Yttrium, Lanthanum and Lanthanides. Historical. Position in the Periodic Table. Separation from Raw Materials. Edited by Gmelin Institute for Inorganic Chemistry of the Max Planck Society for the Advancement of Science. Springer-Verlag, Berlin-Heidelberg-New York. 1976. xvi + 184 pp (42 pp in English). $156.70.

This book is one of a series devoted to the rare earths (System No. 39). The general organization and the year-end to which the literature is covered are:

Part A: History, Occurrence: 1 (1938); 2 (1973).

Part B: The Elements: 1 (1974); 2 (1974); 3 (1973); 4 (1975).

Part C: The Compounds: 1 (1972); 2 (1973);[1] 3 (1975).

Like all others in the series, this volume is indispensible as a ready access to the literature of inorganic chemistry. Further, the volume maintains the same features (prefix and table of contents in both German and English, English side headings, complete references, etc.) and high quality of previous volumes. The major areas covered are: history of promethium (atomic no. 61), atomic weights and isotope abundance, and laboratory and industrial separation from the raw materials.

At the end of World War II there was a great concern that the economic situation in Germany threatened the discontinuance of the major compilations of inorganic (Gmelin) and organic (Beilstein) chemistry. Consequently, there was a definite effort in this country to raise sufficient funds to ensure the continuance of these compilations. Not only was this a commendable humanitarian gesture but a very practical investment. The appearance of each volume of Gmelin shows that the investment has paid big dividends.

(1) W. J. Evans, *J. Am. Chem. Soc.*, **97**, 6290 (1975).

W. Conard Fernelius, *Kent State University*

Gmelin/Handbook of Inorganic Chemistry, 8th Edition. Rare Earths. System Number 39. Part B4: Scandium, Yttrium, Lanthanum and Lanthanides. Properties of the Nuclei, Atoms, and Molecules. Edited by Gmelin Institute for Inorganic Chemistry of the Max Planck Society for the Advancement of Science. Springer-Verlag, Berlin-Heidelberg-New York. 1976. xx + 427 pp (246 pp in English). $234.40.

The major topics covered by this volume are the properties of nuclides (nuclidic masses, nuclear moments, decay, etc.), atoms, ions, and molecules. The properties include optical spectra and levels, ionizing potentials, electron affinities, x-ray energy levels, inner-shell ionization level widths, x-ray emission spectra, Auger electrons, Coster-Kronig transitions, absorption of x- and β-rays, atomic and ionic radii, atomic and ionic refraction.

The language in which the material is presented (German or English) seems to be at the preference of the compiler. The sudden shift as one goes from one subdivision to another startles the reader a bit at first but the abundant use of English is a matter to which many of us can adjust readily.

W. Conard Fernelius, *Kent State University*

Gmelin/Handbook of Inorganic Chemistry. 8th Edition. Rare Earths. System Number 39. Part C3: Scandium, Yttrium, Lanthanum and Lanthanides. Fluorides, Fluoride Oxides, and Their Alkali Double Compounds. Edited by Gmelin Institute for Inorganic Chemistry of the Max Planck Society for the Advancement of Science. Springer-Verlag, Berlin-Heidelberg-New York. 1976. xxxiv + 439 pp (German). $325.60.

The major topics covered by this volume are fluorides (molecules in the gaseous phase and in rare gas matrix, solids, solutions, melts, hydrates, solid solutions); fluoride oxides (MOF, MO_xF_{3-2x}); fluoride hydroxides; fluoride nitrides; alkali fluorometalates (including ammonium and hydrazinium fluorometalates).

The rare earth fluorides have been extensively investigated because of their technical and scientific importance. The solid trifluorides are applied, for instance, as starting material for the preparation of pure metals, as host crystals for lasers, as anti-Stokes phosphors, and as ion-selective electrodes. In addition trifluorides are used in nuclear technology for the removal of neutron-absorbing substances from salt melts by the formation of solid solutions. Numerous data on preparation, on crystallographic and thermal properties, as well as on chemical reactions are available. The alkali fluorometalates also have been thoroughly investigated since they are suitable for optical applications similar to those of the trifluorides. One questions only whether grouping the fluorometalates under individual rare earths would not be preferable to the present grouping under the individual cations.

W. Conard Fernelius, *Kent State University*

Vibrational Spectra of Organometallic Compounds. By E. MASLOWSKY, JR. (Loras College). John Wiley & Sons, Inc., New York, N.Y. 1977. vii + 528 pp. $24.95.

This book presents a comprehensive review of the infrared and Raman spectral studies of organometallic compounds published in the chemical literature prior to April 1976. Over 2000 references are cited. The author's definition of an organometallic is broad and includes compounds of boron, silicon, germanium, phosphorus, arsenic, antimony, selenium, and tellurium. However, carbonyl and cyanide complexes are not considered, unless these ligands occur in conjunction with other organic ligands. The book is organized into three chapters, which in turn discuss alkyl (232 pp), unsaturated and noncyclic (67 pp), and unsaturated and cyclic (206 pp) organometallic derivatives. Each of the reported studies is given a thorough and often critical review, and tables of data and actual spectra are plentiful. Particularly useful are the correlation tables which the author presents.

Unfortunately, it is assumed that the reader is familiar with the terminology and techniques associated with vibrational spectroscopy, and no attempt is made to introduce these or to define terms as they appear. Furthermore, the book is not readable. It was produced directly from the manuscript by a photo offset process, and the print is very light. The lack of a sufficient number of subheadings makes the sections appear to continuously run together. Although the book should occasionally prove useful as a reference source, it probably would be of little overall value to a practicing organometallic chemist.

Gregory L. Geoffroy, *The Pennsylvania State University*

Aliphatic Chemistry. Volume 4. Edited by A. MCKILLOP. The Chemical Society, London. 1976. x + 281 pp. £18.00.

This latest volume in the series, "Specialist Periodical Reports", retains the four subdivisions of the field of aliphatic chemistry used in its predecessors, viz., acetylenes, alkanes, allenes, and olefins; functional groups other than alkanes, acetylenes, allenes, and olefins; naturally occurring polyolefinic and polyacetylenic compounds; and chemistry of the prostaglandins. This contribution encompasses the 1974 scientific literature and, as with prior volumes, the scope of coverage within each subdivision is comprehensive and thorough. Even though very extensive and highly active areas of research are treated in relatively short chapters (prostaglandin chemistry, as an example, is surveyed in only 23 pages!), the tight, concise, yet critical, style of writing and careful organization of each chapter permit exceedingly effective presentation of the significant publications in each area. One negative aspect of the extremely condensed nature of each chapter is that several pages occasionally intervene between the initial mention of compounds or reaction schemes and the presentation of corresponding structural formulas, but this is not a major short-coming. It is regrettable that the limited audience for a volume of this sort forces its cost to be so high that many chemists cannot afford to incorporate the book into their personal libraries.

John C. Gilbert, *University of Texas at Austin*

The Elementary Language of Solid State Physics. By M. H. B. STIDDARD (University College). Academic Press, Inc., London. 1975. xii + 188 pp. $14.00.

This book is appropriately titled. The book is intended for chemists who have some experience in elementary physics, crystallography, group theory, and quantum mechanics and wish to benefit from the concepts of solid-state physics.

The author presents some of the basic topics of solid-state physics which are of particular interest to chemists, such as crystal symmetry, the reciprocal lattice and crystal diffraction, theories of electrons in metals, and defects in solids. Each concept introduced in the text is carefully defined or derived mathematically. The discussions on crystal symmetry and matrix representation of symmetry operations and on the effect of crystal orientation on physical properties for various crystal systems are presented on an elementary introductory level with great clarity, not easily found in any other text on the subject. The postulates and working principles of quantum mechanics are reviewed in sufficient detail, before the presentation of the free-electron-gas theory of metals. The theories of Bloch functions, Brillouin zones, and semiconductor properties are developed mathematically rigorously and are easy to understand. Throughout the text there are many examples illustrating applications of concepts and exercises for the reader to work out.

The book will be useful to students and practitioners of solid-state chemistry and is recommended as one of the basic texts in a graduate solid-state chemistry course.

M. Greenblatt, *Rutgers University*

Statistical Mechanics. Volume II (Specialist Periodical Reports). Edited by K. SINGER (Royal Holloway College, University of London). The Chemical Society, London. 1975. 327 pp. $49.50.

This is a pleasing volume dealing primarily with the statistical mechanics of fluids, with emphasis on work in the U.K. The Senior Reporter, K. Singer, states that the aim of the volume is "to present readable and coherent exposition of important recent developments". Of the five chapters, perhaps only C. G. Gray's "Equilibrium Statistical Mechanics of Molecular Liquids" is heavily oriented toward very recent developments, but the others contain welcome doses of background material and personal viewpoints, and all are indeed quite readable. Of the remaining four chapters (P. Schofield, "Theory of Time-Dependent Correlations in Simple Classical Liquids"; D. W. Wood, "Thermodynamic Behaviour in the Critical Region"; C. W. Outhwaite, "Equilibrium Theory of Electrolyte Solutions"; and S. Toxvaerd, "Statistical Mechanics of Surfaces"), the longest, Wood's 131-page discussion of critical behavior, deserves special mention. This clearly written, wide-ranging chapter is alone worth the price of admission. The chapter includes, among other things, an interesting discussion of the Padé approximant method and recurrence relations, and a discussion of many model systems and their exact and numerical solution, including an equivalence table for various Ising-type models. Schofield's article is also especially worthwhile and readable. Comparison with and discussion of experiments is minimal, but computer results abound in various chapters. The volume should be on the shelf of both the neophyte and the expert; both will benefit from the generally clear exposition and useful references to old and new work.

Eric J. Heller, *University of California, Los Angeles*

Topics in Phosphorus Chemistry. Volumes 8 and 9. Edited by E. J. GRIFFITH (Monsanto Co.) and M. GRAYSON (American Cyanamid Co.). Wiley-Interscience, New York, N.Y. Vol. 8: 1976. vii + 644 pp. $40.95. Vol. 9: 1977. v + 516 pp. $43.50.

Most scientists who are interested in the chemistry of phosphorus must already be familiar with the "Topics in Phosphorus Chemistry" series. Volumes 8 and 9 continue the tradition of presenting authoritative and comprehensive review articles covering timely and current areas. Each of the chapters in these volumes is well written and, in most cases, exhaustively referenced. (Several of the contributions contained about 1000 references and one, "Transition Metal Complexes of Phosphorus Ligands", has nearly 1800.) Format and layout

are similar to previous volumes; each contains a not too extensive subject index and a cumulative index to the titles which have appeared in the series. Volume 8 also contains a very useful structural formula index to phosphoryl coordination compounds covered in the chapter of that title. Missing, and perhaps not feasible in view of the number of citations, is an index to the authors whose research is covered in the reviews and a comprehensive formula index.

The contents of Volume 8 is "The Chemistry of Phosphorohydrazides and Azides" (R. J. W. Cremlyn and D. H. Wakeford), "The Mass Spectra of Organophosphorus Compounds" (I. Granoth), "NMR Parameters of the Proton Directly Bonded to Phosphorus" (J. F. Brazier, D. Hovalla, M. Loenig, and R. Wolf), "Phosphorus Sulfides" (H. Hoffman and M. Becke-Goehring), "Phosphoryl Coordination Chemistry: A Study of Isolated Complexes of Neutral Ligands" (M. G. W. DeBolster and W. L. Groeneveld), "The Chemical Analysis of Phosphate Rock (R. S. Young), "The Chemistry of P-C-N Systems" (D. Redmore), and "The Reaction of Disulfides with Trivalent Phosphorus Compounds" (T. Mukaiyama and H. Takei). Volume 9 contains "Transition Metal Complexes of Phosphorus Ligands" (O. Stelzer), "Phosphate Ceramics" (A. E. R. Westman), and "ESR of Phosphorus Compounds" (P. Schipper, E. H. J. M. Janzen, and H. M. Buck).

I suspect that not too many individuals will purchase these volumes unless they have a direct interest in one of the topics reviewed. However, their acquisition should be a must for any library with a reasonably comprehensive chemistry collection.

John W. Gilje, *University of Hawaii*

Applications of Biochemical Systems in Organic Chemistry. Parts I and II. Edited by J. B. JONES (University of Toronto), C. J. SIH (University of Wisconsin), and D. PERLMAN (University of Wisconsin). Wiley-Interscience, New York, N. Y. 1976. xx + 1065 pp. $64.00.

This timely and useful two-volume work has been written primarily to introduce organic chemists to the potential and power of biochemical methods in structural and synthetic problems. Fittingly, the editors have had conspicuous success with such applications in their own research, and they have enlisted other outstanding bioorganic chemists to make this an effective multi-authored effort.

Part I is an exposition of the current use of enzymes and microorganisms in effecting selective transformations, with emphasis on practicality. After an excellent introduction to biochemical concepts by Jones, Perlman summarizes, with practical advice and specific examples, the experimental procedures involved in microbial transformations, and Sih and J. P. Rosazza outline the types of synthetic steps which microbes are capable of accomplishing, particularly hydroxylation at nonactivated carbon. The heart of Part I is a long and detailed chapter by Jones and J. F. Beck on asymmetric syntheses and resolutions using enzymes, complete with tables of rate constants and representative experimental procedures. It contains particularly thorough discussions of the specificity of chymotrypsin, acylases, and other hydrolytic enzymes and of oxidoreductases, the two main classes which are likely to be most useful to organic chemists, as well as less well-known enzymes such as those which catalyze asymmetric halohydrin and cyanohydrin formation. R. Bentley discusses the use of biochemical methods for the determination of configuration at both chiral and prochiral centers, and Part I closes with a short section on stereochemical terminology, a list of biochemical suppliers, and an abbreviated IUB list of enzymic reaction types.

Part II contains eleven chapters which together present a compelling picture of the intermingling of biochemical concepts in a great deal of organic research. In the longest chapter, J. P. Guthrie analyzes the factors responsible for rate enhancement due to enzymic catalysis and their possible application to synthetic problems. One aspect of this is beautifully developed by D. J. Cram in his discussion of synthetic host-guest chemistry, and another by C. A. Bunton in "Micellar Reactions". The applications of several solid-phase techniques which originated in biochemical laboratories are treated in chapters on affinity chromatography (G. M. Whitesides and A. H. Nishikawa), immobilized enzymes and coenzymes (K. Mosbach), and syntheses using polymer supports (L. J. Marnett, D. C. Neckers, and A. P. Schaap), all of which offer particular advantages. I. A. Rose and K. R. Hanson discuss interpretation of the stereochemistry of enzymatic reactions, an expanded version of their 1975 *Accounts of Chemical Research* article, and H. W. Whitlock, Jr., provides a brief but selective comparison of enzymatic vs. chemical methods for chiral isotopic labeling. The future prospects for large-scale organic synthesis using cell-free enzymes are discussed by G. M. Whitesides, and G. A. Hamilton surveys enzymic oxidation-reduction reactions. A chapter by A. I. Scott on biogenetic-type synthesis is largely devoted to biomimetic transformations of complex indole alkaloids.

The literature has been thoroughly covered through 1974 and some chapters include a number of 1975 references. The same combined subject index appears in both volumes. The result is an attractive blend of practical applications which can be put to immediate use by many organic chemists and thought-provoking ideas for future development, and can be highly recommended.

Richard K. Hill, *University of Georgia*

Proceedings of the International Symposium on Atomic, Molecular and Solid-State Theory and Quantum Statistics. Edited by PER-OLOV LÖWDIN (International Journal of Quantum Chemistry, Symposium No. 9, 1975). Wiley/Interscience, New York, N.Y. 1975. xxv + 583 pp. $25.00.

This collection of papers presented at the 1975 International Symposium held at Sanibel Island is dedicated to Professor L. H. Thomas. A sizable number of papers are devoted to an analysis and use of the Thomas-Fermi-Dirac theory. In all there are about 65 papers on many aspects of quantum theory including about 13 on various solid-state problems and one by Prigogine on Dissipative Phenomena. The range of papers is very broad and interesting. However, this volume is most suitable for libraries since much of the material is now dated by the two years which have passed since its original publication date.

Neil R. Kestner, *Louisiana State University*

Introductory Group Theory. By J. R. FERRARO (Argonne National Laboratory) and J. S. ZIOMEK (Freeman Laboratories). Plenum Publishing Co., New York, N.Y. 1975. xiii + 292 pp. $19.95.

The book provides considerable detail on how to apply symmetry concepts to vibrational spectroscopy. Specific examples are used throughout as the major mechanism for explaining the procedures. In this regard, it serves as a very useful text that fills common gaps in other treatments of the subject. The numerous tables and the ten appendices provide a working spectroscopist or a beginning serious student with a considerable amount of useful information. The book makes little attempt to explain the basis of the various procedures. For example, it clearly instructs a student in the use of a character table but does not explain in fundamental terms what a character table actually is.

The pedagogical method employed throughout is (1) to state a principle or give a formula in the absence of an explanatory introduction, then (2) to illustrate the principle in great detail on realistic examples. Specific vibrational data are presented for practice type challenging problems along with answers. It is recommended only for advanced undergraduate courses and for all graduate students in the field.

Lon B. Knight, Jr., *Furman University*

Molecular Spectroscopy. Volume 4. Senior Reporters: By R. F. BARROW (Oxford), D. A. LONG (Bradford), and J. SHERIDAN (University College of North Wales). The Chemical Society, Burlington House, London. 1976. viii + 279 pp. £17.25.

This volume continues a fine tradition of high quality reviews on areas of molecular spectroscopy. The six chapters, all by prominent spectroscopists, primarily cover the literature of 1974 and early 1975 although earlier work is discussed in a number of cases. The first chapter, "Microwave Spectroscopy", by J. N. MacDonald and J. Sheridan is essentially a continuation of the topic from Volume 3 and is devoted primarily to discussing the results for individual molecules. The molecules range from diatomics such as $^{16}O^{18}O$ to large fused-ring systems such as bullvalene. Cyclic molecules and others with large-amplitude motions or with rotational isomerism are well covered. In addition, brief discussions of studies of astrophysically important molecules and of collisional and time-dependent effects are included. Chapter 2 by P. R. Scott and W. G. Richards is a brief discussion of the electronic structure of diatomic transition-metal molecules including ScF, TiO, ScO, and the hydrides of the metals of the first transition series. Both experimental studies and quantitative molecular orbital (Hartree-Fock) calculations are described. The third chapter

by L. D. Barron, "Rayleigh and Raman Scattering of Polarized Light", is a rigorous theoretical treatment of considerable value to researchers dealing with optical activity. Chapter 4, "Biological Applications of Raman Spectroscopy", by V. Fawcett and D. A. Long is the longest chapter dealing with a topic reviewed more than a dozen times in recent years. Nonetheless, this review with its compilation of data is quite pertinent. Recent data involving resonance Raman spectroscopy on cartenoids, visual pigments, haem proteins, chlorophylls, and porphyrins, for example, have special prominence. J. A. Koningstein's contribution on "Ionic and Molecular Electronic Raman Spectroscopy" in Chapter 5 is an outstanding one reflecting the fact that his own work is in the forefront of the field. Theoretical fundamentals are well presented as in a comprehensive review (with many spectra) of experimental work to date. The last chapter by M. J. French and D. A. Long, "Non-linear Raman Effects: Part I", touches the surface of perhaps the fastest growing area of spectroscopy. Vibrational relaxation and hyper-Rayleigh and hyper-Raman scattering are reviewed with an emphasis on experimental detail, basic theory, and resulting data, although these are somewhat limited (especially for the hyper-Raman effect). All in all this volume is essential reading for the practicing spectroscopist.

J. Laane, *Texas A&M University*

Facts and Theories of Aromaticity. By D. LEWIS and D. PETERS (Royal Hollaway College, University of London). Crane, Russak and Co., Inc., New York, N.Y. 1975. viii + 109 pp. $16.50.

The authors have attempted to write a book for the advanced undergraduate or research worker which deals with both experimental and theoretical data bearing on the aromaticity concept.

The bulk of this monograph is devoted to experimental evidence and theoretical ideas which are treated summarily. What the authors have done well is to point out the artificial nature of the concept and the difficulties in any of the proposed criteria serving as a universal indicator of aromaticity.

The very sketchy "chapters" on homoaromaticity and anti-aromaticity merely serve to point out the existence of such categories and to provide a list of references.

The book will be of greatest value to the neophyte chemist faced with the task of organizing an abundance of data and thought in relation to the term, aromatic character.

A. Krantz, *State University of New York—Stony Brook*

The Theory of Molecular Spectroscopy. By C. J. H. SCHUTTE (University of South Africa). North Holland Publishing Co., Amsterdam. 1976. 512 pp. $67.95.

This book is very accurately described by its title. It presents the basic mathematical elements of the physical theory needed for the understanding of ground-state molecular spectroscopy. It specifically excludes the electronic excited states. The mathematical presentations are beautiful in their brevity, but not so terse as to make them incomprehensible. I experienced great pleasure reading the book, but feel that anyone who has not studied the material previously would find very difficult going. The book depends on the reader's familiarity with linear algebra and group theory and a well-developed quantum mechanical intuition.

The first chapter is a description of linear algebra and vector spaces. All of the standard theorems are proven nicely and provide a fine reference for this material. The second chapter does the same thing for group theory.

The third chapter presents the fundamentals of quantum mechanics with very little physical explanation. Quantum mechanics is postulated and then the formalism is used to describe oscillators, angular momentum and the central field problem.

The fourth and fifth chapters describe the application of quantum mechanics to the rotating and vibrating molecule. There is considerable discussion of the derivation of the Hamiltonian which is then used to solve various problems. The application of the Born–Oppenheimer approximation to the Hamiltonian is also discussed.

The last chapter is an all too brief description of the interaction of radiation with matter. It begins with a nice presentation of time-dependent perturbation theory and then goes on to a discussion of selection rules. Unfortunately, there is not enough explanation to make the material read smoothly.

Its valuable appendices contain character tables of point groups, direct product representations, vector coupling coefficients, and a variety of other useful information. It has a twelve-page, up-to-date, bibliography and a good index.

In general I would recommend the book as a superb reference for experienced workers in the field and advanced students, but would suggest that the material should be learned first from other texts such as Herzberg or Townes and Schawlow. Its price makes it out of range for many people, but it belongs in every library.

H. J. Metcalf, *SUNY, Stony Brook*

IRS Organic Chemistry. Series Two. Volume 10. Free Radical Reactions. By W. A. WATERS. Butterworth & Co. Publishers, Ltd., London–Boston, 1975. 375 pp. £13.45 ($32.46).

With the volume of literature being published today in a seemingly overwhelming number of specialties and micro-specialties, keeping up becomes a Herculean task. For this reason, we all have become more and more dependent on the type of volume that provides an annotated list of references organized by research area and time period covered. There are now a substantial number of sources for this type of bibliographic help, including at least ten series of the "annual review" type plus the Specialist Reports published by the Chemical Society.

This particular volume does a fair job in covering most (but *not* all) areas of current study in the free radical field. Topics reviewed include: homolytic aliphatic and aromatic substitutions, addition reactions, structure of carbon- and sulfur-centered radicals, nitrogen radicals, radicals of groups III–V, autoxidations, triplets, and electrode reactions.

As is typical, the chapters vary considerably in quality. Some are better organized, more critical, or more up-to-date than others. A given chapter may or may not be useful, depending on the immediate needs of the research worker; one of my students found the article on nitrogen radicals to be helpful since it has a collection of references for a relatively exotic area we happened to be exploring.

Some of the chapters in this book compete directly with other review sources; for instance, the material on photoxidation was covered in "Specialist Periodical Report—Photochemistry" (July 1971 to July 1974), which appeared before this volume was published.

All in all, this book is a useful place for a research worker to initiate (or to double-check) a literature search. The cost makes it a "libraries only" item, but that does not destroy the utility of a book which is used in a rather eclectic manner in which this one will be.

William A. Pryor, *Louisiana State University*

Electrons in Liquid Ammonia. By J. C. THOMPSON (The University of Texas at Austin). Clarendon Press, Oxford. 1976. xii + 297 pp. $30.50.

Since their discovery by Weyl in 1864, solutions of active metals in anhydrous liquid ammonia have attracted the interest of a wide spectrum of experimental and theoretical scientists. In 1963 the first of a series of international meetings (Colloque Weyl) initiated a pulse of renewed interest in these systems using modern experimental and theoretical techniques. For those interested in stable solutions of electrons, there is a need to organize the relatively recent outpouring of information on these systems. Thompson's effort in this volume serves admirably for this purpose.

As might be expected (Thompson was trained as a physicist), the stress in this volume is on subjects nearer to the interests of physicists or physical chemists. After a brief historical overview (Chapter 1), the major chapters (Chapter 2, Metal–Ammonia Solutions as Liquid Metals; Chapter 3, Metal–Ammonia Solutions as Electrolytes; Chapter 4, the Metal–Nonmetal Transition in Metal–Ammonia Solutions; Chapter 5, Liquid–Liquid Phase Separation; Chapter 6, Solutions of Alkaline Earth and Rare Earth Metals; Chapter 7, Solid Metal–Ammonia Compounds) contain a well-organized critical review of pertinent physical properties as well as a discussion of the currently accepted theoretical interpretation of such phenomena; both the modern and older literature is thoroughly covered. The final Chapter (8) is concerned with solutions of metals in other solvents (e.g., other amines, ethers, and hexamethylphosphoramide).

This volume, which is a part of the Oxford Monographs on the Physics and Chemistry of Materials, is a useful literature aid to that body of research scientists interested in the unusual properties of these systems.

J. J. Lagowski, *The University of Texas*