

## Book Reviews

**Topics in Applied Physics. Volume 5. Mössbauer Spectroscopy.** Edited by U. GONSER (University des Saarlandes). Springer-Verlag, New York-Heidelberg-Berlin, 1975. xviii + 241 pp. + 96 fig. \$30.10.

This book represents a departure from most books dealing with Mössbauer spectroscopy. The majority of books on Mössbauer spectroscopy arise from conference proceedings. Others are one- or two-person efforts and tend to be tutorial. Professor Gonser has gathered five excellent authors, who discuss applications of Mössbauer spectroscopy to their specialties involving chemistry, magnetically ordered compounds, biology, lunar materials, and ferrous metallurgy. The treatments are not exhaustive—they could not be in a book of 241 pages. Rather, an introduction to each section summarizes the appropriate theory and the remainder illustrates the application of theory through examples. As such, the book should serve as a readable introduction to those who wish to know how Mössbauer spectroscopy may impact on their areas of interest (if among those covered).

The Introduction by Gonser is concerned with the basis of the effect, the interactions which cause the characteristic features of the spectra, and the instrumentation needed. The captions of the Figures 1.13a and 1.13b are interchanged, which could mislead one into preferring a NaI(Tl) scintillation detector over a proportional counter for  $^{57}\text{Fe}$  work. Also velocity calibration via laser interferometry or Moiré fringes is much preferable to the cited use of the hyperfine splitting of pure  $\alpha$ -iron.

The article on Chemistry, by Gutlich, is perhaps the most pedantic. The chemical information obtainable from isomer shift and from the quadrupole interaction is considered at length. Since isomer shift is treated in such detail, one wonders why the influence of temperature and perhaps of zero-point motion are not explained. The relations between the components of the electric field gradient tensor and chemical structure and bonding are discussed in great detail. Methods for the measurement of the components are not discussed.

Grant discussed Magnetically-Ordered Compounds. One or more magnetically ordered sublattices may be present, and the magnitude of the fields and their orientations change with temperature. The Mössbauer effect is a sensitive tool for measuring these parameters.

Biological molecules are discussed by Johnson. Problems of sensitivity are severe for iron-containing molecules, but can be helped by enrichment with  $^{57}\text{Fe}$ . A clear exposition is given of hemoglobin in its ferrous and ferric, high-spin and low-spin configurations. Also, considerable information is given about the iron-sulfur proteins.

Lunar materials are discussed by Hafner. Iron is a common constituent of terrestrial minerals, and still more common among lunar minerals. It is relatively easy to obtain  $^{57}\text{Fe}$  Mössbauer spectra from the lunar "soil". The most striking result is the reduced state of the iron—no ferric iron, only ferrous and free metallic iron. Since many of the lunar materials are glassy or poorly crystalline, the Mössbauer effect has advantages over x-ray diffraction techniques.

Fujita's article on Physical Metallurgy is devoted mainly to ferrous metals. Mössbauer spectra reveal changes in phase, in common with x-ray diffraction. In addition, changes of the Mössbauer parameters occur as a consequence of the number and identity of non-iron nearest neighbors to the iron atom being studied. Amorphous alloys can also be treated. Oxidation of a metal can be followed readily, both in terms of the compounds present and the kinetics of the reactions.

Mössbauer spectroscopy has applications throughout physics, chemistry, geology, archeology, and other disciplines. The present slim volume is a most useful and welcome introduction to its applications to chemistry, magnetically ordered compounds, biology, lunar minerals, and metallurgy.

R. L. Collins, *The University of Texas at Austin*

**Topics in Current Chemistry. Volume 66. Triplet States III.** Edited by F. BOSCHE. Springer-Verlag, Berlin-Heidelberg-New York, 1976. 154 pp. \$26.30.

The latest volume of this series of critical reviews contains four

contributions: "Excited Triplet Organic Carbonyl Compounds" by P. J. Wagner; "Triplet States from Azo Compounds" by H. Dürr and B. Ruge; "Triplet States from Azides" by H. Dürr and H. Kober; and "Line Broadening in Large Molecules" by G. Fisher. Each of these authors is certainly an expert in the field reviewed. While the first three chapters will be of value primarily to organic photochemists, the last chapter is clearly in the domain of the spectroscopist. Despite the title of this volume, the specific examples cited in the chapter by Fisher deal almost exclusively with electronic transitions within the singlet manifold of states. The literature coverage appears to end in 1975 for the Wagner chapter and in 1974 for the others. Although attractively produced, the brevity and cost of this book lead me to share the reservations eloquently expressed by the reviewer of Volume 54: Triplet States I [*J. Chem. Soc.*, **98**, 2026 (1976)].

Robert E. Connors, *Worcester Polytechnic Institute*

**The HMO Model and its Application. Volume 3. Tables of Hückel Molecular Orbitals.** By EDGAR HEILBRONNER (University of Basel) and HANS BOCK (University of Frankfurt). Translated by WILLIAM MARTIN (Union College) and ANTHONY J. RACKSTRAW. John Wiley & Sons, Inc., New York, N.Y., Verlag Chemie, GmbH, Weinheim, Germany, 1976. 190 pp. \$19.50.

This book, Volume 3 in a series, consists of tables of  $\pi$ -electron calculations on 79 simple  $\pi$ -electron systems. The quantities included in the tables are defined explicitly in Volume 1, and again briefly in Volume 3, and have been computed with the HMO program listed in the third volume of the original German edition. The information given in the tables includes the MO diagram with symmetry designations; the eigenvalue and Hückel coefficients; the coefficient of the total  $\pi$ -electron energy; bond orders and free valencies; and atom-atom, bond-atom, and bond-bond polarizabilities. The systems included fall into one of four categories: chains (up to  $n = 10$ ), rings (from  $n = 3$  to 8, and  $n = 10, 14$ , and 18), special  $\pi$ -electron systems (primarily systems with two or three rings), and partial  $\pi$ -electron systems. In the beginning of the book a list of the HMO tables and symbols is given, which makes it easy to find the data for a particular system.

Janet E. Del Bene, *Youngstown State University*

**International Review of Science. Organic Chemistry. Series 2. Volume 2. Aliphatic Compounds.** Edited by N. B. CHAPMAN (University of Hull). Butterworths, London, 1975. 400 pp. £13.50.

This is the second biennial review of the literature and covers mainly the literature from the period 1972 to 1973, with a few earlier and later references. This volume on aliphatic compounds is divided into nine separate chapters on (1) hydrocarbons; (2) halogeno compounds; (3) alcohols, ethers, and related compounds; (4) nitrogen compounds; (5) phosphorus compounds; (6) sulfur compounds; (7) carbonyl compounds; (8) carboxylic acids; and (9) boron compounds. Each chapter is written by a different expert. A largely successful effort has been made to limit the appearance of a particular topic to only one of the chapters. Hydroboration, for example, might be expected in Chapters 1, 3 or 9 but is discussed mainly in 9. Each chapter is extensively referenced. There is no author index but a subject index appears in the volume, which is a convenience. The index, however, is somewhat sketchy and omits some references to material contained in the text; for example, a cycloaddition reaction described on p 282 is not mentioned in the index under "Cycloaddition", nor are the sigmatropic rearrangements shown on pages 271-272 mentioned under "Sigmatropic reactions". One hopes the indexing will be improved in subsequent series. Another matter of concern is the very long time between the end of the period reviewed (1972-1973) and the publication of the volume (early 1976).

Even with the shortcomings mentioned, this seems a worthy effort and should be of help to chemists trying to cope with the torrent of research literature.

David W. Emerson, *The University of Michigan—Dearborn*

**Advances in Liquid Crystals. Volume 2.** Edited by G. H. BROWN (Liquid Crystal Institute, Kent State University). Academic Press, New York-San Francisco-London. 1976. xi + 308 pp. \$30.00.

This book, like so many other "Advances in . . ." series, consists of several distinct areas of research reviewed by different authors. The first subject is "Molecular Geometry and the Properties of Nonamphiphilic Liquid Crystals" by G. W. Gray. (Amphiphiles and non-amphiphiles are carefully defined in the introduction.) This 72-page section is an excellent up-to-date review of the subject. The subsections include discussions of general structural features, mesogens with alicyclic and heterocyclic rings, the effect of terminal and lateral substituents as well as the central group on mesomorphic properties, and the role of molecular structure in the formation of smectic or nematic/cholesteric phases. The section entitled "Selective Reflection of Cholesteric Liquid Crystals" was authored by W. Elser and R. D. Ennulat. The physics and chemistry of cholesterics are reviewed. In the discussion on temperature dependence of selective reflection, the correlations observed between cholesteryl structure, i.e., alkyl chain length, and width of color band or the wavelength of selective reflection, are particularly interesting. An extensive review of applications is also given. A section on "Liquid Crystals and Emulsions" was authored by S. Friberg and K. Larsson. Emulsifier molecule arrangements and the interactions between different components, i.e., water/emulsifier and hydrocarbon/emulsifier, are covered.

Emulsion stability, flocculation, coalescence and phase behavior, and structure are discussed. In his section on "Vibrational Spectroscopy of Liquid Crystals", B. J. Bulkin describes the information that is potentially available from infrared and Raman spectroscopy and reviews the current literature in the area according to mesophase. The fifth section is devoted to "The Continuum Theory of Liquid Crystals as it Applies to Static Equilibrium". J. L. Ericson discusses the energetics associated with various mesophases, equilibrium equations, linear theory, and linear and nonlinear problems.

The reviews are up to date, with most of the references cited from the 1970s and some as recent as 1976. This book should be available in any scientific library, and scientists doing research in this field may want to have a personal copy.

Zack G. Gardlund, *General Motors Corporation*

**Solutions and Solubilities. Part II.** Edited by M. R. J. DACK (Australian National University). John Wiley & Sons, Inc., New York, N.Y. 1976. xii + 499 pp. \$34.50.

This volume, in common with Part I, contains a variety of theoretical and practical chapters: "Introduction to Theories of Solutions and Applications to Phase Equilibria" by C. A. Eckert; "The Nature of Intermolecular Donor-Acceptor Bonds" by H. A. Bent; "The Influence of Solvent on Chemical Reactivity" by M. R. J. Dack; "Solvent Effects on Selected Organic and Organometallic Reactions—Guidelines to Synthetic Applications" by G. Illuminati; "Reactions in Inorganic Solvents" by R. A. Zingaro; "The Effect of Pressure and Temperature on Reactions in Solution" by D. D. Macdonald and A. F. M. Barton; "Structure of Water and Aqueous Solubility" by F. W. Getzen; and "Polymer Solutions" by E. B. Bagley and J. M. Seigliano.

Although the writing is uniformly good, experts in a particular area may be disappointed by the brevity of treatment, and the literature coverage, which was more than two years old at the time the volume was published.

The inorganic solvents chapter covers hydrogen fluoride and superacids, ammonia, and sulfur dioxide. The discussion in many cases lacks depth because of space limitations, but could be quite valuable as a guide to both original literature and review articles in specific areas. The chapter on pressure and temperature effects has some of the same problems. One would never guess from the text that thermistors are so commonly used in temperature regulation. On the other hand, pressure techniques are well handled, and this is the less familiar and more valuable portion of the chapter. The polymer solutions chapter has a lucid discussion of dispersion, polar, and hydrogen-bonding interaction contributions to solubility parameters.

It may be that an individual point is discussed more fully and more authoritatively elsewhere. But particularly for someone entering an area of solution chemistry, the present volume answers the questions of what are the important concepts and techniques, and where can detailed discussions be found.

Richard Fuchs, *University of Houston*

**Colloid and Interface Science. Volumes II–V.** Edited by MILTON KERKER (Clarkson College of Technology). Academic Press, Inc., New York, N.Y. 1976. Vol. II: xx + 481 pp. \$21.00. Vol. III: xx + 548 pp. \$22.50. Vol. IV: xviii + 587 pp. \$22.00. Vol. V: xvi + 507 pp. \$22.00.

Published in five volumes, the four reviewed here consist of 218 of the 221 contributed papers given at the International Conference on Colloids and Surfaces held in San Juan, Puerto Rico, from June 21 through June 25, 1976. Because the papers cover a wide range of topics, each volume contains work on a few areas of surface science. Volume II contains 54 papers and is subtitled "Aerosols, Emulsions and Surfactants". It also contains a fair number of papers on nucleation, condensation, and crystal growth. Volume III consists of 56 papers and is subtitled "Adsorption, Catalysis, Solid Surfaces, Wetting, Surface Tension and Water". Very few of the papers in Volume III have used ultra-high-vacuum techniques and the amount of "clean surface" work reported is small. The articles on water concern water in clay, glasses, and other heterogeneous environments. There are 57 papers in Volume IV which is subtitled, "Hydrosols and Rheology". The 51 papers in Volume V are principally of biological interest. Volume V is subtitled "Biocolloids, Polymers, Monolayers, Membranes, and General Papers".

It should be noted that approximately one-third of the papers in each volume are given by abstract and no details of the work are presented. Each volume provides a good representation of much of the current research efforts in surface chemistry, and the collection would make a useful addition to a library.

David L. Freeman, *University of Rhode Island*

**Handbook of Psychopharmacology. Section I: Basic Neuropharmacology. Volume 3. Biochemistry of Biogenic Amines.** Edited by L. L. IVERSEN and S. D. IVERSEN (Cambridge) and S. H. SNYDER (Johns Hopkins). Plenum Press, New York and London. 1975. xii + 486 pp. \$35.00.

This collection of chapters on various functions of brain monoamine-containing neurons, e.g., enzymatic synthesis and degradation, storage and release, and uptake, covers catecholamines (dopamine and norepinephrine), serotonin, histamine, and acetylcholine. Though the latest references are 1974 in a rapidly changing field, these authoritative reviews should be useful to chemists and other researchers in fields related to biogenic amines and particularly useful to students. The chapters vary in thoroughness, but most are reasonably complete in referencing important areas within their scope.

Coverage of various topics is not balanced. All of the information on histamine is tucked neatly into one chapter, and the same is true for acetylcholine. Serotonin has a chapter to itself in addition to being mentioned in the chapter on uptake and briefly in a chapter dealing with intraneuronal compartments. Five chapters discuss various aspects of catecholamines. This lack of consistent structure does not detract significantly from the usefulness of the volume.

The inclusion of an index helps considerably in tracking down various bits of information on a topic. The index could have been more useful with a little more care in its preparation. The degree of detail is not consistent in various parts of the index, nor is the index complete in several instances. For example, *p*-chloroamphetamine is referenced only to p 198 in the index but is discussed additionally on p 196 and on pp 423–424.

Overall the editors, authors, and publisher are to be commended, for as the jacket cover indicates, "this volume critically evaluates and integrates the vast amount of research findings on biogenic amines as neurotransmitters".

Ray W. Fuller, *Lilly Research Laboratories*