

Book Reviews*

Handbook of Gaussian Basis Sets: A Compendium for *Ab-Initio* Molecular Orbital Calculations. By R. Poirer (Memorial University, St. John's, Newfoundland), R. Kari (Laurentian University, Sudbury, Ontario), and I. G. Csizmadia (University of Toronto). Elsevier Science Publishers: Amsterdam, Oxford, New York, and Tokyo. 1985. xii + 674 pp. \$146.25. ISBN 0444-42493-8.

Ab initio calculations of molecular properties have become commonplace because of the availability of user-friendly computer programs and of a wide range of basis sets, usually Gaussian in form, to match any computational budget. This volume, published as No. 24 in Elsevier's Physical Sciences Data Series, may be viewed as an extension of the publisher's earlier volume, No. 16, entitled *Gaussian Basis Sets for Molecular Calculations* (S. Huzinaga, Editor). While the earlier volume presented a limited range of basis sets, the present volume is overwhelming in its comprehensiveness. For carbon an astounding 104 different sets are presented, with many of these differing only in their contraction patterns. A total of 67 elements are considered, namely hydrogen through ytterbium, with cesium, barium, and lanthanum being skipped. For most of the elements beyond krypton only two different basis sets are presented (exceptions: three for tin and four for iodine). A brief introduction to the Tables adequately describes the notational conventions, but there is little or no commentary on the relative merits of the various sets. Nevertheless, this volume is a very valuable contribution to the quantum chemical literature as it greatly simplifies the task of locating Gaussian basis sets.

Lawrence L. Lohr, *University of Michigan*

Modern Chromatographic Analysis of the Vitamins. Edited by André P. De Leenheer (State University of Ghent), Willy E. Lambert (State University of Ghent), and Marcel G. M. De Ruyter (Psychiatric Center St. Jozef). Marcel Dekker: New York. 1985. ix + 556 pp. \$85.00. ISBN 0-8247-7221-0.

This book is a collection of chapters authored by individuals or groups experienced in the analysis of each vitamin. Each chapter is devoted to one vitamin plus its metabolites and related compounds. Both the fat-soluble A, D, E, and K vitamins and the water-soluble ascorbate, folate, nicotinate, thiamine, flavins, pyridoxin, cyanocobalamin, and biotin vitamins and coenzymes are covered. A brief introduction to the chemistry and metabolism of each vitamin is followed by a literature review of the methods used for its chemical determination in a variety of sample types. The emphasis is on chromatographic methods, but other methods are also mentioned. Sample preparation and potential problems are discussed. The reference lists at the end of each chapter are comprehensive through about 1982 with some more recent references.

This is not a guide to the practice of chromatography nor is it a text in vitamin chemistry. It is a good source of information for those experienced in chromatographic methods who need to know the state of the art in the quantitative determination of a vitamin.

John B. Phillips, *Southern Illinois University at Carbondale*

Solid State NMR for Chemists. By Colin A. Fyfe. C.F.C. Press: Guelph, Ontario. 1983. x + 593 pp. \$55.00. ISBN 0-88955-038-7.

Over the history of nuclear magnetic resonance (NMR) there loom several important developments. Two examples from the last decade or so are NMR imaging and high-resolution NMR in solids. The present book, dealing with the latter topic, is one of the only extensive introductions of which I am aware to the possibilities of solid-state NMR in chemistry. It describes the application of modern solid-state techniques (including solid echoes, cross polarization, magic-angle spinning, magic-angle hopping, two-dimensional and local-field measurements, multiple-pulse spectroscopy, dynamic nuclear polarization) to a wide variety of nuclear isotopes (including ^1H , ^2D , ^{11}B , ^{13}C , ^{15}N , ^{17}O , ^{19}F , ^{23}Na , ^{27}Al , ^{29}Si , ^{31}P , ^{51}V , ^{59}Co , ^{113}Cd , ^{129}Xe , ^{133}Cs , ^{195}Pt , ^{207}Pb) in a wide variety of materials (including catalysts, organometallic compounds, coal, zeolites, minerals, polymers, liquid crystals, model biological systems). The book, printed on an apparently modest budget, represents an extensive and dedicated effort emphasizing applications of NMR, together with spectra typical of these solid and partially ordered materials. While not a text for students who need to learn the fundamental physics or underlying theory of solid-state NMR, it is an excellent practical reference if you wish to find out about the modern techniques and peruse a review or compendium of NMR spectra and what one learns from them in solids,

particularly in zeolites, an area in which the author has made important contributions. In this sense it is an appropriate complement to the fundamental, pedagogically oriented texts by Slichter and Mehring. It also presents a good collection of literature references (Chapter 7, one concerned with applications of CP/MAS, for example, contains 275 references), a convenient start for someone contemplating entering the field or wondering about the potential of solid-state NMR in chemistry. As an illustration of the difference in emphasis between this volume, which features about 600 spectra on so many pages, and some other widely used NMR texts, my students determined some S/E ratios (ratio of number of spectra to number of equations). It turned out to be about 10 for Fyfe, compared with 0.25 for Harris' *NMR Spectroscopy*, 0.12 for Mehring's *High Resolution NMR in Solids*, and 0.004 for Slichter's *Principles of Magnetic Resonance*. There are no errors in the treatment (although my attention was drawn by a colleague to an amusing misprint on p 115), and I found the text well balanced in terms of techniques covered. As a recommendation for this work, let me mention in closing that some of my best friends are chemical engineers, solid-state chemists, and geologists and I have recently found myself directing them to Fyfe to see what they may be able to learn about their problems by NMR. My students and I also refer to it frequently, and I believe it will be an excellent source of information to a wide clientele of chemists for the next few years.

A. Pines, *University of California, Berkeley*

Trace Residue Analysis: Chemometric Estimations of Sampling, Amount, and Error. Edited by D. A. Kurtz (Pennsylvania State University). American Chemical Society: Washington, D.C. 1985. X + 284 pp. \$59.95. ISBN 0-8412-0925-1.

This monograph is number 284 in the ACS Symposium series and contains thirteen chapters by an international panel of authors. Specific topics discussed include outlier processing, correlation chromatography, cubic spline functions, and multiple-curve weighted least-squares procedures. The symposium was sponsored by the Divisions of Pesticide and Analytical Chemistry of the American Chemical Society, and this fact is reflected in the examples of methods chosen for illustration, which are largely from the area of pesticide residue analysis. In the preface, the editor states that, "The symposium on which this volume is based was formatted, first, to outline appropriate and noncumbersome methods for analytical decision making and, second, to make the methods easily understandable to the ordinary bench chemist so that they will actually be used. I visualize this text, actively being used, next to an analytical instrument." In this latter respect I think that the book fails, as nearly all multi-author symposium texts do. There is a lack of cohesion between individual chapters and the didactic nature of a text book is lost. In fact, the bench chemist reading this text, without much prior preparation in statistics, will soon be lost and confused by the subtle difference in views and emphasis of the various authors. That is not to say that this book is in any way weak; it is simply a symposium proceedings and not a text book. Viewed as such it should be purchased by libraries but I do not believe that it is the type of text one would anticipate finding lying open in a busy analytical laboratory. The academic analytical chemist will find much food for thought and the glossary of terms and worked examples found in some chapters are very useful.

Colin F. Poole, *Wayne State University*

Metabolites and Metabolism. By Edwin Haslam (University of Sheffield). Clarendon Press, Oxford University Press: Oxford and New York. 1985. v + 161 pp. \$22.95. ISBN 0-19-855377-3.

This book provides an excellent review of the characteristics and products of secondary metabolism. It presents the major categories of natural products and their origins. These include polyketides, alkaloids, phenolic compounds, terpenes, and steroids. The author points out the underlying chemical reactions that lead to diverse products within a given category. There are some errors in the book in schemes and some errors of omission of molecular structures and a figure. These errors are frustrating to the novice but of little consequence to the knowledgeable reader. The book provides discussion of regulation of secondary metabolism and possible functions of the products according to current rationale by the author and other leading investigators. Specific examples are presented of enzymes that have flexible specificity in some species in contrast to multiple isoenzymes in other species to accomplish production of different products. The diversity of the evolutionary process is aptly illustrated.

John E. Robbins, *Montana State University*

*Unsigned book reviews are by the Book Review Editor.

Chemistry and Biochemistry of the Amino Acids. Edited by G. C. Barrett (Oxford Polytechnic, U.K.). Chapman and Hall: New York, 1985. x + 684 pp. \$99.00. ISBN 0-412-23410-6.

This book was designed to provide a thorough treatment of developing areas of the chemical and biochemical aspects of amino acids and to provide access directly or through secondary sources to original references. It has accomplished this very well in 22 chapters by different authors citing nearly 4000 primary and secondary references.

The initial chapters, *Nomenclature of Amino Acids* (G. C. B.), *The Protein Amino Acids* (P. M. Hardy), *Beta and Higher Amino Acids* (C. N. C. Drey), and *The Non-Protein Amino Acids* (S. Hunt), summarize the background of discovery of the most important amino acids and provide many tables listing post-translational modifications of amino acids in proteins, more than 600 non-protein amino acids occurring in nature, and properties of the protein amino acids.

The biochemistry of amino acids is covered in three chapters. *Metabolic and Pharmacological Studies* (D. A. Bender) concentrates on areas of metabolism in which recent advances have been made with brief references to well-established metabolism. *The Biosynthesis of Amino Acids in Plants* (P. J. Lea, R. M. Wallsgrove, and B. J. Mifflin) covers an area often neglected and references are made frequently to differences in bacterial systems. *Enzyme Inhibition by Amino Acids and their Derivatives* (M. J. Jung) provides examples of different types of inhibitors and stresses the more recent transition state analogues, irreversible inhibitors with a reactive group including suicide inhibitors produced by the enzyme.

The chemistry of amino acids is covered in six chapters on *Synthesis, Resolution and Reactions* (of Amino Acids) (G. C. B.), *Protected Amino Acids in Peptide Synthesis* (J. Meienhofer), *Degradation of Amino Acids Accompanying *in vitro* Protein Hydrolysis* (S. H.), and *Racemization of Amino Acids* (J. L. Bada). Extensive use of tables with primary and secondary references provides access to the more classical areas allowing stress on the newer developments of the chemistry of amino acids.

Mass Spectrometry of Amino Acids and their Derivatives (R. A. W. Johnstone and M. E. Rose) includes discussions of fragmentation pathways and different uses of mass spectrometry with emphasis upon fundamental aspects and examples from recent literature rather than comprehensive coverage. The influences of structure, solvent, and shift reagents on *NMR Spectra of Amino Acids and their Derivatives* (G. C. B. and J. S. Davies) are discussed with standard chemical shift data compiled in appendices. *X-Ray Crystal Structures of Amino Acids and Selected Derivatives* (V. Cody) describes the three-dimension crystal structure determinations of protein amino acids.

The separation and analysis of amino acids are treated by a discussion of the development and current status of *Ion-Exchange Separation of Amino Acids* (P. E. Hare, P. A. St. John, and M. H. Engel), summaries of recent advances in *Gas-Liquid Chromatographic Separation* (M. H. E. and P. E. H.) and high performance *Liquid Chromatography* (D. Perrett) of amino acids and their derivatives, including an addendum of recent significant developments in HPLC, and a discussion of methods of *Colorimetric and Fluorimetric Detection of Amino Acids* (G. A. Rosenthal).

The literature concerning *Optical Rotatory Dispersion and Circular Dichroism of Amino Acids and Their Derivatives* (C. Toniolo) is surveyed and the *Physical Properties of Amino Acid Solutions* (T. H. Lilley) provides a summary of some aspects of physicochemical behavior of amino acids in aqueous solution.

The authors have attained their objective of comprehensive coverage of the amino acids within a single volume to provide a very useful book.

William Shive, *University of Texas at Austin*

Analytical Methods for Pesticides and Plant Growth Regulators. Volume XIII. Synthetic Pyrethroids and Other Pesticides. Edited by G. Zweig and J. Sherma (U.S. Environmental Protection Agency and Lafayette College). Academic Press: Orlando, FL, 1984. xviii + 312 pp. \$65.00. ISBN 0-12-784313-2.

This series has appeared since 1963 when Volume I of *Analytical Methods for Pesticides, Plant Growth Regulators, and Food Additives* was printed. Only a few food additives were included in the early volumes, and the present title has consistently been used beginning with Volume VI. Each volume has included new material, and some volumes have contained analytical methods to update procedures given in earlier volumes. In the case of Volume XIII, new procedures are given for 13 substances and updated methods are listed for ten substances. Analytical methods are discussed for technical-grade products, formulations, and residues of pesticides and plant growth regulators. Nearly 40 authors, experts in the field, have conspired to produce reliable and accurate methods of analysis for 23 substances. The analytical procedures are especially designed for the determination of trace amounts of compounds.

The 13 substances included for the first time are cyhalothrin, cyper-

methrin, decis[®], fenprothrin, fluralinate, permethrin, pydrin[®], sumithrin[®], aspon[®]: soil insecticide, fenarimol, nuarimol, fluridone, and hexazinone. The ten materials for which updated analytical procedures are given include carbaryl, diflufenuron, 3-amino-*s*-triazole (amitrole), asulam, betasan[®] selective herbicide, diuron, eptam[®] and eradicane[®] selective herbicides, fluometuron, propanil, and sutan[®] selective herbicide. The chemical names and structures are given for each of the common names. For example, the active ingredient in eptam[®] and eradicane[®] is *S*-ethyl dipropylthiocarbamate.

For each substance, general information, analysis procedure(s), and references are given. Typically, the analysis procedure involves high-performance liquid chromatography or gas-liquid chromatography with electron capture or flame ionization detection. Alternate procedures are given in some cases.

The volume is clearly written and gives ample details of the analytical procedures. A bonus is a cumulative index for Volumes I–XIII.

Joseph R. Siefker, *Indiana State University*

The HIRN System: Nomenclature of Organic Chemistry, Principles. By Kenzo Hirayama (Suntory Ltd., Osaka, Japan). Maruzen Company, Ltd.: Tokyo; and Springer-Verlag: Berlin-Heidelberg-New York-Tokyo, 1985. viii + 147 pp. \$39.00. ISBN 3-540-15031-5.

Once in a while a scientist becomes so dissatisfied with nomenclature in his field, which he finds to have evolved illogically and piecemeal, that he develops and proposes a new system. This is not at first universally acclaimed, but it soon receives wide usage. Two famous examples are Linnaeus' reform (1775–1777) of names of plants and animals and that of Lavoisier (1787) for chemicals. Now Hirayama joins the reformers. Whether his system will be adopted remains to be seen, especially now that computerized organization and searching of organic structural formulas competes with nomenclature.

The HIRN (Hirayama Radial Nomenclature) system, which is intended to replace the IUPAC *Nomenclature of Organic Chemistry* ("Blue Book") with a simpler one, retains some features of the IUPAC rules. There is still priority of a parent portion of a structure (now called a "prior hydride") and modifiers of this parent, but the parent is cited first and modifiers later (radial arrangement) to avoid the inversion now used in indexes. We still see alkanes as carbanes, cycloalkanes as cyclocarbanes, arenes as such, numbers used as locants (but with some different rules), degree of unsaturation expressible by -an(e), -en(e), -yn(e) syllables, and replacement of ring carbon atoms by heteroatoms described by oxa-aza-sulfa infixes.

The HIRN system, which is to be developed further in a second volume, has been carefully thought out, but it can be described as simple only in comparison to the IUPAC Blue Book. The resultant names for complex structures are still unpronounceable and useless for oral communication, as, for example, "penta(3.¹A²)areno-1⁶,2⁴,4⁶-trinorade" (p 75); but the author considers that they are better for machine use.

The book, produced from typescript, appears remarkably free of chemical and grammatical errors when its intricacy is considered.

O. C. Dermer, *Oklahoma State University*

Lehrbuch der Organischen Chemie. 20th Edition. By H. Beyer and W. Walter (University of Hamburg, Germany). S. Hirzel Publishers: Stuttgart (Germany). 1984. xvi + 954 pp. DM 68.00 (\$30). ISBN 3-7776-0406-2.

This text is a prime example of the European "Lehrbuch" at its best. It is up to date, thorough, comprehensive, and written lucidly. Twenty careful revisions have served to debug it and to keep it at the state of the art. To my knowledge, there is no comparable book in English. The Beyer-Walter text seems to be meant for students with some basic knowledge of organic chemistry, but it is also an excellent reference book for chemists at any stage of their career.

A brief (50 pp) general section on methods, and bonding, is followed by all of organic chemistry—including chapters on Carbohydrates (42 pp), Terpenes and Steroids (61 pp), Heterocycles (116 pp), Peptides (25 pp), Nucleic Acids (27 pp), Enzymes (14 pp), and Metabolic Processes (10 pp). The material is organized by classes of compounds, without slighting reaction mechanisms and stereochemistry, which are developed as they become needed. Mechanisms and stereochemistry are treated with great competence, and at the current state of the art. Terms like prochirality, anomeric effect, stereoselectivity, etc., are defined and used with great precision. Mechanisms are given similar attention. For example, the presentation of the Diels-Alder addition is based on frontier orbital theory, the stereochemistry and mechanism of hydroboration are discussed, along with its use, the Hofmann-Curtius family of rearrangements is correctly presented as concerted, and distinguished from nitrene reactions, and so forth. The topic of molecular structure is also well covered, and also distributed throughout the book. All 217 isomers for C₆H₆ are drawn in a table, and almost five pages are devoted to the

structure of benzene. Throughout the book historical notes are included, and numerous references to review articles and books are given—many of them from the English literature.

The organization of the material by classes of compounds is done in a sensible, pragmatic manner. The first section, Aliphatics, begins with alkanes and alkenes, followed by their polymers and then petroleum chemistry. This illustrates a prominent feature of the book: Industrial chemistry is seen as an integral part of chemistry. The chemistry of industrial processes and products is included in all chapters, and prominent trade names (and, for example, the numbering scheme for Freons) are given. Color, melting point, odor, and toxicity are given for quite a few compounds.

To illustrate the organization, chapter 15 (nitroalkanes) is followed by chapter 16, containing mono-amines, their nomenclature, pK_a , synthesis (Hofmann, Curtius, Lossen, Schmidt, Gabriel reactions), properties, reactions, quaternary amines, stereochemistry, and optical activity at 3- and 4-bonding N, enamines, diamines. Chapter 17 goes on to aliphatic diazo compounds, diazirines, and diaziridines (small rings are not covered in the chapter on Heterocycles). Chapter 18 (11 p) deals with organic compounds of phosphorus, arsenic, silicon, and boron.

It would be very useful to have an English translation of this book. Such a translation would be an excellent text for a two-semester advanced organic chemistry course. Paired with one of the top advanced texts of the US (such as the 3rd edition of J. March's "Advanced Organic Chemistry"), the two would be a superb reference basis for students and other chemists alike.

Walter Lwowski, *New Mexico State University*

Microbial Energetics. By E. A. Dawes (University of Hull). Chapman and Hall, and Methuen, Inc.: New York. 1986. viii + 187 pp. \$39.95. ISBN 0-216-91790-5.

This is a concise, clear textbook intended for advanced undergraduates in microbial biochemistry. It is also likely to be useful to researchers in fermentation in technology needing a summary of principles governing microbial growth, yield, and response to metabolites. There are also definitions of terms commonly used now to describe how directly observable, plottable quantities are linked to their metabolic underpinnings. The book has 12 chapters spanning the following topics: adenine nucleotides, glucose metabolism and ATP yields, growth energetics, membrane transport and membrane energy transduction, energy conservation in aerobic and anaerobic chemoheterotrophs, chemolithotrophs, phototrophs, energy reserves, and microbial survival. The energy reserves chapter is especially useful and authoritative, reflecting as it does a considerable part of Dawes and Colleague's own research. Dawes' book will serve well as a supplementary text in metabolic biochemistry. It shows how many pathways undergird cell growth in general whereas some are peculiar to bacteria, living as they must under rugged conditions, yet surviving. There are about 15 references per chapter, with the complete title given for each reference. In marked contrast to many scantily indexed treatises being produced now, this small book is truly well indexed. There are nearly 800 separate entries, saving much digging time for readers needing particular items.

Rex Lovrien, *University of Minnesota*

The Proton in Organic Chemistry. By Ross Stewart (University of British Columbia). Academic Press: Orlando, FL, and New York. 1985. vii + 313 pp. \$65.00. ISBN 0-12-670370-1.

The author compares this work with the well known one by R. P. Bell, "The Proton in Chemistry", by saying that it differs by being concerned specifically with organic chemistry and "somewhat less rigorous". These are fair assessments. The result is an informative and useful book in which the material is presented with an attractive literateness.

The first of the seven chapters is an introduction, which sets out the terms and symbols to be used, and deals with the important subject of water as the solvent of reference, even though it is now possible to measure acid-base properties in a vacuum. The next two chapters are devoted to neutral organic acids and bases and contain many tables of carefully selected examples, accompanied by discussion of the reasons for the trends recorded (i.e., the relation of structure to the strength of acids and bases). The coverage is by no means limited to such common acids as phenols and carboxylic acids but extends, for example, to such interesting but often neglected types as phosphoric and phosphonic acids, and even to arsenic. Another chapter describes the acidity and basicity of unstable and metastable organic species, such as radicals, intermediates, and excited states. There is thus a larger amount of specific information than is to be found in Bell's 1973 book.

A chapter is devoted to transfer reactions of protons, hydrogen atoms, and hydride; it includes a section on the use of isotope effects in the investigation of mechanisms. This chapter is, of course, more up to date than the treatment of these subjects in Bell's book, but the treatment is

substantially shorter. In the last chapter, catalysis of organic reactions by acids and bases is discussed. This is a large and complex subject, which has a strong connection to enzyme catalysis, and a thorough treatment of the present state of knowledge might require an entire book. Professor Ross has elected to confine the discussion to three general areas: specific acid and specific base catalysis; general acid and general base catalysis; and reactions conducted under strongly acidic or strongly basic conditions. The principles are clearly laid out, and a goodly number of representative examples are described.

References are abundant and include many useful review articles as well as reports of original research. There is a reasonable subject index. Altogether, this is a satisfying book, suitable both for instruction of advanced students and for reference by practicing chemists, many of whom will find it attractive for personal purchase.

Tribochemistry. By Gerhard Heinicke. Carl Hanser Verlag: Munich and Vienna. 1985. 495 pp. DM 128.00. ISBN 3-446-13972-9.

Tribochemistry is that branch of chemistry that treats chemical and physicochemical changes brought about by mechanical energy, typically by friction or impact. A familiar example is striking a spark with a flint. It is a field with a venerable history, but it is less well known and appreciated than, say, electrochemistry or thermochemistry. Nevertheless, it is a subject of great importance, particularly as it is encountered in lubrication, corrosion, initiation of explosion, geochemical processes, etc.

This book is a thorough treatise on tribochemistry. It takes up the causes and effects, the mechanisms, and the applications. Figures, tables, and references are abundant. Some, at least, of the references are as recent as 1982 (there may be more recent ones as well).

The author writes not only to physical chemists but also to inorganic chemists, technologists, and engineers. Organic tribochemistry seems to be insufficiently developed, except in the polymer area, to warrant discussion at this time, although the potential is there for application in catalysis, for example. He closes the book with discussions of the role of tribochemical reactions in the origin of life on earth and their importance in the development of mineral deposits and fossil fuels.

Studies in Organic Chemistry. Volume 21. Carbocation Chemistry. By Pierre Vogel (Institut de Chimie Organique, Université de Lausanne). Elsevier Science Publishers, B. V.: Amsterdam and New York. 1985. xiv + 596 pp. \$129.75. ISBN 0-444-42522-5.

This monograph interweaves carbocation chemistry with discussions on an array of concepts that are relevant to physical organic chemistry. As a consequence, the book is very long. In some instances, the inclusion of the conceptual material seems fitting, when as in the discussion of carbocations and organometallic complexes in Chapter 9, the concepts of the theory of π complexes and of isolobal fragments are presented prior to a discussion of topics such as pyramidal carbocations, metalloalkyl cations, and the relationship between the chemistry of carbocations and transition-metal complexes. In contrast, about 40 pages of the first chapter are devoted to basic ideas of thermodynamics and kinetics such as the elementary concepts of equilibrium, statistical mechanics, heat of formation, thermochemical group increments, transition-state theory, and the relationship between reaction enthalpy and reaction rate. The presence of this material in a single-topic monograph seems inappropriate inasmuch as these concepts are discussed more thoroughly and more completely in many standard works.

The strength of this book lies in its presentation of the chemistry of carbocations. As outlined in the following paragraph, virtually every topic discussed in the recent literature is examined in this book. However, because the coverage is very broad it is not always insightful and there are few summaries or conclusionary passages in the work.

Chapters 1 presents an introduction to the subject. Important matters such as the stable cations in red wine, the chemistry of wine's aging, and wine's storage temperature are interspersed with introductory sections concerning elementary thermodynamics and kinetics. The second chapter is devoted to the nomenclature of carbocations and the thermochemical properties of the molecules and ions in the gas phase. Chapter 3 examines the behavior of carbocations in solution. Information concerning the available modes of formation, including photochemical and electrochemical techniques, is presented. The behavior of carbocations in very strongly acidic solutions is discussed. Techniques for the study of stable ions in solution by spectroscopic and kinetic methods are described in Chapter 4. Appropriately, the studies of carbocations by NMR spectroscopy receive considerable attention. A long discussion of the influence of structure on reactivity of the ions is presented in Chapter 5. The results of gas- and solution-phase experiments are examined from the viewpoint of classical electrostatic theories, perturbation molecular orbital methods, and concepts of aromaticity. Chapter 6 provides a short analysis of the solvation of cations and anions. The next chapter describes solvolytic displacement reactions and extends the discussion of the in-

fluence of structure on reactivity. The array of subjects treated in this long chapter ranges from salt effects and solvent ionizing power to problems in structure and reactivity with a detailed discussion of anchimeric assistance. Rearrangement reactions are broadly illustrated in the first passages of Chapter 8, but the principal focus is on the complex behavior of relatively simple aliphatic ions. The relationship between carbocations and organometallic compounds is examined in the ninth chapter, which begins with an introduction to π complex theory and utilizes the concepts of isolobal molecular fragments. The subject matter of the tenth chapter, which provides a survey of synthetic carbocation chemistry, ranges from rather simple electrophilic substitution reactions to rather sophisticated manipulations of organometallics compounds. Virtually all the examples are drawn from very recent literature.

This very long monograph will probably be widely read by chemists who need to survey the field of carbocation chemistry. It will serve this purpose very well because so many significant topics are examined. Regrettably, the treatments of the various subjects are somewhat uneven in quality. To illustrate, the material presented in the second chapter includes a necessary survey of nomenclature and a good summary of the experimental methods suitable for use in the gas phase. However, there are misstatements in the discussion such as the remark that the positive charge is in a vacant orbital (the positive charge is on the nucleus) and the awkward definition of the Frank-Condon effect. Many passages are too terse. For example, there is no discussion of the issue of whether cation-radical catalyzed Diels-Alder reactions proceed via stepwise or concerted pathways. Rather unconvincing valence bond models for hyperconjugation are used in Chapter 4. This chapter also contains a good discussion of the NMR isotopic perturbation methods, but the basic equations are not derived. The results for the carbocations are well treated, but the conclusions of others concerning anions and organometallic compounds are cited without comment. Chapter 5 includes a passage on elementary orbital theory. Although the orbitals of the methyl group are considered, the ideas are not exploited in a discussion of the differences in stability of aliphatic carbocations. The chapter on solvation is very short. This is surprising in view of the fact that so much interesting work has been done to contrast the behavior of ions in the gas phase and in solution phase. Chapter 7 deals with a broad variety of topics. The treatment is very much up to date, but the factors governing reactivity seem to be treated in isolation with little attempt to weave the factors into a broader comprehensive understanding of the overall issues. Furthermore, there are misstatements about the special salt effect and about the ways in which racemization can occur. Most sections lack summaries or conclusions.

These remarks are provided to warn potential readers that the book, although very comprehensive in its coverage of the topic, has some shortcomings in scholarship. Nevertheless, I recommend the book to persons who wish to survey the field of carbocation chemistry as it exists in 1986.

Leon M. Stock, *University of Chicago*

Topics in Molecular Interactions. Edited by W. J. Orville-Thomas (University of Salford), H. Ratajczak (University of Wrocław), and C. N. R. Rao (Indian Institute of Science). Elsevier Science Publishers: New York and Amsterdam; and Indian Academy of Sciences; Bangalore. 1985. xiii + 448 pp. \$109.25. ISBN 0-444-99556-0.

There is very little that falls under the (admittedly arbitrary) heading of chemistry that does not deal in at least some fashion with the interactions between molecules. High-resolution spectroscopy and *ab initio* quantum chemistry are two counterexamples that spring to mind, but even here, recent work with clusters holds an eventual promise for strong ties with many-molecule behavior. It is thus not surprising that a volume with a title such as "Topics in Molecular Interactions" should prove to be a compendium of nine separately useful, but largely unrelated, review articles.

Some of the articles focus on particular types of chemical systems. K. J. Rao and R. Parthasarathy, for example, give an overview of some of the data on dynamics in glasses which can be obtained by techniques ranging from ultrasonic and dielectric measurements to vibrational and nuclear magnetic resonance spectroscopy. While the article borrows heavily from an earlier text by Wong and Angell ("Glass: Structure by Spectroscopy"), the emphasis on dynamical rather than structural information gives the current article a different enough slant to be interesting. Analogously, C. N. R. Rao provides a brief glimpse at molecular motion in plastic crystals and S. Chandrasekhar and N. V. Madhusudana discuss dynamics in liquid crystals. The former is an especially physical look at the relevant experimental and molecular dynamics results. Unfortunately, at 19 pages, it is one of the shortest articles in the volume.

In addition to surveys of particular chemical systems, the book also has a number of contributions devoted to what NMR can tell us about the world at large. H. G. Hertz, A. Kratochwill, and H. Weingärtner

have an extensive presentation of the phenomenology of spin relaxation. Here, these authors' approach to molecular association and hydrogen bonding is spelled out in careful (even painstaking) detail. More specialized articles by C. Detellier and P. Laszlo and by G. A. Webb and M. Witanowski review NMR studies of ion-molecule interactions and experiments involving nitrogen NMR, respectively.

The final set of articles consists of three rather disparate reviews, organized around particular molecular phenomena. S. Kielich provides a rather formal summary of ideas on intermolecular light scattering. Perhaps not inappropriately in a book on interactions, his aim is clearly to focus on the role of each electrostatic multipole in its turn. As a result, there is little discussion of either the underlying statistical mechanics or the physical mechanisms. K. Umamoto and K. Ouchi, by way of contrast, provide an encyclopedic (120 pp) review of experimental progress in studying hindered internal rotation. Very little of the article is devoted to intermolecular interactions, but those who found the discussion in Orville-Thomas' earlier classic book on the subject ("Internal Rotation in Molecules") enlightening will find more recent data along the same lines. Finishing up the book is a brief article by R. Wolfenden on the affinity of organic compounds for water as a solvent.

As a unified look at intermolecular interactions this volume is (understandably) not very successful. Nor, for that matter, is the book a "study in physical and theoretical chemistry"—that being the title of the series in which the book is published. Rather, the text is largely an eclectic collection of physical-organic chemistry articles, some of which will be of interest to people in that community. The reader should be warned, however. Many of the articles are a little out of date. Besides the authors' own journal articles, one would be hard pressed to find ten references in the whole volume with dates beyond 1980. To the extent to which Truth is timeless the reader can, of course, ignore this warning.

Richard M. Stratt, *Brown University*

General and Synthetic Methods. Volume 7. Senior Reporter: G. Patenden (University of Nottingham). The Royal Society of Chemistry: London. 1985. 469 pp. \$115.00. (Available from ACS). ISBN 0-85186-884-3.

The *Specialist Periodical Reports* were created to "provide systematic and detailed review coverage of progress in the major areas of chemical research". Volume 7 of *General and Synthetic Methods*, which covers the literature of 1982, fills this role admirably. Coverage is full, rather than selective. A weakness of this approach is that an article may be cited two (or more) times, if it pertains to more than one topic. Conversely, the strength of this approach is that coverage of each topic (e.g., Synthesis of Aldehydes and Ketones, or Nitriles and Isocyanides) is quite detailed.

For readers who cover the literature well, it should be noted that about two-thirds of the references are from *JACS*, *JOC*, or *Tetrahedron Letters*. Other journals are, however, more than adequately represented. This review volume could thus serve as a useful retrieval device for those who do not have time to cover those journals. This is not, however, a volume for ready reference. To appear in 1982, the work cited must have been done in 1980 and 1981. The introduction is dated November 1983, but the volume was not printed until 1985 and was not received for review until early 1986.

A major contribution of this series is in providing a comprehensive yearly review, by topic, of developments, in organic synthesis. With these volumes in hand, it is very easy to learn the state of the art (at least up to 3 years ago) in, for instance, Organometallics in Synthesis, or Ring Expansion Methods. The value of this series will grow with each passing year.

Douglass F. Taber, *University of Delaware*

The Polysaccharides. Volume 3. Edited by Gerald O. Aspinall (York University). Academic Press: Orlando, FL. 1985. xiv + 470 pp. \$85.00. £85.00. ISBN 0-12-065603-5.

This six-chapter book is the last volume in a treatise on the polysaccharides that constitutes the most comprehensive summary of their chemistry and biochemistry currently available. Internationally recognized experts in their respective fields provide individual chapters affording authoritative coverage of the major aspects of the subject, but with deliberate exclusion of such cognate topics as glycoproteins, glycolipids, and nucleic acids.

N. K. Matheson and B. V. McCleary discuss enzymes metabolizing polysaccharides, and their application to analysis of the structure and function of glycans. Next, D. W. James, Jr., J. Preiss, and A. D. Elbein delineate the biosynthesis of polysaccharides of two types, structural and storage. Chapter 3, by A. Guilbot and C. Mercier, is devoted to starch: fractionation and characteristics of its macromolecular components, structure and reactivity of the starch granule, and industrial uses of starch. R. Geddes then describes the sources of glycogen and its structure

and metabolism, and L.-Å. Fransson treats the mammalian glycosaminoglycans and proteoglycans and their primary sequences and intermolecular associations. Finally, R. A. A. Muzzarelli provides a comprehensive account of chitin, including its physical characterization and fibril formation, its chemical characterization, the amino acids and metals contained as impurities, some of its chemical derivatives, applications in the medical and biochemical fields, and some other advanced applications. The book concludes with an addendum by the Editor that gives references to the IUPAC-IUB nomenclature for oligo- and polysaccharides and a brief treatment of the relatively new technique of fast-atom-bombardment mass spectrometry as applied to structural determination of such saccharides having molecular weights of up to ~4000.

The book is recommended for use by organic chemists, biochemists, biologists interested in microbiology and immunology, and specialists in food nutrition and agriculture. It should become a major reference book for libraries in industry, research institutes, and universities.

R. Stuart Tipson, *Kensington, MD*

Chemical Bonding and Spectroscopy in Mineral Chemistry. Edited by Frank J. Berry (University of Birmingham, UK) and David J. Vaughan (University of Aston in Birmingham, UK). Chapman and Hall, and Methuen, Inc.: New York. 1985. x + 325 pp. \$73.00. ISBN 0-412-25270-8.

This book seeks to provide an introduction to the concepts and techniques needed for modern mineral spectroscopy and bonding studies. The genesis of this volume was a symposium held in 1982 which brought together chemists, geologists, and mineralogists with a common interest in the application of spectroscopic techniques to the study of bonding in minerals. Eight contributors have written chapters devoted sequentially to aspects of mineralogy involving quantum mechanical models; X-ray spectroscopy; electronic absorption spectroscopy; luminescence; Mössbauer spectroscopy; ESR and NMR spectroscopy; analysis of opaque minerals; and surface studies of minerals.

Each chapter presents relevant introductory material (including experimental descriptions, where appropriate), case studies involving various minerals, a concluding section, and leading, but not exhaustive, literature references. Some effort has been made to cross-reference material in different chapters. Although an index is provided, minerals are not always listed by both common name and formula.

In terms of chemical interest, this text surveys many chemical aspects of mineralogy. Pedagogically, the book could serve as a supplementary text for an inorganic or solid-state chemistry course at the advanced undergraduate or graduate level. Mineralogy, an interdisciplinary field, is profiting greatly from recent advances in such areas as solid-state chemistry and physics, geology, and materials sciences. The breadth of the field is illustrated by some of the topics discussed in this text which include the origin of gem colors, phase equilibria in the Earth's mantle, structural features of zeolites, and the firing of pottery. The only potential drawback of this text for chemists is that some of the mineralogical terminology may be unfamiliar. Readers without a background in mineralogy will occasionally need to have access to a standard reference on the subject.

Arthur B. Ellis, *University of Wisconsin—Madison*

Advances in Polymer Science. Volume 73/74: Chromatography/Foams/Copolymers. Springer-Verlag, New York, Inc.: New York. 1986. iv + 263 pp. \$53.00. ISBN 3-540-15786-7.

The latest volume in the "Advances in Polymer Science" series is certainly up to the high standards set by the preceding volumes. This series, initiated in 1958, has reviewed most of the major topics important to polymer science in the intervening 28 years. It is interesting to note that 9 volumes were issued in the first 14 years and the subsequent 65 volumes were issued in the last 14 years, a fact that reflects the phenomenal growth of polymer science world-wide. The present volume is dedicated to Prof. G. V. Schulz of the Institut für Physikalische Chemie der Universität Mainz and consists of five reviews.

The first review, Phase Distribution Chromatography. Possibilities and Limitations (62 pages), by G. S. Greschner, encompasses the theory behind phase distribution chromatography (PDC), a comparison of PDC to gel permeation chromatography as well as Baker-Williams fractionation, and a discussion of the technique's limitations. PDC finds its most important application in the determination of molecular weight distributions which are known to be very narrow at the outset from, say, anionic polymerizations. An application of PDC to a polystyrene/cyclohexane system is detailed. Thirty references are provided, half of which are post-1970.

The second review, Syntactic Polymer Foams, by F. A. Shutov (60 pages), presents the area of foamed plastics. These systems are produced by dispersing hollow microspheres within a polymer binder. They are

important to the construction of boats, submarines, shuttles used in deep-sea mineral mining, underwater pipe casing and in the aerospace industry given their low density and high strength. This review describes the chemistry of foam formation from a variety of microspheres and binders as well as the physical properties displayed by the foams primarily in terms of strength, resistance to hydrostatic pressure, and thermal resistance. Of the 194 references provided, 25% are to the Russian literature. This review extends the author's previous work published in Volume 51 (1983) of this series.

The next review is by A. Sen on the Copolymerization of Carbon Monoxide with Olefins (18 pages). The synthesis of carbon monoxide-olefin polyketone copolymers and their subsequent chemical modification to polyalcohols, polyoximes, and polyamines form the focus of this review with short discussions of copolymer characterization and degradation also included. Approximately half of the 76 references given are post-1970.

The fourth review, Graft and Block Copolymers via Polymeric Azo Initiators, by O. Nuyken and R. Weidner (51 pages), describes the synthesis of block or graft copolymers via the preparation of precursor polymers containing azo functional groups either as part of the backbone or as part of the pendent groups along the main chain followed by thermolysis of the azo functionality in the presence of a suitable monomer. Ninety references are given, most of which are quite current.

The last review is by Y. Doi and T. Keii on the Synthesis of Living Polyolefins with Soluble Ziegler-Natta Catalysts and Application to Block Copolymerization (47 pages). The kinetics and mechanism of olefin polymerization with soluble titanium- and vanadium-based Ziegler-Natta catalysts are described as is the synthesis of block copolymers via living coordination polymers. The soluble catalysts are seen to represent a significant improvement over the heterogeneous Ziegler-Natta catalysts in the production of well-defined block copolymers free of homopolymer impurities. The 133 references given are mostly post-1970.

The reviews are all very well written and represent excellent overviews of their respective subjects. A cumulative author index (covering the entire series) and a subject index for the current volume are also provided. The volume and the series are both highly recommended to experienced researchers and graduate students alike.

Spiro D. Alexandratos, *University of Tennessee (Knoxville)*

Methods and Applications in Crystallographic Computing. Edited by S. R. Hall (University of Western Australia) and T. Ashida (Nagoya University). Clarendon Press, Oxford University Press: New York and Oxford. 1984. ix + 506 pp. \$32.50. ISBN 0-19-855190-8.

Photographically reproduced kernels with some figures, of papers presented at the International School on Crystallographic Computing, Kyoto, Japan, August 18-27, 1983, make up this text. It contains an unusual range of subjects: (X-ray) data measurement and processing, solution techniques, refinement techniques, accurate electron density analysis, computer software and hardware, computer database techniques, computer graphics, powder methods, and electron diffraction and microscopy.

Papers in data measurement, solution and refinement techniques, accurate electron densities, and powder methods critically and intricately present the current states of these fields, with recent and older significant references. Many examples are macromolecular. Papers on computers are specialized but convey useful concepts. Three papers illustrate gas-phase electron diffraction and atomic or near atomic resolution electron microscopy of periodic and aperiodic solids.

Charles J. Fritchie, Jr., *Tulane University*

Organic Micropollutants in Drinking Water and Health. Proceedings of an International Symposium, Amsterdam, The Netherlands, June 11-14, 1985. Edited by H. A. M. deKruif and H. J. Kool. Elsevier Science Publishers: Amsterdam and New York. 1985. xx + 507 pp. \$133.25. ISBN 0-444-42583-7.

Water for drinking purposes has been purified since the end of the 19th century. The original reason for this purification was disinfection to overcome pathologic microorganisms causing diseases spread by water. Although this is still the major reason, over the last decade some worry has developed about the organic micropollutants (trace organics) in drinking water. This concern has been spearheaded by the common use of chlorination to disinfect water. Such chlorination generates chloroform and related chlorinated organics (by reacting with biological residues in water) as man-made organic micropollutants. These organics can be mutagenic and carcinogenic in some biological tests at higher doses, but this does not tell whether we are worse off by drinking tiny amounts daily in our water. Drinking water also is not a major source of chemicals to which humans are exposed.

Still, the health and economic consequences of making mistakes in the way we purify our drinking water could be enormous. Thus there is good justification for the ongoing work and concern about the potential car-

cinogenicity and mutagenicity of our water, including ways to reduce this potential burden.

This edited book presents the proceedings of an international symposium on the subject conducted in June of 1985 in Amsterdam. All aspects of the subject are covered, including the variety of techniques in use or potentially available for purifying water. Chlorination, sedimentation, filtration, activated carbon, ozone, and microbiologic treatment are examples of such techniques. Current knowledge about the identity of organic micropollutants (most are unknowns at present) and the mechanism of their formation are covered. Results from animal dosing and mutagenic activity assays related to drinking water are presented.

The major strength of the book is its global coverage of the issue. Many countries were represented at the symposium and their current techniques for purifying drinking water are presented along with their ongoing work and concerns about the potential problem of organic micropollutants. The book is also to be congratulated for its rapid publication and comprehensive coverage of the subject. Unfortunately, a few of the "countries" should have put some fresh ribbons in their typewriters before preparing their final draft: the level of organic pollutants in the print is rather low for some of the chapters.

Roger W. Giese, *Northeastern University*

Medicinal Chemistry. The Role of Organic Chemistry in Drug Research. Edited by S. M. Roberts and B. J. Price (Glaxo Group Research Ltd.). Academic Press: London and Orlando, FL. 1985. xix + 296 pp. \$65.00. ISBN 0-12-589730-8.

Properly told, accounts of drug research can provide some of the truly fascinating stories of modern chemistry. By concentrating on a limited number of drugs or drug classes, the editors of this book have provided space for sufficient depth to allow some of that story to be told. This approach is well suited to their intended audience, those having a basic knowledge of organic chemistry but unfamiliar with the drug industry, and purpose, which is to introduce readers to the process of drug discovery and to stimulate their interest to further study.

The first three chapters, by S. M. Roberts, B. Walker, and M. G. Davis, serve as a useful introduction to enzymes, receptors, and the action of drugs on a molecular level. Much of this material will be familiar to those who have had an introductory biochemistry course, but its inclusion is appropriate to the book's intended audience.

The remaining chapters detail drug discovery and development: the bronchodilator salbutamol, by L. H. C. Lunts; β blockers, by B. G. Main and H. Tucker; the antiulcer drug cimetidine, by C. R. Ganellin; the analgesic buprenorphine, by J. W. Lewis; the muscle relaxant atracurium, by J. B. Stenlake; topical steroidal antiinflammatories, by J. Elks and G. H. Phillips; steroid contraceptives, by S. J. Zeelen; injectible cephalosporin antibiotics, by C. E. Newall; clavulanic acid and related compounds, by A. G. Brown; the antifungal ketoconazole, by J. Heeres; and the schistosomocidal oxamiquine, by H. C. Richards.

Each of the chapters on drug discovery discusses, generally in quite readable fashion, the nature of the targeted diseases, the means of arrival at the initial active compound, and the program of structural modification leading to drugs of increasing activity and specificity. The book makes good use of illustrations to demonstrate many of the biochemical concepts, and pharmacological data are well tabulated or graphed. Although structural formulae are presented for all of the compounds mentioned, the amount of information on chemical synthesis ranges from generous to merely adequate. The chapter on ketoconazole contains essentially none. In most cases synthetic routes are presented in schematic form; some, but not all, show reagents for individual steps. The entire scheme is usually identified by a reference when mentioned in the text, but in some cases no reference can be found. The result is that experimental procedures on individual steps are unlikely to be found in the literature without some trial and error. This makes the book less useful for organic chemists than it could have been with more detailed references. A glossary, comprised of just 51 entries and located sensibly at the beginning of the book, is adequate to bring relief to those unacquainted with at least some of medicinal chemistry's jawbreakers. A list of references, none more recent than 1984, closes each chapter. An index is provided at the end of the book.

Although each of the contributors was directly involved in at least a portion of the events discussed, the tone of the book tends to be scholarly and rather formal. Some chapters convey more than others a sense of excitement and challenge of being involved in drug discovery. For example, C. R. Ganellin's personal insights enliven his account of the evolution of the SK+F histamine antagonist project from the initial theoretically based *in vitro* tests, through synthesis of hundreds of inactive compounds, into the doldrums of corporate disfavor, and ultimately on up through various leads to the billion-dollar-per-year cimetidine. Other writers provide perspective by relating anecdotes and adding remarks to the technical information; the book would have benefitted from more of

this style of writing.

In summary, this book provides thorough and readable accounts of drug discovery by persons directly involved and should find use among students of medicinal chemistry and organic chemists wanting to learn more about how drugs are developed. The printing and binding of this book are of very high quality, a welcome respite from the computer-generated texts proliferating in recent years. The proofreader's marks remaining in Figure 4 of Chapter 2 are the only intruders in an otherwise immaculate little volume.

Marvin S. Hoekstra, *Warner-Lambert/Parke-Davis*

Analytical Solution Calorimetry. Edited by J. K. Grime (The Proctor and Gamble Company). John Wiley and Sons: New York. 1985. XVI + 401 pp. \$60.00. ISBN 0471-86942-2.

This book is a practical update and expansion of previous books and reviews on the subject. It is divided into seven chapters with a total of seven contributing authors. The first chapter is a short introduction to the field, including some elementary thermodynamics. The substantive material begins in chapter two with a thorough discussion of the theoretical and analytical aspects of solution calorimetry, followed by a chapter on instrumentation and data reduction covering the major types of solution calorimetry. The rest of the book includes both general analytical applications and in-depth coverage of flow enthalpimetry, determining ΔH and K values and biochemical applications.

For the most part each chapter is self-contained with only occasional references to previous chapters. This approach, along with a very helpful list of symbols, enables the reader to pick and choose which chapters to read. However, it is a consequence of this approach that some concepts developed with similar equations and graphs are repeated in different chapters. There are extensive citations to the literature, with Chapter 6 alone listing 236 references. Overall, the field is covered comprehensively except that differential measurements are barely mentioned and computer applications are omitted. The book would be very beneficial to someone interested in starting to use calorimetric techniques. Many of the pitfalls that novices learn about the hard way are pointed out. It would also be appropriate as a text for a special topics course.

Gary D. Howard, *University of North Carolina at Charlotte*

Electron Spin Resonance: Elementary Theory and Practical Applications. By John E. Wertz (University of Minnesota) and James R. Bolton (University of Western Ontario)* Chapman and Hall and Methuen Inc.: New York. 1986. xiv + 497 pp. \$49.50 cloth; \$26.50 paper. ISBN 0-412-01181-6.

This is a much needed reprint of the out-of-print 1972 edition published by McGraw-Hill. This book has become arguably the best introductory book on electron-spin resonance (ESR) and is also well designed for classroom use. Electron-spin resonance has become a well-developed spectroscopic technique with widespread application to many areas of chemistry, physics, and biology. The technique is typically briefly covered in physical chemistry texts, advanced inorganic and organic texts, and in some texts on molecular spectroscopy. However, many of the full introductory texts devoted to ESR have gone out of print, so this reprint is particularly welcome.

This book covers the basic principles and instrumentation of ESR, the analysis of liquid- and solid-phase organic radical and transition-metal ion spectra, introductory material on magnetic relaxation phenomena, triplet-state spectra, and a few other topics. It gives an introduction to electron-nuclear double resonance (ENDOR) techniques but does not cover other types of double resonance or time-dependent techniques, such as electron-spin-echo spectroscopy, which have been most intensively developed in the last ten years.

The overall presentation is excellent and quite readable. The inclusion of substantial numbers of problems is particularly valuable when used as a text. This book is highly recommended for libraries that do not already have the original edition, for graduate courses on magnetic resonance and molecular spectroscopy, and for all scientists that use ESR or refer to ESR results in their research.

Larry Kevan, *University of Houston*

Advances in Organometallic Chemistry. Volume 24. Edited by F. G. A. Stone (University of Bristol) and R. West (University of Wisconsin). Academic Press, Inc.: Orlando, FL. 1985. IX + 470 pp. \$79.50. ISBN 0-12-031124-0.

This book continues the outstanding tradition of the series by incorporating topics of interest to a wide variety of organometallic chemists. Chapter one discusses The Remarkable Features of (η^4 -Conjugated diene)zirconocene and -hafnocene Complexes (G. Erker, C. Kruger, and G. Muller) (100 references), where the primary emphasis is concerned with the synthesis, properties, and structures of complexes of both *cis* and *trans* dienes with these metals. The second chapter, Organometallic

Metal Clusters Containing Nitrosyl and Nitrido Ligands (W. L. Gladfelter) (131 references), describes studies of the preparation, structures, spectroscopy, and reactivity of clusters with coordinated nitrosyl and nitrido ligands. Chapter three, The Electron-Transfer Reactions of Polynuclear Organotransition Metal Complexes (W. E. Geiger and N. G. Connelly) (231 references), primarily stresses electrochemical studies on multimetallic sandwiches, ligand-bridged bimetallics, and clusters. The next chapter, Organometallic Lanthanide Chemistry (W. J. Evans) (121 references), discusses the synthesis and reactivity of both lanthanide-carbon and lanthanide-hydrogen bonds as well as low-oxidation-state chemistry. Chapter five describes Silyl, Germyl, and Stannyl Derivatives of Azenes, $NnHn$: Part II (N. Wiberg) (63 references), with primary emphasis on the preparation, properties, and thermolyses of Group IV derivatives of triazene and tetrazene. Chapter six is concerned with the Photochemistry of Alkyl, Alkylidene, and Alkylidyne Complexes of the Transition Metals (D. B. Pourreau and G. L. Geoffroy) (197 references), with emphasis placed on the alkyl derivatives with appropriate generalizations throughout the manuscript. The final chapter describes X-Ray Structural Analyses of Organolithium Compounds (W. N. Setzer and P. von R. Schleyer) (214 references plus selected bibliography); most of the material is concerned with simple organoalkalies with smaller sections on mixed-metal systems and compounds without carbon-lithium bonds.

Though the high price of this volume is most likely to cause its placement to be limited to libraries, the book is strongly recommended.

Edwin M. Kaiser, *University of Missouri—Columbia*

The Theory of Thermodynamics. By J. R. Waldram (Cambridge University). Cambridge University Press: Cambridge and New York. 1985. xv + 336 pp. \$59.50 hardcover. ISBN 0-521-24575-3. \$24.95 paperback. ISBN 0-521-28796-0.

I was surprised to open this book and discover that it was an undergraduate text devoted to statistical physics, rather than thermodynamics. The avowed purpose of the author, who is a Lecturer in Physics at Cambridge, is to give a "clear and compact presentation" of the theory of thermodynamics which would be useful beyond the student's first exposure to the subject. Although designed to fit into the English undergraduate curriculum, this book might well be useful in the U.S. as a junior-level text in statistical physics.

The major emphasis of the book is on theoretical concepts. The basic ideas of statistical thermodynamics are introduced with simple examples (harmonic oscillator, particle in a box), and the author has gone to some trouble to illustrate the meaning of the theory with words and illustrations. The first 14 chapters constitute a reasonable introductory treatment of the subject.

Chapters 15–18 cover more advanced topics, including an introduction to fluctuations, transport processes, and phase transitions. These subjects are discussed without the use of much mathematics, and it is not clear that these chapters would be of real use to undergraduates. The book closes with a wordy chapter on basic principles in which the origin of irreversibility and other fundamental problems are described.

The author has provided a small number of problems at the end of each chapter and answers at the end of the book. There one also finds a nice set of general references and a list of suggestions for further reading. The margins of the text are filled with key words and references to sections of the book where additional treatments of a topic are located. I found that and the book cover a bit too modern for my tastes.

I am not sure where this book would fit in the physical chemistry curriculum in this country. The first fifteen chapters might be adequate for a one-term course in statistical thermodynamics for advanced undergraduates, although at least half of the material would be a review of the statistical thermodynamics taught in the usual required physical chemistry course. Perhaps this book is best left to the physicists.

Joel Keizer, *University of California, Davis*

Mass Spectrometry. Volume 8. Specialist Periodic Reports. Senior Reporter: M. E. Rose (Sheffield City Polytechnic). Royal Society of Chemistry: London. 1986. xvi + 360 pp. \$126.00. ISBN 0-85186-328-0. Obtainable from the American Chemical Society.

This volume provides a general survey of progress in most areas of mass spectrometry for the period June 1982 through June 1984. It consists of eleven chapters, each written by a well-qualified authority or authorities on the topic covered. Some chapters review general areas; others cover timely topics of current interest. The literature surveyed is vast, indicating the continuing vitality of the overall field. The first chapter by Powis on ionization processes and ion dynamics covers fundamental aspects of ion production, developments in the emerging field of the spectroscopic study of ions, intramolecular energy relaxation and relationships between theoretical descriptions of transition states, and experimental observations. The second chapter by Baldwin on structures

and reactions of organic ions emphasizes techniques for generating and characterizing ions, with methods of structure elucidation based on tandem mass spectrometry. Generation of ions with novel structures is well surveyed, but actual reactions of ions is rather neglected. The third chapter by Dannacher and Stadelman on photoelectron-photoion coincidence mass spectrometry is an excellent general survey of the field including a tabulation of molecules studied, information provided by the technique, and a discussion of experimental issues. Chapter 4 on instrumentation by Kemp summarizes recent developments in sample introduction techniques, soft ionization processes for dealing with large and polar molecules, nonimpact methods of generating ions, recent progress in extending the mass range of available instruments, and developments of multiselector instruments. The next chapter by Chapman discusses computer control of instruments, data acquisition, and computer-based interpretation of spectra. The sixth chapter by Nibbering describes recent progress in the rapidly developing field of Fourier transform ion cyclotron resonance spectroscopy. Capabilities, methods of sample introduction, and studies of ion-molecule reactions are reviewed. Bowie's chapter describes analytical applications and methods of production of and ion molecule reactions of negative ions, including studies of solvated species that help bridge the gap between gas-phase and solution chemistry. In the eighth chapter Caprioli emphasizes methods of achieving reliable quantitation by fast atom bombardment and interesting applications of the technique to following the course of chemical reactions, including enzymatic reactions, in solution. This chapter does not generally review recent applications of the technique. The ninth chapter by Rose covers technical advances and a wide variety of biological, clinical, environmental, and geochemical applications of gas chromatography-mass spectrometry and high-performance liquid chromatography-mass spectrometry. A special section on the applications of the latter to inorganic and organometallic compounds is included. Chapter 10 by Harvey describes recent uses of stable isotopes for in vivo studies of drug metabolism and studies of a wide variety of pharmaceuticals and drugs of abuse. The last chapter by Chalambois catalogs studies of organometallic compounds, which have been aided by progress in obtaining spectra of low volatility and labile metal-containing compounds, and applications of newer methods of ion structure determination. He also provides a brief survey of reactions of metal and metal-containing ions with organic compounds. This volume will be quite valuable to anyone wishing to keep abreast of the overall field of mass spectrometry, although the unavoidable time lag between preparation and publication prevents the coverage from being completely up to date.

David J. McAdoo, *University of Texas*

Introduction To Characterization and Testing of Catalysts. By J. R. Anderson and K. C. Pratt (University of Melbourne). Academic Press, Inc.: Orlando, FL. 1985. ix + 457 pp. \$82.00. ISBN 0-12-058320-8.

This book fulfills the need for a general, comprehensive treatment of the practice and development of characterization and testing of solid catalysts. It contains seven chapters. The first three deal with the morphology and geometrical structures of solid catalysts, incorporating the classical measurements of surface area, particle size, and pore structure. Chapter four is concerned with density and mechanical and thermal properties of catalysts. Chapter five is about chemical characterizations, and the determination of bulk properties such as surface acidity and basicity, group functionality, etc., is discussed. Chapter six reviews techniques for testing the activities of catalysts. Considerable attention is given to the rates, limitations, and types of laboratory reactors. The last chapter describes modern physical instrumental methods which are useful for further detailed catalyst characterization.

The layout of each chapter is consistent throughout the book. It always starts with a concise discussion of definitions, theories, and apparatus of the experimental methods. This is followed by specific comments such as the advantages and disadvantages as well as limitations of these methods. In many topics, examples concerning sample preparations and data treatment are provided in detail. Most useful are the many tips given here and there for better outcome of results, apparently from the authors' personal research experience. The references cited are certainly better than adequate.

As many probably agree, modern surface-catalyst research is now pushed into the molecular level. For example, the understanding of catalyst selectivity is definitely dependent upon further innovative work. The book with its limits on page and scope does not address such problems. However, it does equip one with fundamental knowledge for future endeavor. The book should be a good text for a general course on catalyst characterization and testing for material scientists. It would also be a valuable collection for chemists, physicists, and engineers who are interested in any characterization of solids.

C. Allen Chang, *University of Texas at El Paso*

Books on Applied Chemistry

Instrumentation and Control for the Process Industries. By John Borer Elsevier Science Publishers: New York. 1985. xiii + 301 pp. \$58.50. ISBN 0-85334-342-X.

The author's intent is to consolidate "in one volume the essential basic knowledge of the subject required by control engineers for their work". The twelve chapters are the following: Principles of industrial measurement; Measurement of process pressure; Fluid level measurement; Measurement of fluid flow rate; Measurement of quantity; Measurement of temperature; Transmission of measured data; Principles of control; Control mechanisms; Final control elements; Process control and system design; The modern process control system.

Engineering Thermoplastics: Properties and Applications. Edited by James M. Margolis. Marcel Dekker: New York and Basel. 1985. x + 393 pp. \$65.00. ISBN 0-8247-7294-6.

Fifteen contributed chapters, each devoted to a particular type of polymer (e.g., polycarbonate, polyimides, etc.), make up this volume, which includes a 2-page list of companies and products.

Extruder Principles and Operation. By M. J. Stevens. Elsevier Science Publishers: New York. 1985. xii + 339 pp. \$60.00. ISBN 0-85334-336-5.

This book is concerned with the processing of melted thermoplastics and rubbers, using the single-screw extruder.

Photovoltaic Materials and Devices. Edited by B. K. Das and S. N. Singh. Halstead Press (John Wiley & Sons): New York. 1985. xii + 448 pp. \$39.95. ISBN 0-470-20224-6.

This book contains the large number of papers given at a symposium held in New Delhi in 1984 and is dedicated to the memory of the late Dr. G. C. Jain. The five rubrics are the following: Photovoltaic systems and applications; Silicon and silicon solar cells; Amorphous silicon solar cells; Mis and thin film heterojunction solar cells; Photoelectrochemical solar cells.

The Assessment and Control of Major Hazards. A Symposium organized by the Institution of Chemical Engineers. Institution of Chemical Engineers (distributed by Pergamon Press: Elmsford, New York). 1985. v + 454 pp. \$36.00. ISBN 0-08-031444-9.

This volume contains the many papers given at a symposium held in Manchester in 1985, successor to the initial one of 1982. The scope has been extended; the previous symposium dealt only with assessment.

Plastics for Electronics. By M. T. Goosey (Dynachem Corp.). Elsevier Applied Science Publishing Co.: New York and London. 1985. ix + 380 pp. \$67.50. ISBN 0-85333-338-1.

This volume of 10 contributed chapters is "aimed at the engineer or research scientist working in the multidisciplinary field where electronics and polymer technology overlap"; knowledge of polymer chemistry in depth is not assumed.

Encyclopedia of Emulsion Technology. Volume 2: Applications. Edited by Paul Becher. Marcel Dekker: New York and Basel. 1985. xi + 521 pp. \$95.00. ISBN 0-8247-1877-1.

Volume 1 of this work, which appeared in 1983, was concerned with basic theory. Volume 2 is devoted to applications. It is not an encyclopedia in the ordinary sense, but it is a book with eight chapters, in five of which pharmaceutical, agricultural, cosmetic, and food applications are treated. Other chapters are Demulsification, Research Techniques, and an Updated Bibliography on Hydrophile-Lipophile Balance.

Industrial Environmental Control: Pulp and Paper Industry. By Allan M. Springer (Miami University of Ohio). John Wiley & Sons: New York. 1986. xviii + 430 pp. \$75.00. ISBN 0471-80756-7.

A comprehensive work that deals with both air and water pollution and abatement methods in the plant and out of it. It is designed as a reference tool for the practicing engineer.

Advances in Solid State Technology. Volume 1: Silicon-on-Insulator: Its Technology and Applications. Volume 2: Layered Structures and Interface Kinetics: Their Technology and Applications. Edited by S. Furukawa. KTK Scientific Publishers: Tokyo. D. Reidel: Dordrecht and Boston. 1985. Volume 1: vii + 295 pp. \$59.00. ISBN 90-277-1940-3. Volume 2: viii + 369 pp. \$74.00. ISBN 90-277-1939-X.

These two volumes contain papers presented at the U.S.-Japan seminar held in Oiso, Japan, in 1983. Among the topics discussed in the more than 50 chapters are solid-phase epitaxy, interface kinetics, structures of silicon on insulators and silicide on silicon, and novel nanometer and layered devices.

Melting and Dissolution: Phenomena, Estimation of Melt Times, Applications. By Hans Adolf Friedrichs (Rheinisch-Westfälische Technische Hochschule). Verlag Stahl Eisen: Düsseldorf (distributed by Heyden & Son: Philadelphia). 1984. ii + 179 pp. \$25.00. ISBN 3-514-00319-X.

This is a translation of a 1984 original in German. The text is in double-spaced typescript and has many line-diagrams. The emphasis is on the iron-carbon system, but the fundamentals are general. An extensive set of appendixes includes computer programming.

IP Standards for Petroleum and Its Products. Part 1: Methods for Analysis and Testing. Volume 1: Methods IP 1-261. Volume 2: Methods IP 262-372. Institute of Petroleum. John Wiley & Sons: Chichester and New York. 1985. ca. 2000 pp. \$125.00 (set). ISBN 0471-90725-1.

These two volumes contain over 250 methods for analysis and testing of petroleum products by chemical or physical methods. The methods are described in full experimental detail.

Powtech '85: Particle Technology. Published for the Institution of Chemical Engineers by Pergamon Press: Oxford, UK, and Elmsford, NY. 1985. 294 pp. \$24.00. ISBN 0-08-031443-0.

Contains 23 typescript papers from a symposium held in Birmingham, UK, in 1985, dealing with particle formation, liquid/solid interaction, and handling bulk solids.

Spray Drying Handbook. 4th Edition. By K. Masters. John Wiley & Sons: New York. 1985. xiv + 696 pp. \$79.95. ISBN 0-470-20151-7.

This edition is revised and expanded from the 1979 edition so as to include modern developments, especially those leading to lower energy consumption and improved protection of the environment.

Microelectronics Processing: Inorganic Materials Characterization. Edited by Lawrence A. Casper. American Chemical Society: Washington, DC. 1986. x + 443 pp. \$79.95. ISBN 0-8412-0934-0.

Contains 25 typescript chapters based on papers given at a symposium sponsored by the Division of Industrial and Engineering Chemistry of the ACS.

Mineral Impurities in Coal Combustion: Behavior, Problems, and Remedial Measures. By Erich Raask. Hemisphere Publishing Corp.: Washington, DC, and New York. 1985. xxi + 484 pp. \$69.50. ISBN 0-89116-362-X.

This book was written "to present information on many and varied boiler operation problems associated with coal impurities...". Chapter 3 is devoted to mineral impurities in coal.

Disposal of Chemical Munitions and Agents. A report Prepared by the Committee on Demilitarizing Chemical Munitions and Agents, Board on Army Science and Technology, Commission on Engineering and Technical Systems, National Research Council. National Academy Press: Washington, DC. 1984. xvi + 216 pp. \$16.50. ISBN 0-309-03527-9.

This is a report by the Committee on Demilitarizing Chemical Munitions and Agents, and it deals with the many problems (legal, chemical, environmental, safety, etc.) attending disposal of unwanted chemical munitions of various types. One of the methods considered was to place them in a deep hole and nuke them; it was judged that public acceptance would be improbable.

Hazard Assessment of Chemicals: Current Assessments. Volume 4. Edited by Jitendra Saxena. Academic Press: Orlando, FL. 1985. xvii + 334 pp. \$69.50. ISBN 0-12-312404-2.

Contains eight chapters, on such subjects as in situ monitoring of mutagens, protection of aquatic life, clean-up of soil contaminated with zinc, etc. There is a chemical substance index as well as a subject index.

Research Techniques in Nondestructive Testing. Volume VIII. Edited by R. S. Sharpe. Academic Press: Orlando, FL. 1985. x + 479 pp. \$99.00. ISBN 0-12-639058-4.

Contains nine contributed chapters, including ones on ultrasonic methods, acoustic emission techniques, and eddy current testing.