Additions and Corrections

Effects of Ion-Pair Structure on Relative Basicity in Chloroform: Acid–Base Equilibria Controlled by Steric Repulsion, π-Stacking Interactions, and Hydrogen Bonding within an Ion Pair [*J. Am. Chem. Soc.* **1993**, *115*, 5324–5325]. KEI MANABE, KIMIO OKAMURA, TADAMASA DATE, AND KENJI KOGA*

The ratio of the binding constants of compounds **1**–**4** with picric acid should be 3:66:88:1. The discussion in the text was based on this ratio and therefore there is no change in the conclusion of the paper.

Analysis of the Monoalkylation and Cross-Linking Sequence Specificity of Bizelesin, a Bifunctional Alkylation Agent Related to (+)-CC-1065 [*J. Am. Chem. Soc.* **1993**, *115*, 5925–5933]. DAEKYU SUN AND LAURENCE H. HURLEY*

Page 5931, column two, line four from the bottom: Reference 30 should appear after the word "previously".

Page 5931, ref 27: The reference number should be 28, not 25.

Book Reviews [*]

Isotopes in Organic Chemistry. Volume 8. Heavy Atom Isotope Effects. Edited by E. Buncel (Queen's University, Ontario) and W. H. Saunders, Jr. (University of Rochester). Elsevier: Amsterdam, London, New York, and Tokyo. 1992. xii + 335 pp. $225.50. ISBN 0-444-88926-4.

No series on isotope effects in chemistry would be complete without a volume devoted to heavy atom effects. Volume 8 contains six chapters: (1) Heavy atom isotope effects in molecular rearrangements, by Henry J. Shine (Texas Tech University; 40 pp, 82 refs); (2) How to measure heavy atom isotope effects: general principles, by Piotr Paneth (Technical University, Lodz, Poland; 27 pp, 81 refs); (3) Heavy atom isotope effects in enzyme-catalyzed reactions, by Paul F. Cook (Texas College of Osteopathic Medicine; 63 pp, 98 refs); (4) Information derived from variation in the natural abundance of ^{15}N in complex biological systems, by G. Shearer and D. H. Kohl (Washington University; 55 pp, 130 refs); (5) Heavy atom isotope ratios in bone as guides to prehistoric diets, by Margaret J. Schoeninger (University of Wisconsin; 57 pp 180 refs); and (6) Heavy atom isotope rate effects in solvolytic nucleophilic reactions at saturated carbon, by Vernon J. Shiner, Jr. and F. P. Wilgis (Indiana University; 97 pp, 183 refs). Each chapter succeeds in providing a complete stand-alone review of the subject as well as incorporating a significant amount of recent (late 1980s to 1992) material not previously reviewed elsewhere. All were readable, well-organized, and interesting. While the topics of Chapter 4 and particularly that of 5 are less clearly focused on *organic* chemistry (the title of the series), they each added a genuine measure of interest and point the way to new and less conventional applications of isotope chemistry.

Chapter 1 is a well-written, comprehensive treatment of the use of heavy atom isotope effects to elucidate the mechanisms of intramolecular rearrangements. The review does a valuable service in bringing the reader up-to-date since the earlier 1964 and 1970 reviews by Arthur Fry. There are a great many useful tables of data and specific examples, well-illustrated with structures, including those from the author's own work on benzidine and photo Fries rearrangements.

Chapter 2 is a relatively brief, but clear and practical, outline of information about when and how to use heavy atom kinetic isotope effect (HAKIE) techniques. It contains a fair number of recent references drawing on the author's own work as well as that in collaboration with Marion O'Leary. Particularly useful is the first section "Should Heavy Atom Kinetic Isotope Effects be Measured?" cautioning that only if theoretical calculations show that different mechanisms will give different KIEs will any useful information be available from experiment. Other sections deal with selection of radioactive, stable, natural-abundance, or enriched isotopes, competitive vs direct measurements, and correlation of experimental results with mechanism.

Chapter 3 is a comprehensive treatment with many applications of how HAKIEs and especially the powerful and useful technique of multiple isotope effects can be applied to the understanding of enzyme-catalyzed reactions. A useful summary appears on p 127. At least 27 enzyme systems, the majority studied by W. W. Cleland and collaborators, are treated. All of the work discussed has been carried out in the last decade, making the review quite useful although some of the material appears as well in Cleland's 1991 chapter in Enzyme Mechanism from Isotope Effects (P. Cook, Ed.; CRC Press). A detraction from the chapter under review is a frequent lack of referencing both of the material discussed and of the many data tables.

Chapter 4 focuses on how variation in the natural abundance of ^{15}N can be used to study the nitrogen cycle in complex ecological and physiological systems. The chapter provides a complete literature review with major sections devoted to net NO_3^- uptake under steady state conditions by one-celled organisms and to denitrification. The sections called "future research" are useful in describing the further potential of this approach.

Chapter 5 emphasizes interesting results rather than chemistry or theoretical treatment. The many references are varied, coming from anthropology, archeology, nutrition, and geochemistry, and introduce the chemist to an interesting application of isotope studies, ones to which other chemists, including O'Leary and Myron Bender, have contributed. The central theme involves the extent to which isotope composition of bone and other tissue reflects that of the diet and therefore how it may be interpreted to assess prehistoric human diet.

Chapter 6 is a masterful major review of a large topic: HAKIES in solvolytic nucleophilic reactions at saturated carbon. It is meticulous, thorough, and beautifully presented and organized. The review spans some 45 years of isotope effect and solvolysis studies and cites many earlier reviews. About 12% of the references have appeared within the last six years. The authors have provided a most valuable service to anyone interested in physical organic chemistry or embarking on or involved in KIE work. Sections include those on historical review (isotope effect theory, HAKIEs, and solvolysis mechanisms), an excellent section summarizing current understanding of solvolysis mechanisms, especially Scheme 1, followed by sections on isotopic (Cl, O, S, N) substitution in the nucleophile and the leaving group, and carbon isotope effects (α, β, and γ). Many useful tables enhance the value of the review.

K. Barbara Schowen, *The University of Kansas*

Atomic Spectra and Radiative Transitions. Second edition. By Igor I. Sobelman Springer-Verlag: Berlin. 1992. xiv + 356 pp. $54.00. ISBN 0-387-54518-2.

This paperback book is in the Atoms + Plasmas series and is a second

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[*] Unsigned book reviews are by the Book Review Editor.

edition of a book first published in 1978. It covers the systematics of atomic spectra, continuous spectrum radiation, excitation of atoms, spectral broadening, relativistics corrections in the spectra of highly charged ions, extensive tables of oscillator strengths, and probabilities and cross-sections of radiative transitions.

I found this a useful reference book in that it nicely contains the necessary material, which is often difficult to find in one book, on the theory of atomic spectra. It takes the reader through the simple hydrogen spectra to more complex multi-electron systems. A sound knowledge of mathematics including calculus and vector analysis is required to follow much of the material, making it definitely not for the beginner. The book contains only 47 references, of which only four are in the late 1980s, with the rest appearing to be holdovers from the previous edition.

Joseph Sneddon, *McNeese State University*

Numerical Recipes in C. By William H. Press (Harvard), Saul A. Teukolsky (Cornell), William T. Vetterling (Polaroid), and Brian P. Flannery (Exxon). Cambridge: Cambridge and New York. 1992. xxvi + 994 pp. $49.95. ISBN 0-521-43108-5.

Numerical Recipes in FORTRAN. By William H. Press (Harvard), Saul A. Teukolsky (Cornell), William T. Vetterling (Polaroid), and Brian P. Flannery (Exxon). Cambridge: Cambridge and New York. 1992. xxvi + 964 pp. $49.95. ISBN 0-521-43064-X.

The Numerical Recipes books became instant classics when they first appeared seven years ago. The authors have managed to produce a second edition that is better, though often only marginally, than the original.

Few texts are as ubiquitously found on scientists' bookshelves as Numerical Recipes. The books contain many (over 300 in the new edition) useful programs and routines. Yet most of the routines may be found in numerical analysis texts and have been available for many years in numerical libraries (e.g., LINPACK, IMSL). The books' popularity comes from the authors' lucid descriptions and editorial commentaries. Their honesty with the reader, describing which routines work well and under what conditions algorithms may fail, is much appreciated. As the authors acknowledge, their style was inspired by Foreman Acton's recently reprinted classic, *Numerical Methods That (Usually) Work* (Mathematical Assoc. of America, Washington, 1990).

The Numerical Recipes books cover a wide variety of topics that are of interest to chemists. The authors present general algorithms, which can serve as basic building blocks for specialized work. For example, a typical molecular dynamics simulation might use an ordinary differential equation solver (Chapter 16), a sorting routine (Chapter 8), some random number generators (Chapter 7), and an FFT routine to compute autocorrelation functions (Chapter 13). Since the book is written for a general scientific audience, the reader will often want to supplement it with specialized texts; for example, in molecular dynamics, *Computer Simulation of Liquids* by M. P. Allen and D. J. Tinsley (Clarendon, Oxford, 1987) is an excellent reference.

The books contain full listings of all the programs and routines; anyone willing to personally type them in is not required to pay a license fee. The programs are available on diskette (Macintosh and PC 5 1/4″ or 3 1/2″) from Cambridge Press. The diskettes cost $40; C and FORTRAN versions must be purchased separately. A more convenient way to obtain the source code is to download it over Internet; the license fee is $50 per workstation for educational institutions. It is unfortunate that Cambridge has decided to charge for services which most publishers provide free of charge. However, the books are reasonably priced and remain an excellent value.

The authors have done a good job of updating the material and references in each chapter. Most chapters contain an extra section or two of new material; the special functions and Fourier transform chapters are significantly expanded. To control the size of the book, advanced material has been set in a smaller typeface. Since most of the fundamental algorithms appeared in the first edition, many of the added topics are of interest only to specialized audiences. However, some sections (e.g., wavelet transforms) cover important algorithms that have appeared since the first edition was published.

A common question will be, "If I already have a copy of the first edition, is it worth buying the new edition?" If you find yourself using Numerical Recipes at least once a month, then it's probably worth upgrading to the new edition. On the other hand, if you consult your copy only once or twice a year, it is unlikely that the more esoteric topics added in the new edition will be of interest. Even if you keep your old edition, get a copy of the new source code; most of the programs are downward compatible with the old edition, and small improvements have been made.

The original Numerical Recipes books came in three flavors: C, FORTRAN, and Pascal. The first edition of the Pascal version is still available but will not be updated. The routines from the first edition are also available in BASIC. In the second edition, the authors wisely decided to concentrate on the two most common languages in scientific computing: ANSI C and FORTRAN 77. Few persons will find it necessary to own both the C and FORTRAN versions of the book, since the two texts, other than the source code listings, are virtually identical. While C++ is growing in popularity and FORTRAN 90 compilers have recently appeared, these new languages are still not widely adopted by the scientific community. In any case, the routines in Numerical Recipes are so clearly written that any competent programmer should have little trouble translating them into any language.

Alejandro Garcia, *San Jose State University*

Amino Acids and Peptides. Volume 23. A Specialist Periodical Report. Senior Reporter: J. H. Jones (University of Oxford). Reporters: G. C. Barrett, J. S. Davies, D. T. Elmore, C. H. Frydrych, R. W. Hay, and K. B. Nolan. The Royal Society of Chemistry: Cambridge, England. 1992. xii + 328 pp. £97.50. ISBN 0-85186-214-4.

This specialist periodical report reviews the literature published in 1990. Patent literature is generally not covered. The report does not contain an index but does contain a fairly detailed Table of Contents. It is formatted into the same six chapters as the preceeding Volume 22: 1. Amino Acids; 2. Peptide Synthesis; 3. Analogues and Conformational Studies on Peptide Hormones and Other Biologically Active Peptides; 4. Cyclic, Modified and Conjugated Peptides; 5. β-Lactam Antibiotic Chemistry; 6. Metal Complexes of Amino Acids and Peptides.

In Chapter 1, with a coverage of 654 papers, a major section deals with the synthesis of amino acids and their analogues. Three other prominent sections in this chapter are those on physico-chemical studies (e.g. X-ray, NMR, OR, CD, MS), chemical studies (e.g. racemization), and analytical studies (e.g. GLC, TLC, HPLC) of amino acids. In Chapter 2, 618 papers pertaining to such peptide synthetic methodologies as amino, carboxyl, and side-chain protection, peptide and disulfide bond formation, and solid-phase and enzyme-mediated peptide synthesis are covered. As in Volume 22, a lengthy list of syntheses of peptides/proteins and their analogues and fragments is provided. Chapter 3 covers such topics as amide bond surrogates, dehydroamino acids, and conformationally restricted peptide analogues. The focus of the latter topic is on rings and bridges formed via either amide or disulfide bonds. This chapter also contains a section on enzyme inhibitors wherein the major emphasis is on renin inhibitors. Another topic of Chapter 3 is that involving studies of side-chain interactions through either residue substitution, deletion, or modification. Examples of biologically active peptides covered in this section include the opioids, cholecystokinin, angiotensin, vasopressin, LHRH, gastrin, neuropeptide Y, and ANF. In all, 270 papers are reviewed in Chapter 3.

In past volumes there has been a fair amount of overlap between Chapters 3 and 4. This has been minimized in the present volume, since a single reporter has authored both chapters. Thus, one finds that the 120 papers reviewed in Chapter 4 cover the naturally occurring cyclic peptides, cyclodepsipeptides, and peptides containing thiazole-type rings and other non-protein ring components. Also covered in this chapter are the phosphonopeptides, glycopeptides, and non-carbohydrate peptide conjugates. In Chapter 5, 257 papers dealing with β-lactam chemistry are reviewed with the azetidinones, as in the previous year, receiving the most attention in the literature. Also contained in this chapter is an appendix on β-lactams prepared for structure-activity relationship studies. The final chapter covers 118 papers that deal with the synthesis, structure, and reactivity of metal–amino acid and metal–peptide complexes.

In summary, this specialist periodical report should be a useful resource book for individuals involved in the various aspects of amino acid and peptide research.

Rodney L. Johnson, *University of Minnesota*

Principles of Polymerization. Third Edition. By George Odian. John Wiley and Sons: New York. 1991. $59.95. ISBN 0-471-61020-8.

The third edition of *Principles of Polymerization* by George Odian is a welcome addition to the available texts which are suitable for providing a basis for both graduate and undergraduate education in macromolecular synthesis. This reviewer and his colleagues have periodically used, for some time, the second edition of this book. A number of the features have been updated and expanded in the third edition. The third edition is composed of nine chapters: Introduction; Step Polymerization; Radical

Chain Polymerization; Emulsion Polymerization; Ionic Chain Polymerization; Chain Co-polymerization; Ring Opening Polymerization; Stereochemistry of Polymerization; Reactions on Polymers; and an index.

The book focuses on the reactions of organic chemistry which lead to the synthesis of macromolecules. It begins by defining the characteristics that distinguish polymers from their much smaller sized homologues and proceeds to discuss the three major types of polymerization reactions, including step (polycondensation), chain (addition), and ring opening polymerizations. The book preface states that it is intended for chemists with little or no background in polymers, as well as experienced polymer chemists, with the view that the book can be a self-educating introduction as well as a classroom text. At our university, we have in various years used the second edition as either an undergraduate or graduate text. In general, we have found it to be more appropriate for graduate students and advanced undergraduates. Extensive supplementing is necessary for the average undergraduate. The text provides a good introduction to polymerization chemistry, primarily from the point of view of an organic chemist. Relatively little structure property behavior is presented, and a few references to books like van Krevelen's would have been helpful. However, in the third edition, the author has provided significantly more statistical information and frequently mentions appropriate applications for the polymerizations which he discusses. The basic features of the step and free radical chain polymerizations are, in general, well done, and the third edition further improves over the second edition. Ionic polymerization is an area where rapid change is underway and is difficult to chronicle in a major text (749 pages) such as this one. It, therefore, probably is still a weaker section relative to the classical radical and step polymerization sections. As in any book, numerous corrections and improvements can be suggested. In particular, in the step growth section dealing with molecular weight and end group control, terminology continues to be used which is at best not very helpful and at worst inappropriate.

There are other problems with this book. For example, on page 97, the reactivity of aliphatic glycols and aromatic phenols with acid chlorides is reversed. The discussion of liquid crystalline polymers does not give references to some of the main recent reviews, and further, there is no real description of the molecular structural requirements for liquid crystallinity! The remark on page 166 that cholesteric polymers are rarely observed makes this mesophase seem mysterious when, of course, such polymers are known and readily made. The discussion of chemical modification provides only a very superficial discussion of neighboring group effects, which can be very important in terms of kinetics, microstructure, and conversion and are usually ignored. He also does not mention the conversion of PVA to the industrially important acetals and the statistics of this pairwise reaction. Some mention of the kinetic and statistical analyses of such effects by authors such as Boucher and Plate should be included. On page 669, he apparently does not consider natural macromolecules when he states that "optically active polymers are rarely encountered"! In regard to polymer stereochemistry and tacticity, mention of recent work of G. Wulff would have been useful.

James E. McGrath,
Virginia Polytechnic Institute and State University

Surfactant Science Series. Volume 40. Analysis of Surfactants. By Thomas M. Schmitt (BASF Corporation). Marcel Dekker Inc.: New York. 1992. vii + 464 pp. $150.00. ISBN 0-8247-8580-0.

The science and technology of surfactants is an active area of research, as can be inferred from the thousands of papers published annually. The Surfactant Science Series under the general editorial direction of Martin J. Schick and the late Frederick M. Fowkes has played a very important role in advancing this research through the timely production of high-quality research monographs. The volume under discussion is a recent addition to this useful series of publications.

Analysis of Surfactants is written by a single author, Thomas M. Schmitt of BASF Corporation, Wyandotte, Michigan. In this sense, it is a departure from many other volumes in the Surfactant Science Series which usually involve multiple authors. One can see greater coherence and continuity among the various topics discussed in this book, reflecting some of the advantages of having a single author for the monograph.

The topic of analysis of surfactants has been discussed also in earlier volumes of the Surfactant Science Series. The first volume in the series, *Nonionic Surfactants* (1966), and the fourth volume, *Cationic Surfactants* (1970), both contained chapters on surfactant analysis. Volume 8 in the series (published in 1977) was entirely devoted to the analysis of anionic surfactants while Volume 19 (published in 1986) was devoted to the analysis of nonionic surfactants. Inevitably, the present book overlaps with some of the earlier materials. Indeed, the readers will continue to use the earlier references for a number of analytical techniques that are described in greater detail in them. The main strengths of *Analysis of Surfactants* are its comprehensive character, the emphasis on commercial surfactants usually present as mixtures, the variety of techniques described for the separation as well as the analysis of the surfactants, the discussion on the analysis of surfactants present in formulated commercial products and of trace quantities of surfactants present in the environment, and the inclusion of approximately 1200 literature references with complete titles of articles, most of which cover the period from 1980 to 1990.

The book contains a total of thirteen chapters. The first three chapters are devoted to the specifications of commercial surfactant products and the general methods for determining their composition and purity. The chapters deal respectively with anionic surfactants, nonionic surfactants, and cationic and amphoteric surfactants. For example, to characteize alkylbenzene sulfonates, these chapters describe the following parameters and the required test methods: assay (two-phase titration), alkyl chain length or average molecular weight (elemental analysis, desulfonation, gas chromatography), disulfonated alkylbenzene (extraction), alkyl chain distribution (gas chromatography), alcohol-insoluble matter (gravimetry), neutral oil (petroleum ether extraction, gas chromatography, HPLC), moisture (azeotropic distillation, Karl Fischer titration), sodium sulfate (potentiometric titration), and sodium chloride (potentiometric titration).

Chapter 4 describes methods of qualitative analysis to determine whether any surfactant is present in a system and, if so, whether the surfactant is anionic, cationic, nonionic, or amphoteric. Chapter 5 summarizes techniques used to separate surfactants in milligram or gram quantities. Mainly separation methods of a preparative character are considered. Chapters 6–11 describe various quantitative methods of analysis. The topics of liquid chromatography, gas chromatography, thin-layer chromatography, and supercritical fluid chromatography are each discussed separately in Chapters 6–9. Chapter 10 considers various spectroscopic methods including UV–VIS, IR, NMR, and mass spectroscopy. Brief reference is made to other spectroscopic methods. Chapter 11 describes a number of general methods such as titration, electrochemical techniques (including ion-selective electrodes and polarography), and gravimetric methods.

Chapter 12 describes how surfactant analysis can be carried out when the surfactant is present in trace quantities in the environment. Emphasis is placed on the multi-step approach consisting of the concentration step to isolate surfactants from the bulk of the matrix where they are present, the separation of the compound of interest, and its subsequent quantification. The last chapter provides a brief dicussion of how formulated commercial products such as laundry detergent, shampoo, and toothpaste can be analysed. The book has a satisfactory indexing of topics with more than 1300 items listed for convenient reference.

For anyone interested in surfactant research, this book will serve as a useful resource. Especially those who are not analytical chemists but experimentalists who deal with surfactants routinely will find this book to be a ready reference for surfactant characterization purposes.

R. Nagarajan, *The Pennsylvania State University*

Studies in Inorganic Chemistry. Volume 14. The Chemistry of Inorganic Ring Systems. Edited by Ralf Steudel (Technische Universitat Berlin). Elsevier: Amsterdam and New York. 1992. xxii + 486 pp. $214.50. ISBN 0-444-88933-7.

This volume consists of a series of papers based primarily on lectures presented at The 6th International Conference on Inorganic Ring Systems (IRIS VI) that was held in Berlin in August, 1991. The following topics are covered in 22 chapters, each written by a distinguished, internationally recognized scientist: (1) Clusters, Cages and Concatenations (N. Greenwood, 14 pp, 28 references); (2) Novel Delocalized Rings Involving Heavier Main Group Elements (P. P. Power, 10 pp, 20 references); (3) Binary Carbon Sulfides: Unusual Molecules and Materials (C. P. Galloway, T. B. Rauchfuss, X. Yang, 10 pp, 35 references); (4) Novel Silicon Ring Compounds from Disilenes (R. West, 16 pp, 32 references); (5) Novel Ring Systems from Cyclotrisilanes and Cyclotristannanes (M. Weidenbruch, 24 pp, 71 references); (6) Homo- and Heterocyclic Si-O-Systems -Rings and -Cages (U. Klingebiel, S. Schütte, D. Schmidt-Bäse, 25 pp, 9 references); (7) Exotic Polyhedral Oligogermanes and Related Molecules (A. Sekiguchi, H. Sakurai, 24 pp, 22 references); (8) New Heterometallic Silylamides with Polycyclic and Cage-Like Structures (M. Veith, S. Müller-Becker, 20 pp, 48 references); (9) Strained Inorganic Heterocyclic Compounds and Their Conversion to Macrocycles and High Polymers (H. R. Allcock, 25 pp, 123 references); (10) Inorganic Rings on Carbon Chains (C. W. Allen, 21 pp, 57 references); (11) P_n and As_n Units as Building Blocks for Metallacycles, Cages, Sandwich and Triple-Decker Complexes (O. J. Scherer, C. Blath, J. Braun, B. Höbel, K. Pfeiffer, B. Rink, H. Slodzyk, P. Walther, B. Werner, R. Winter, 16 pp, 27 references); (12) Phosphorus-Containing Macrocycles. A Game of

Building Blocks (J.-P. Majoral, A.-M. Caminade, 23 pp, 10 references); (13) The Synthesis of Sulfur- and Selenium-Containing Organic and Inorganic Rings from Titanocene Precursors (R. Steudel, 21 pp, 95 references); (14) Symbiosis between Main Group and Transition Elements (H. W. Roesky, 16 pp, 36 references); (15) Diphosphadithia- and Diphosphadiselena-Tetrazocines and Their S(Se),S′(Se′)-Dialkyl(aryl) derivatives (T. Chivers, D. D. Doxsee, M. Edwards, R. W. Hilts, 24 pp, 45 references); (16) Heterocyclic Thiazyl and Selenazyl Radicals; Synthesis and Applications in Solid State Architecture (A. W. Cordes, R. C. Haddon, R. T. Oakley, 28 pp, 111 references); (17) Some Synthetic and Structural Aspects of Dithiadiazoles, RCN$_2$S$_2$, and Related Compounds (A. J. Banister, J. M. Rawson, 26 pp, 74 references); (18) The Preparation and Structure of Metallasulfur/Selenium Nitrogen Complexes and Cages (J. D. Woollins, 24 pp, 82 references); (19) Homopolyatomic Selenium Cations and Related Halopolyselenium Cations (J. Passmore, 35 pp, 36 references); (20) Binary Selenium-Nitrogen Species and Related Compounds (T. M. Klapötke, 19 pp, 67 references); (21) Complexes Involving Inorganic Aromatic Rings (B. M. Gimarc, L. E. Starr, 21 pp, 58 references); (22) Comments on the Nomenclature of Inorganic Ring Systems (I. Haiduc, 27 pp, 26 references).

As evidenced by the title list, this volume covers a very broad spectrum of main group element systems from boron to tellurium as well as selected topics dealing more with transition metal chemistry and organic/inorganic hybrid polymers. The subject matter deals primarily with the synthesis, reactivity, and structural characterization of new ring systems, but bonding and stereochemistry are also included to varying degrees in each chapter. The book is generally organized by elements, going from left to right in the main groups of the Periodic Table. The individual articles are focused on the work of the principal investigators and thus should not be considered as exhaustive reviews of the subjects. Nevertheless, there are a great many references to important papers on related topics in all of the articles. The style and format of the papers are not rigidly uniform throughout, since they are presented directly as submitted by the authors. Overall, this volume will be of significant use as a reference to those working in the field of inorganic rings, clusters, or polymers and to the larger community of inorganic chemists as well. It might even be appropriate as a pseudo-textbook for an advanced course in main group element chemistry.

Robert H. Neilson, *Texas Christian University*

Reagents for Organic Synthesis. Volume 16. By Mary Fieser (Harvard University). John Wiley and Sons: New York. 1992. 436 pp. $54.95. ISBN 0-471-52721-1.

Volume 16 extends this useful series by surveying the literature from 1989 through 1991. It continues the highly readable format, with reagents listed alphabetically, cross-references to abstracts in earlier volumes, representative equations, and original references.

One of the two indices is a list of authors cited. The other is a subject index which contains compounds, classes of compounds, and reaction types. It includes reagents which are mentioned in the text as well as those which are the main entries. Although the subject index should not be considered comprehensive, the skilled organic chemist should have no trouble in using it to retrieve key references. Furthermore, the presentation lends itself to browsing. The series remains an essential reference for practitioners of organic synthesis.

Kathlyn A. Parker, *Brown University*

Poly(Ethylene Glycol) Chemistry: Biotechnical And Biomedical Applications. Edited by J. Milton Harris. Plenum Publishing Company: New York. 1992. xxii + 386 pp. $89.50. ISBN 0-306-44078-4.

This book covers the biotechnical applications of poly(ethylene glycol). As defined and used in the text, this polymer is alternatively cited as poly(ethylene oxide) (PEO), which describes the chain repeat unit. The 22 chapters contributed to this book are by the leading workers from throughout the world. The evaluations are mostly applied, such that the polymer scientist may wish to inquire of earlier volumes for fundamental poly(ethylene glycol) (PEG) properties such as glass transition temperature, melting point, and fractional crystallinity. Considerations of PEG molecular weight effects in the book are generally cited only by the "nominal" molecular weight, as provided by the manufacturer. This seems adequate for the purposes of these contributions that center on the special characteristics of PEG in aqueous systems. Nonetheless, this book is not intended to be authoritative on this polymer.

The editor, Prof. Harris, affirms that "PEGs possess a variety of properties pertinent to biomedical and biotechnical applications". Of general interest is the solubility of this polymer in water and its insolubility in many common organic solvents. This facilitates applications for partitioning and complexing, such as with metal cations. The analogy of these complexes with crown ethers is noted on page 4. "PEG is used in almost all aqueous phase partitioning...For large-scale separations in the biotechnical industry, PEG/salt systems have been most widely used, primarily for large scale enzyme extractions", note Chapter 6 by Folke Tjerneld.

Surface modification with PEG has also been a matter of major attention, as discussed in Chapter 8. Chapter 14 by Edward M. Merrill states, "...evidence demonstrated conclusively that PEO adsorbed out of solution onto glass vessel walls prevented subsequent adsorption of protein or virus from their respective solutions, and it is impossible to name any other water-soluble polymer that is equally effective." Merrill further delineates the applications for covalent endlinking of PEO. These include developing PEO crosslinked gels and PEO star molecules, both as methods of immobilization and for potential applications. The use of functionalized PEGs for modification of polypeptides is discussed, Chapter 21, as is the use of PEG gels for drug delivery, Chapter 12. This book thus appears to be a good source for those interested in the biotechnical applications of this interesting polymer.

For physical chemists, the chapter by Antonsen and Hoffman may be of particular interest. They describe the structuring of water with PEG, giving rise to an endothermic transition on warming at about –50 °C, due to loss of order for water clustered with PEG.

Roger S. Porter, *University of Massachusetts*

Fused Pyrimidines. Part Four. Miscellaneous Fused Pyrimidines. The Chemistry of Heterocyclic Compounds. Volume 24. By Thomas J. Delia (Central Michigan University). Interscience: New York. 1992. xvii + 317 pp. $175.00. ISBN 0-471-80462-2.

This work is the last of a four-part series comprising Volume 24 in *Chemistry of Heterocyclic Compounds.* A variety of less well-known fused pyrimidines are described in this work, with coverage of those ring systems where the second ring is six-membered with one or more heteroatoms.

The chemistry of the four isomeric pyridopyrimidines subsequent to 1967 is discussed in considerable detail. Considerable ingenuity has been shown by numerous investigators in effecting annulation of the second ring, and this section is a very useful summary of the major, modern ways of constructing both the pyridine and pyrimidine rings at different oxidation levels and with a variety of useful substituents. The important role of substituent modification on the chemistry of these ring systems is clearly evident from the numerous, well-documented examples described.

The pyrano- and thiopyranopyrimidines likewise have four possible isomeric systems, and their synthesis and reactivity, especially of substituents, are also well covered. Examples describing annulation of both rings emphasize the strategies involved in such chemistry and illustrate the effect of heteroatom variation on the approach used. The coverage of the pyrimidopyrimidines (restricted to two possible isomers), the pyrimidopyridazines (restricted to three possible isomers), and the pyrimidotriazines (restricted to four possible isomers) provides interesting insights into a variety of ring annulation methods controlled by the number of heteroatoms to be introduced and functional group manipulations. The chemistry described here is readily applicable to related ring systems, and this volume will be an important resource in this respect.

The author has produced a well-documented, readable reference work, and the ample use of clear structural formulas enables the reader to quickly understand the chemistry involved. Numerous tables report physical characteristics, and reference citations to examples of these ring systems are recent, with literature coverage extending from 1967 through 1988. This series was initiated in 1950 and over the years has played an important role in the literature of heterocyclic chemistry. This volume is no exception and continues the tradition of high quality. It is an essential reference work for all libraries, but unfortunately, its high price places it out of reach for individual acquisition.

Kevin T. Potts, *Rensselaer Polytechnic Institute*

Bioanalytical Applications of Enzymes. Volume 36 of Methods of Biochemical Analysis. Edited by Clarence H. Suelter and Larry Kricka. John Wiley & Sons: New York. 1992. xiii + 260 pp. $79.95. ISBN 0-471-55880-X.

The 36th volume of the well-known series *Methods of Biochemical Analysis* is focused on bioanalytical applications of enzymes. Enzyme analysis is the unifying concept of this volume, reflected well by the choice of the individual contributions arranged in seven chapters written by the authors renowned in the field.

Unique Applications of Immobilized Proteins in Bioanalytical Systems, M. N. Gupta and B. Mattiasson (34 pp, 143 refs). Requirements of an ideal bioanalytical system together with the role of enzymes in biological assays are discussed in the introductory chapter., A review of modern enzyme immobilization methods is presented in regard to their applicability in bioanalysis. Interactions of enzymes with antibodies, lectins, and affinity ligands are discussed. Possibilities and interesting examples of reversible affinity immobilization, which may be utilized for bioanalytical purposes, are given here.

The analytical use of enzymes in organic solvents is another interesting topic of this chapter, which is concluded by some examples of enzyme-based analytical devices.

Fundamentals of Dry Reagents Chemistries: The Role of Enzymes, Bert Walter (28 pp, 60 refs). The reader is introduced to the field of new, fast evolving analytical techniques known as dry reagent chemistries, which are becoming increasingly important in clinical analysis. Devices utilizing dry chemistry are usually small planar elements characterized by miniature size and convenience to the user. Several conventional analytical steps are integrated into a single element based to a large extent on enzymes as an integral part of the element.

The authors describe basic principles and construction of dry reagent chemistry elements in a very descriptive way. The analytical function of these elements, which can be very complex, and instrumentation for the signal monitoring are also discussed. Some examples of an integrated dry reagent chemistry like the Dextrostix (Miles Diagnostics) for whole blood glucose analysis are discussed in detail. An interesting comparison between a number of dry and conventional solution chemistries is given in a tabular form.

Enzyme Electrode Biosensors: Theory and Applications, J.-M. Kaufmann and G. G. Guilbault (50 pp, 333 refs). After a brief introduction of the biosensor field, the elements of the enzyme electrode device are thoroughly discussed. Principles and evolution of enzyme electrodes are discussed in detail, and an extended treatment of immobilization procedures into a thin film or layer over the electrode, summarized in the form of tables with many references, is given. It would be desirable to provide more specific hints and instructions for the construction, as many of the electrodes for special purposes are still made by the user. The enzyme electrode characteristics, like stability, selectivity, response time, and detection limits are discussed in detail. Applications of enzyme electrodes with a number of examples are given. A formidable amount of literature was compiled.

Enzyme-Labelled Probes for Nucleic Acid Hybridization, Jon M. Kaguni and Laurie S. Kaguni (12 pp, 38 refs). The reviewer, being only superficially acquainted with the topics of this and the following chapter, will limit himself only to a brief description of their contents.

This concise review presents the properties of enzymes used for defined DNA and RNA modifications to produce probes for hybridization analysis. The probes provide structural information (mapping) on DNA and RNA molecules. Recombinant DNA's by colony and plaque hybridization may be identified. Reaction conditions and examples of experiments with different probes are given. Properties of T4-encoded polynucleotide kinase, DNA-directed DNA polymerases with their 3′ → 5′ exonuclease function, and their use for labelling of DNA and RNA are discussed. Details of 5′-end, 3′-end, and uniform labelling, as well as production of strand-specific DNA and RNA probes, are presented.

DNA Restriction Enzymes and RFLPS in Medicine, Jeffrey A. Kant (20 pp, 57 refs). General information on restriction enzymes (endonucleases) and their purpose is followed by a detailed description of what is known as RFLPs (restriction fragment-length polymerisms).

This use of restriction enzyme provides an extremely powerful tool for investigation of biomedical problems. Detection of genetic disorders and disease-causing mutations and new ways of studying neoplasia and cancer using RFLP markers will certainly attract the attention of an interested reader.

Advances in Enzymatically Coupled Field Effect Transistors, Satoru Shiono, Yoskio Hanzato, and Mamiko Nakako (26 pp, 52 refs). During the last decade field effect transistors (FET) have attracted the attention of biosensor researchers for their potential advantages as transducers in conjunction with immobilized enzymes.

An introduction in the basic theory and construction of such devices is presented with a number of schematic drawings and photographs visualizing their structure and circuitry. A comparison with other transducers such as electrodes is made. Performance of enzymatically coupled FET with a photolithographically patterned enzyme membrane together with practical application of a glucose sensitive device in medical diagnostics rounds off this well balanced review.

Some of the enzyme coupled FET characteristics resemble closely those of the dry chemistry devices reviewed in the second chapter of this volume. However, the editors missed the opportunity for a critical comparison of these two increasingly important biosensor families with respect to their present and future applications.

Enzyme-Labelled Antibodies in Bioassays, M. R. Walker, R. A. Scott, and G. H. G. Thorpe (29 pp, 76 refs). From the vast area of antibody application as a biochemical probe, the authors select the use of enzymes as antibody labels and discuss the various methods for enzyme labelling, methods for signal amplification, and detection methods for such systems. Advantages and limitations of enzymes-antibody conjugates are critically discussed, especially in relation to other options for antibody labelling. Peroxidases, alkaline phosphatase, glucose-oxidase, urease, and luciferases are considered for conjugation with antibodies. Applications in immunoassays and in new developments using genetically engineered enzymes and antibodies together with new simplified methodologies and instrumentation needed in clinical practice conclude this last chapter.

Due to its balanced introductory and advanced treatment of the topics, the book will be useful to many readers, whether they seek only specific information or also work in the field of bioanalytical application of enzymes.

The book contains a relatively well compiled subject index, an extensive author index, and the cumulative author index, Vol. 1–36 and supplemental volume.

J. E. Prenosil, *Swiss Federal Institute of Technology (ETH)*

Practical Sonochemistry: Users' Guide to Applications in Chemistry and Chemical Engineering. By Timothy J. Mason (Coventry University, England). Ellis Horwood Ltd: Chichester, England. 1991. 186 pp. $59.95. ISBN 0-13-682642-3.

Sonochemistry—the application of ultrasound to chemical problems—is an area of growing interest, and many synthetic procedures have been found to benefit from sonication. This book attempts to do two things: to provide an introductory survey of sonochemistry and to give a collection of experimental procedures.

The book begins with a basic introduction to the topic which is followed by chapters surveying the use of ultrasound bath and probe systems. A very brief description of possible apparatus for operation on a large scale is also included. While these chapters may be useful for the absolute beginner, the topics have been covered in more depth in several other texts, including the companion volume to this by the same author. The main factor which differentiates this text from the other introductory books available is the listing of detailed experimental procedures which I feel is the most valuable aspect of the book, details of methodology in many areas of sonochemistry having been contributed by most of the leading workers in the area. Difficulty in reproducing results is a well-known problem in sonochemistry and has contributed to its lack of widespread adoption. The procedures in the book will be helpful in overcoming this, since more details are included here than are often published in the literature.

In summary, the book, which is aimed at the newcomer, will be particularly useful to a synthetic chemist who is interested in exploring the application of ultrasound to reactions.

Gareth J. Price, *University of Bath, England*

Inorganometallic Chemistry. Edited by Thomas P. Fehlner (University of Notre Dame). Plenum Press: New York. 1992. xiv + 401 pp. $95.00. ISBN 0-306-43986-7.

In this additional volume of the series Modern Inorganic Chemistry several well-known authors attempt to link main group and transition metal chemistry. Starting with a short introduction, T. P. Fehlner endeavors to define the constructed word "Inorganometallic". In Chapter 2, Main Group Fragments as Ligands to Transition Metals, the same author presents in a competent and descriptive way this highly topical area of interdisciplinary research. In Chapter 3, Transition Metal-Main Group Cluster Compounds, C. E. Housecroft gives a very extensive insight into the widespread and fascinating manifoldness of clusters with bonds between transition metals and group 13 to 16 elements.

D. M. P. Mingos convincingly presents, in his well-known manner, the application of the polyhedral skeletal Electron Pair Theory, the Fragment Molecular Orbital Methods, and the Topological Electron Counting Theory even to mixed clusters (main group/transition metal) in Chapter 4, Bonding Connections and Interrelationships. With Chapter 5, Experimental Comparison of the Bonding in Inorganometallic and Organometallic Complexes by Photoelectron Spectroscopy, S. L. Lichtenberger et al. offer an intriguing survey on the understanding of photoelectron spectra of complexes with organic, organometallic, and inorganic ligands. Obviously as an homage to the title of this book, N^{3-} and P_3^+ are described as inorganometallic analogues of CR^{3-} and $C_3R_3^+$. In Chapter 6, Transition Metal-Promoted Reactions of Main Group

Species and Main Group-Promoted Reactions of Transition Metal Species, R. N. Grimes points out the interlock of both areas, especially with the help of illustrative examples of his own research. Considering the vast area, some inhomogeneity could not be avoided. Chapter 7, The Metal-Nonmetal Bond in the Solid State, is an elegant bridging to solid state chemistry in which T. Hugh Banks describes in a very informative and well-balanced way many different classes of compounds.

Two relevant areas of application form the last two chapters. In Chapter 8, Molecular Precursors to Thin Films, M. S. Steigerwald explains various techniques leading to III–V and II–VI semiconductors (e.g. GaAs, InP, HgTe, ZnSe) via molecules-to-solid conversion. R. T. Paine gives a comprehensive survey and a qualitative insight into the field of ceramic materials in Chapter 9, entitled Ceramics. In addition to metal borides, carbides, silicides, nitrides, phosphides, and chalconides, this contribution speculates on possible future developments.

In this elaborate book with up-to-date references, solid fundaments for the bridges connecting main group and transition metal chemistry have been erected. Experts and nonexperts will find useful information and valuable ideas.

Otto J. Scherer, *Universität Kaiserslautern*

Advances in Theoretically Interesting Molecules. Volume 2. Edited by Randolph P. Thummel (University of Houston). JAI Press: Greenwich, CT, and London. 1992. xii + 223 pp. $78.50. ISBN 0-89232-953-X.

This volume consists of four reviews that are rather disparate in nature, unified only in that they are "theoretically interesting". The chapters are Cyclooctatetraenes: Conformational and π-Electronic Dynamics within Polyolefinic [8]Annulene Frameworks by Leo A. Paquette (139 references); A Compilation and Analysis of Structural Data of Distorted Bridgehead Olefins and Amides by Timothy G. Lease and Kenneth J. Shea (59 references); Nonplanarity and Aromaticity in Polycyclic Benzenoid Hydrocarbons by William C. Herndon and Paul C. Nowak (150 references); and The Dewar Furan Story by Ronald N. Warrener (149 references).

The senior authors are experts in their fields, and the reviews reflect much of their own work. Paquette discusses bond-shifting and ring inversion in cyclooctatetraenes, much of which is his own work. The review includes syntheses, thermodynamics, and kinetics, and it is useful to have such a complete and authoritarian account summarized in one place. The second chapter discusses the structures and strain energies of various types of bridgehead double bonds but does not include much chemistry. Similarly, the third chapter is restricted to structural aspects, including deviations from planarity, of benzenoid aromatic hydrocarbons of the alternant hydrocarbon type (without odd-membered rings). Nomenclature in terms of graph theory is included, but the treatment does not include the latest type of benzenoid ring systems, "buckytubes". This chapter is more in the nature of a research paper than a review, apparently in keeping with the subtitle of the series: "A Research Annual". The last chapter differs substantially from the others in dealing almost wholly with syntheses and reaction mechanisms. Although the treatment emphasizes Dewar-furans, isomers of furan with fused cyclobutene and oxirane rings, related pyrrole and thiophene analogs are presented for comparisons.

The book is well produced; the many structures are clean and easy to read. There are few typographical or other errors. The few errors found should not be too problematic for students. For example, structure **128** on page 40 has C_s symmetry rather than C_2 and the statement concerning entropy of mixing should be somewhat more complex. Similarly, I found the discussion on pages 34 and 35 confusing because structures **A** and **D** are identical as are structures **B** and **C**, but these criticisms are minor.

This book demonstrates the growing use of computational methods, particularly molecular mechanics, in modern organic chemistry. The results of such calculations form an important part of the discussions on bridgehead olefins and polycyclic aromatics but also play a role in cyclooctatetraenes. Even the largely experimental chapter on Dewar-furans refers to quantum mechanical calculations of reaction mechanisms.

Andrew Streitwieser, *University of California, Berkeley*

Chemistry and Physics of Carbon. A Series of Advances. Volume 23. By Peter A. Thrower. Marcel Dekker Inc.: New York. 1991. xiii + 366 pp. $165.00. ISBN 0-8247-8482-0.

More than a third of the length of this book is devoted to nuclear grade activated carbons and the radioactive iodine problem; a hundred or so pages are given over to electro-chemical carbonization of fluoropolymers; and the remaining two chapters are concerned with the characterization of carbons by the technique of magnetoresistance and with the oxidation protection of carbons. All four chapters are competently written even though there is less density of information than one would ideally expect. There is also a tendency to recycle materials that, to the cognoscenti (at whom this series is primarily aimed), is rather familiar. This is particularly true of McKee's chapter on oxidation, in which Figure 14 is a derivative of materials that appeared in Volume 1 (published in 1965) of this series.

The reviewer has three points to make, two on the volume itself and one on the philosophy of the series. The first is that little or no connection exists between the individual chapters; the second is that comparatively little effort seems to have been made in standardizing the presentations between one chapter and the next. (What, for example, does the following sentence on page 3 mean: "By electron diffraction the information of local area is able to obtain"?)

Carbon is a protean solid, ever full of surprises, interest, and importance—this is why the series was first initiated (by P. L. Walker, Jr.). But, given the present enormous pace of change and the rapidly expanding diversity of chemistry and physics that converges on carbon, has not the time come for future volumes to contain many more (but shorter) chapters? These could record progress in both the traditional aspects of carbon science and technology and in new pastures, such as diamond films, fullerenes, fullerides, and other exotic aspects of the subject.

John Meurig Thomas, *The Royal Institution of Great Britain*

Progress in the Chemistry of Organic Natural Products. Volume 59. Edited by W. Herz, G. W. Kirby, R. E. Moore, W. Steglich, and Ch. Tamm. Springer-Verlag: Wien and New York. 1992. ix + 328 pp. DM 260. ISBN 0-306-43986-7.

The latest volume of Zechmeister's series on organic natural products contains two chapters of approximately equal length. In the first S. I. Hatanaka reviews the non protein amino acids that have been isolated from mushrooms, and in the second I. Wahlberg and A. M. Eklund discuss cembranoids, and the related pseudopteranoids and cubitanoids.

Hatanaka has been active in the isolation and identification of non protein amino acids from mushrooms for over twenty years. The literature in the field goes back to the 1950s with Th. Wieland and Fowden being among the pioneers. Many of the amino acids discussed in the chapters have also been isolated from plants. Typically the author describes the isolation of an amino acid and then the elucidation of its structure. Topics such as the biological activity of the compound, its synthesis, and its biosynthesis are also discussed. Amino acids, ranging from hydroxylated leucines and isoleucines present in the cyclopeptides of *Amanita phalloides* to the constituents of γ-glutamyl peptides, are described. The organization is based on the widely varying structures of the acids. Hatanaka points out that, compared to the case of plants, only a small fraction of fungal species have been examined for the presence of non protein amino acids.

Overall the review gives a thorough coverage of the literature and is easy to read. However, the chapter apparently went through a long gestation; there are a few references to 1988 work and apparently only two to articles in 1989.

The structures of cembranoids were first reported in 1962, and their chemistry was reviewed in Volume 36, 1979, of this series. The present chapter concentrates on progress since 1979 up to the end of 1990 with a few references into 1991. The authors give the structures of 351 compounds in tables which include the name of the compound, its source, and references to its X-ray and spectral data, its synthesis (not many have been made), and its biological properties. The tables occupy nearly 70% of the text. The major sources of the compounds are marine invertebrates (200 compounds) and tobacco (70 compounds). The cembranoids (305 compounds) are mainly 14 membered carbocycles with some acylic compounds derived from opening the ring. The pseudopteranoids (10 compounds) and cubitanoids (26 compounds) have 12 membered rings and are believed to be derived from the cembranoids.

Apart from a brief introduction to the cembranoids, most of the discussion is focused on the biosynthesis of the compounds. This coverage is largely based on proposing plausible routes and supporting the ideas by showing that the suggested reactions can be effected in the laboratory. Although the chapter is well written, it is tiresome to read because one has to flip frequently to the tables to find the structures of compounds mentioned in the text.

In summary, both chapters give a thorough coverage of the compounds they discuss and provide newcomers with a useful introduction to these families.

Desmond M. S. Wheeler, *University of Nebraska*

Progress in Inorganic Chemistry. Volume 40. Edited by Stephen J.Lippard (Massachusetts Institute of Technology). John Wiley & Sons, Inc. New York. 1992. vi + 590 pp. $135.00. ISBN 0-471-57191-1.

The volume consists of seven reviews on a range of topics. It begins with a thorough review of coupling reactions of "terminal two-faced π-ligands" and related cleavage reactions by A. Mayr and C. M. Bastos. The bulk of all coupling reactions involve carbyne or alkylidyne ligands, and those are the emphasis of this chapter. Numerous coupling reactions are discussed, and there is a lengthy table of spectroscopic properties of complexes containing coupled ligands. The chapter is concluded with an easy to read section that provides a theoretical basis for the coupling process in terms of frontier orbitals. There is a very interesting chapter by G. D. Stucky titled The Interface of Nanoscale Inclusion Chemistry. Much of it is focused on Guest-Host phenomena employing 3-dimensional hosts such as zeolites, aluminum phosphates, and related metal oxides and the effects that guests have on the nonlinear optical properties of the hosts. There is a comprehensive review of the coordination chemistry of polydentate phosphines by F. A. Cotton and B. Hong. It includes a thorough compilation and discussion of the procedures of ligand synthesis and the various modes of ligand coordination and concludes with a section on catalysis. The activation of H_2O_2 and O_2 with an emphasis on the former is the subject of a review by A. Sobkowiak, H.-C. Tung, and D. T. Sawyer. This review is concentrated on nonheme iron and cobalt coordination complexes and includes an up-to-date review of "Fenton Chemistry". There is an interesting review by M. Witt and H. W. Roesky on compounds with sterically demanding flourinated ligands. Most of the complexes discussed are organometallics. This review also includes a smaller section on metal complexes, mostly organometallics, that contain fluoride ligands. A review by K. K. Pandey discusses a series of uncommon sulfur containing ligands: NS, NSO, S_3N^-, SO, and S_2O. The various preparative methods are enumerated, and extensive tables of spectroscopic and structural data are present along with discussions of the structures and bonding in the molecules. The final chapter by C. D. Hoff is titled Thermodynamics of Ligand Binding. It includes discussions of a number of case studies of the enthalpies of ligand exchange reactions. It is good to see that some people are still thinking seriously about this important topic. As with previous volumes in this series, this volume is distinguished not only by its scope and breadth but also by the depth and quality of the reviews.

Richard D. Adams, *University of South Carolina, Columbia*

The Chemistry of Heterocyclic Compounds. Volume 47. Synthesis of Fused Heterocycles, Part 2. By G. P. Ellis (University of Wales). John Wiley and Sons: Chichester, New York, Brisbane, Toronto, and Singapore. 1992. xi + 769 pp. $360.00. ISBN 0-471-93070-9.

This is volume 47 (Part 2) of the important series *The Chemistry of Heterocyclic Compounds* edited originally by Weissberger and later by Taylor. This volume is written by G. P. Ellis and is intended to provide a convenient manner in which to locate papers or reviews concerned with the synthesis of fused heterocyclic systems. Emphasis is placed on the synthesis of five-, six-, seven-, and eight-membered rings which contain heteroatoms in either one or both rings of these fused heterocyclic compounds.

Another aim of this monograph is to demonstrate the correct IUPAC-approved manner in which to draw these heterocyclic systems and number them. Ellis also states that, while writing Parts 1 and 2 of this volume, it was noticed that many ring systems were named erroneously in the literature. Consequently, the correct names of such compounds are contained in the book. In addition, notes for the use of the IUPAC rules of nomenclature for polycyclic heterocycles are included in an Appendix to Part 1 (1987).

Both Parts 1 and 2 of this volume contain references to a classified selection of papers published from 1969 to 1991 which describe a wide variety of heterocyclizations. Moreover, the reviews cited in this volume on pp 1343–1344 provide additional references of critical importance to heterocyclic chemists. Abbreviations employed in this monograph are clearly defined on p 669 of the text.

This volume (Part 2) is comprised of 106 chapters, the first of which details the effective use of this monograph. The scope, aims, and the manner in which to employ the book as a reference source are clearly outlined in the Introduction. The chapter headings define what general classes of reactive groups undergo cyclization reactions to provide the target fused heterocycles. For example, Chapter 7 is entitled Acylamine and a Carboxylic Acid Derivative and contains the synthesis of pyrazo-3-ones, pyridin-2-ones, pyrimidin-4-ones, 1,3-oxazin-6-ones, etc. Described in each chapter is the cyclization to form 5-, 6-, 7-, or 8-membered rings in that order, although it must be remembered these are fused to another ring system. The syntheses of indoles, quinolines, diazepines, diazocines, triazoles, β-carbolines, thiopyran-4-ones, pyridodiindoles, and thiazepin-5-ones are described, and the list goes on and on.

Volume 47 (Part 2) of this series contains over two thousand references which cover the literature from 1969 to 1991. There is also a general subject index, as well as an index of chemical systems. This index of chemical systems is especially important when the name of the parent fused heterocyclic system is already known to the reader. The syntheses of a tremendous number of heterocyclic systems are described in this volume, and the structures of related molecules are also illustrated with appropriate references in this same section. This is, of course, an important volume for any library which concerns itself with chemistry but will also be a welcome addition to the libraries of pharmaceutical and medicinal chemists. This monograph is very well done and is an important source of information for those who practice heterocyclic chemistry. On the negative side there are many typographical errors, most of which would be noticed by any heterocyclic chemist. On numerous occasions the 2,3-double bond of indoles was omitted; furthermore, substituents which occur on the starting systems sometimes are erroneously omitted from the product. The educated reader, however, will not be dissuaded by these typing omissions.

James M. Cook, *University of Wisconsin—Milwaukee*

Maximum Entropy Solutions to Scientific Problems. By Robert M. Bevensee. PTR Prentice Hall: Englewood Cliffs, New Jersey. 1993. xxiv + 194 pp. $60.00. ISBN 0-13-563818-6.

In science we often are confronted with partial or noisy data while observing a system. How can we make a "reasonable" guess regarding the nature of the actual system from such data? The guess must be in agreement with every aspect of the system that we know with certainty. One reasonable way of arriving at a guess is the "Maximum Entropy" (ME) method presented in this book. In the formulation of the theory, observed data is the "Image", the system is the "Object", and aspects we know with certainty are the "Constraints". Since the image is an incomplete description of the object, there are many possible objects that can produce the observed image. If we assume that a particular object is defined by a specific configuration of its constituents (whatever they might be) and if we formulate a way of assigning a probability P_i for each configuration i of the constituents, then we can define an "entropy" $S = -\sum_i P_i \log P_i$ and extremize this quantity, subject to the constraints, just as we do in statistical mechanics. But this entropy is not necessarily the entropy of thermodynamics and is not subject to any general law. Its usefulness is in the results that it produces in giving a reasonable prediction of the object. Bevensee presents many good examples for the application of this basic idea, pointing out the subtleties involved in the mathematical formulation of the problem in various cases. Just as in statistical mechanics, there is a distinction between an ensemble approach (Gibbs method) and the kinetic theory approach (Boltzmann method). Both methods are discussed. It is a book written with clarity, and one can learn the ME method in considerable detail from this book. Because the book is also concise (194 pages), those not familiar with the method will have to fill in the details of some of the calculation to grasp all the important points.

The methods and examples presented in this book are general and applicable to many scientific fields. Chemists dealing with spectral data or imaging will find explicit examples in this work.

The first chapter presents the general theory and the philosophy. It is abstract, and to appreciate it, it is necessary to go through some of the examples that are presented in later chapters. The rest of the chapters are examples of applications with increasing complexity. They include estimating the radial distribution of the density of the earth given the mass, radius, and the moment of inertia, application to tomography, and spectral frequency resolution. The effects of noise in the data are also considered at various levels of sophistication. For other applications in chemistry, the general theory and examples in this book give a good starting point to formulate the problem in terms of the ME method. The book could be used as a text for an advanced graduate course though it does not contain any exercises.

While reading this book I often felt that the author could have presented simple examples to illustrate the main strengths and the weaknesses of the ME method before presenting real world applications that have considerable complexity. I must hasten to add that the examples presented are excellent. In the preface, Bevensee compares the ME method with other methods through an amusing dialogue between Mr. Classi (a classical statistician) and Mr. Maxi (a ME analyst). This preface is well worth reading before and after going through some examples.

Dilip Kondepudi, *Wake Forest University*

New Frontiers in Catalysis. Studies in Surface Science and Catalysis. Volume 75, Parts A, B, and C. Edited by L. Guczi (Hungarian Academy of Sciences), F. Solymosi (Jozsef Attila University), and P. Tetenyi (Hungarian Academy of Sciences). Elsevier: New York. 1993. xxx + 2878 pp. $559.50. ISBN 0-444-89621-X.

This book was developed from the Tenth International Congress on Catalysis sponsored by the Council of the Congress on Catalysis, the Hungarian Academy of Sciences, the Chemical Society of Hungary, and IUPAC held in Budapest on July 19–24, 1992. After a preface by the editors, there are 438 chapters in typescript form and an author index. There is no subject index.

Perspectives in Medicinal Chemistry. Edited by Bernard Testa (Universite de Lausanne), Emilio Kyburz (F. Hoffmann-La Roche), Walter Fuhrer (Ciba-Geigy), and Rudolf Giger (Sandoz Pharma). VCH: New York. 1993. xii + 644 pp. $150.00. ISBN 1-56081-252-4.

This book was developed from the invited lectures of the XIIth International Symposium on Medicinal Chemistry held in Basel in September 1992. After a preface by the editors, there are 39 chapters in typescript organized under the following headings: The Future of Medicinal Chemistry; Drugs Acting as Enzyme Inhibitors; Drugs Acting on Receptors; Drugs Acting on Nucleic Acids and Nucleic Acid Processing Enzymes; Drugs Acting on Ion Channels; Other Therapeutic Approaches; Drug Design and Targeting; and Molecular Toxicology. There are also an author and a subject index.

Magnetic Resonance Microscopy. Methods and Applications in Materials Science, Agriculture, and Biomedicine. Edited by Bernhard Blumich (Max-Planck Institut) and Winfried Kuhn (Frauenhofer Institut). VCH: New York. 1992. x + 604 pp. $180.00. ISBN 1-56081-202-8.

This book was developed from lectures given by NMR and EPR microscopists at the First International Conference on NMR Microscopy held in Heidelberg in September 1991. After a preface by the editors, there are 36 chapters organized under the following headings: Imaging Methods and Commercial Aspects; Materials Science; Flow and Diffusion; Plants and Agriculture; Biomedicine; and Quot Sunt Anni (an after-dinner speech on Magnetic Resonance Reflections). There is also a subject index.

Bioinorganic Chemistry of Copper. Edited by Kenneth D. Karlin and Zoltan Tyeklar (The Johns Hopkins University). Chapman Hall: New York. 1993. xvi + 506 pp. $69.95. ISBN 0-412-03631-2.

This book is a collection of papers concerned with the chemistry and biology of copper as it pertains to biological systems. After a list of contributors and a preface by the editors, there are 39 chapters in typescript form organized under the following headings: Copper Proteins and Complex Spectroscopy; "Blue" Copper Proteins and Electron Transfer; Natural and Synthetic Regulation of Gene Expression; Hemocyanin and Copper Monooxygenases; Copper-Mediated Redox/Oxidative Pathways; Dioxygen-Binding and Oxygenation Reactions; Nitrogen Oxide (NO_x) Chemistry and Biochemistry; and Copper Oxidases. There is also a subject index.

Making Light Work: Advances in Near Infrared Spectroscopy. By Ian Murray (The Scottish Agricultural College) and Ian A. Cowe (Scottish Crop Research Institute). VCH: New York. 1992. xiv + 652 pp. $180.00. ISBN 1-56081-264-8.

This book was developed from the 4th International Conference on Near Infrared Spectroscopy held in Aberdeen, Scotland, on August 19–23, 1991. After a preface by the editors, there are 98 chapters on the recent developments in near infrared spectroscopy, with emphasis on applications for agriculture. There are also a list of delegates and a subject index.

The Concise Encyclopedia of Magnetic and Superconducting Materials. Edited by Jan Evetts (University of Cambridge, U.K.) and Executive Editor, Robert W. Cahn, FRS (University of Cambridge, U.K.). Pergamon Press: Oxford, U.K. 1992. xxii + 704 pp. $250.00. ISBN 0-08-034722-3.

This book is a supplementary publication for the Encyclopedia of Materials Science and Engineering and compiles literature that covers all the major aspects of the science and technology of magnetic and superconducting materials, with an emphasis given to materials science and technology. Approximately one third of the articles are from the Encyclopedia of Materials Science and Engineering (published in 1986) with updates as necessary. The articles were selected for coverage of three areas: classes of materials; material properties and phenomena that are common to different materials; and applications. After prefaces by the editors, there are a guide to the encyclopedia, an alphabetical list of articles, a list of contributors, and a brief subject index.

Recent Advances in the Chemistry of Anti-Infective Agents. Edited by P. H. Bentley (Smith and Nephew Research, Ltd.) and R. Ponsford (SmithKline Beecham Pharmaceuticals). Royal Society of Chemistry: Cambridge, U.K. 1993. viii + 360 pp. £55.00. ISBN 0-85186-245-4.

This book was developed from the first International Symposium on Recent Advances in the Chemistry of Anti-Infective Agents sponsored by the Fine Chemicals and Medicinals Group of the Industrial Division of the Royal Society of Chemistry held in Cambridge on July 5–8, 1992. After a preface by the editors, there are 24 chapters in typescript form organized under the following headings: Chemistry of Antibacterials/Antibiotics; Chemistry of Antifungals; and Chemistry of Antivirals and Antiparasitics. There is also a short subject index.

Carbohydrates and Carbohydrate Polymers. Analysis, Biotechnology, Modification, Antiviral, Biomedical, and Other Applications. Edited by Manssur Yalpani (NutraSweet Co.). ATL Press: Mount Prospect, Illinois. 1993. v + 315 pp. $175.00. ISBN 1-882-360-40-0.

This book was developed from the Symposium on Industrial Polysaccharides sponsored by the Division of Carbohydrate Chemistry of the American Chemical Society (204th National Meeting of the ACS) held in Washington on August 24–25, 1992. After a preface by the editor, there are 29 chapters organized under the following headings: Biotechnology; Antitumor and Antiviral Activities; Biomedical Applications; Analysis and Conformation; Chemical Modifications; and New Applications. There is a short subject index.

Modern Methodology in Organic Synthesis. Edited by T. Shono (Kyoto University). VCH: New York. 1992. xiv + 464 pp. $145.00. ISBN 1-56081-205-2.

This book was developed from the International Symposium on OrganicReactions sponsored by the Chemical Society of Japan and the National Science Council held in Kyoto on August 19–21, 1991. After a list of contributors and a preface by the editor, there are 27 chapters in typescript form that are concerned mostly with electroorganic chemistry. There is also a short subject index.

Inorganic Chemicals Handbook. Volumes 1 and 2. Edited by John J. McKetta (The University of Texas at Austin). Dekker: New York. 1993. xxii + 1456 pp. $370.00 (two-volume set). ISBN 0-8247-8686-6 and 0-8247-8687-4.

These two volumes are part of a three-volume set designed to present information on common inorganic chemicals including manufacturing, design, and operation. After the preface by the editor, a list of contributors, a table of conversion units, and a table of cost updates, there are 32 chapters in Volume 1 covering the topics aluminum through chloralkali (chlorine) and 39 chapters in Volume 2 continuing chloralkali subtopics and on through potash. Volume 3, which is not yet published, will cover the remaining subjects of the alphabet. Volume 2 has an index.