addition chemistry. The development of a bidentate phosphite ligand permits successful cycloadditions that otherwise fail and, as such, enlarges significantly the utility of this methodology.

Acknowledgment. We thank the National Science Foundation and the National Institutes of Health, General Medical Sciences Institute, for their generous support of our programs. Mass spectra were provided by the Mass Spectrometry Facility, University of California—San Francisco, supported by the NIH Division of Research Resources.

Supplementary Material Available: Characterization of **2–4**, **6–17**, **20**, **23**, and **24** (6 pages). Ordering information is given on any current masthead page.

Additions and Corrections

Olefin Formation in the Oxidative Deformylation of Aldehydes by Cytochrome P-450. Mechanistic Implications for Catalysis by Oxygen-Derived Peroxide [*J. Am. Chem. Soc.* **1991**, *113*, 5886–5887]. ALFIN D. N. VAZ,* ELIZABETH S. ROBERTS, and MINOR J. COON

The following information was inadvertently omitted during publication: formate, the product formed in the decarbonylation of cyclohexanecarboxaldehyde along with cyclohexene by cytochrome P-450, was derivatized as the *p*-nitrobenzyl ester and identified by mass spectrometry.

Palladium-Mediated Stereocontrolled Reductive Amination of Azido Sugars Prepared from Enzymatic Aldol Condensation: A General Approach to the Synthesis of Deoxy Aza Sugars [*J. Am. Chem. Soc.* **1991**, *113*, 6678]. TETSUYA KAJIMOTO, LIHREN CHEN, KEVIN K. K.-C. LIU, and CHI-HUEY WONG*

The configuration at C-3 of compound **4b** should be inverted. Compound **1b** should have the inverted configuration at the corresponding carbon. This compound was prepared from Fuc-1-P aldolase instead of Rham-1-P aldolase.

*Book Reviews**

The Alkaloids, Chemistry and Pharmacology. Volume 39. Edited by A. Brossi (National Institutes of Health). Academic Press, Inc.: San Diego, CA. 1991. xi + 364 pp. $95.00. ISBN 012-469539-6.

The first extremely well written chapter on the betalains was prepared by W. Steglich and D. Strack. The betalains have, of course, received attention by the food industry for use as nonmutagenic color additives. The present chapter highlights recent findings in the area, critically surveying the present state of betaiain chemistry and describing the distribution of betalains in plants. The chapter is replete with an interesting compilation of isolation methods, chemical degradations, spectroscopic details, reaction mechanisms, and biological facts. An encyclopedic listing of the individual pigments is provided in Part B of this chapter, while synthesis, chemotaxonomy, and biosynthesis are found in the latter sections.

The second chapter, by W. Ross, provides a description of the biogenic benzodiazepine alkaloids. These natural compounds are to be contrasted in terms of biological activity with their synthetic relatives, which possess tranquilizing properties. Structure elucidation, biosynthesis, metabolic conversion to quinolines, physiological aspects, and biological activity are covered. Interestingly, of the various members of this family, only asperlicin and specifically analogues of it appear to hold promise as pharmacological agents. This chapter is again extremely rich in detail.

Chapter 3, by L. Castedo and G. Tojo, concerns a class of alkaloids that lacks a nitrogen heterocycle, the phenanthrene alkaloids. An encyclopedic listing of members of this family together with spectral data make up about 20 pages of the chapter. The synthesis of these compounds is considered next and provides some interesting transformations. The pharmacology of these compounds is covered in one single (the last) page of the chapter.

The vegetable drug khat, which is chewed by habitants of several countries for its stimulant properties, is covered in Chapter 4, prepared by L. Crombie, W. M. L. Crombie, and D. A. Whiting. The synthesis and pharmacology of the khatamines are covered first, then the more complex structures, the cathedulin alkaloids, and synthetic work relevant to these alkaloids is detailed next. The chapter is succinct and ends abruptly.

As stated by the authors, H. Hashimoto, K. Kawanishi, and M. Ichimaru, Chapter 5 reviews biological and biochemical investigations of plants from five families using histochemical and other techniques. The authors also describe their apparatus used for histochemical chromatography and its application to plant and animal tissues. While interesting, this particular chapter seems somewhat out of sync with the foregoing ones, especially in view of the more chemical orientation of the earlier chapters. It would seem that this chapter should have been located at the end of the volume or perhaps better published together with like chapters in a separate volume.

Chapter 6, by S. Blechert and D. Guenard, focuses on the structure and isolation of the taxus alkaloids and updates the earlier review of Suffness and Cordell published in Volume 25 of *The Alkaloids*. Major portions of the chapter are devoted to semisynthesis protocols for producing taxol analogues, as well as synthetic efforts aimed toward constructing the tricyclic taxane framework in the laboratory. Total synthesis in this area is, of course, a difficult feat to achieve in view of both the unusual ring system and complex functionality present in the taxanes. The potential of taxol in the treatment of solid tumors and adult leukemia will undoubtedly lead to continued synthetic pursuits. The problems of obtaining adequate supplies of the compound from the yew tree is discussed in the pharmacology section of the chapter.

The last chapter, by G. W. Gribble, concerns the ellipticine alkaloids and related materials and also updates a chapter appearing in Volume

---

*Unsigned book reviews are by the Book Review Editor.

25 of *The Alkaloids*. A major section of the chapter details synthetic work on ellipticine and analogues published between the years of 1985 and 1989. For a "flat" molecule devoid of any stereochemistry, the subject of the article is still quite rich in novel synthetic transformations. The last portions of the chapter provide extensive coverage of the mechanism of action, structure–activity relationships, toxicology, etc. for these molecules. It is clear that more synthetic work will need to be done to generate a successful phase II clinical candidate for cancer based upon the ellipticine skeleton.

Overall, this book continues in the tradition of high quality which one has come to expect of the volumes in this series. This book will be a welcome addition to any chemistry or pharmacology library. The volume will serve as a valuable reference source to researchers wishing to be "brought up to speed" in any of the specific areas of alkaloid chemistry highlighted above.

Alan P. Kozikowski, *Mayo Clinic Jacksonville*

Phthalocyanines: Properties and Applications. Edited by C. C. Leznoff and A. B. P. Lever (York University). VCH: New York. 1989. 436 pp. $135.00. ISBN 0-89573-753-1.

This is the first volume of a series intended to provide up-to-date information on all aspects of phthalocyanine chemistry. The monograph consists of six chapters; the first reviews phthalocyanine synthesis, the third details spectral properties, and the remaining four discuss applications.

Appropriately, Chapter One is a comprehensive review of the synthesis of metal-free phthalocyanines. The chapter compiles methods from 1909 to 1989 and in tabular form indicates the level of phthalocyanine characterization and purification (often absent in much of the extensive existing phthalocyanine literature). The work is well referenced and complete with phthalocyanine structures. The chapter is organized by phthalocyanine substitution pattern: tetra, octa, and hexadeca. Special topics include the tetrasubstituted single isomer problem, multinuclear phthalocyanines, and polyaromatic and heterocyclic aromatic analogues. The concise review is a valuable source of synthetic methods for anyone interested in phthalocyanine preparation.

The second chapter reviews the preparation and properties of phthalocyanines in polymeric phases with an emphasis on the development of new materials based on the unique aspects of phthalocyanines. The organization is by polymer type: phthalocyanine polymers (polymerization through the ligand or coordinated metal, cofacially stacked), phthalocyanines covalently linked to polymer backbone (through either the ligand or metal), charged phthalocyanines electrostatically attached to polymer, and polymers into which phthalocyanines have been physically incorporated. Application of polymer/phthalocyanine combinations to energy transport (conductivity), photovoltaic cells, optical information storage, and process catalysis are mentioned.

The absorption and magnetic circular dichroism (MCD) spectral properties of phthalocyanines are reviewed in Chapter Three. This chapter, the largest of the volume, is unique among spectral reviews. Absorption and MCD spectra for over 20 species are presented for direct comparison. An introduction to MCD theory, experimental practices, and its contribution to the understanding of phthalocyanine spectra is provided. Phthalocyanine electronic theory, structure, and spectra are presented and compared to that of the porphyrins. Special topics include gas- and solid-phase spectra, charge-transfer spectra, spectral deconvolution, and spectral effects of aggregation. The chapter concludes with a compendium of spectral properties of main group, transition metal, and lanthanide/actinide metal phthalocyanines. An extensive table (27 pages) of band positions for phthalocyanine complexes organized by central metal atom provides a convenient reference for evaluating metal, ligand, or solvent effects on phthalocyanine electronic spectra.

The photochemical properties of metallophthalocyanines in solution and characteristic redox reactivity is the subject of Chapter Four. Photophysical properties such as quantum yields of fluorescence and phosphorescence, singlet and triplet energies and lifetimes, rates of intersystem crossing, and redox properties are tabulated. The review distinguishes the photochemistry of phthalocyanine monomers from that of dimers.

Chapter Five reviews the use of phthalocyanine films in chemical sensors. The modulation of the semiconducting properties of certain phthalocyanines upon absorption and desorption of gases has led to their use as chemical sensors. The phthalocyanine–gas interaction is the basis for a number of sensing applications. The nature of sensing devices and the preparation of phthalocyanine-based chemically sensitive coatings are described. The performance of sensors with respect to sensitivity, specificity, reversibility, response time, and stability is discussed in terms of phthalocyanine structure, coordinated metal and macrocycle substituents.

The volume concludes with a review of phthalocyanines in photobiology. The chapter describes the role of phthalocyanines in the rapidly expanding field of photodynamic therapy. Phthalocyanine photobiology is introduced with a historical overview and a discussion of the properties of phthalocyanines that make them attractive alternatives to porphyrins as phototherapeutics. Phthalocyanine photophysics and reactions with molecular oxygen are reviewed to provide an insight into the mode of photodynamic action. The bulk of the chapter critically surveys phthalocyanine-mediated phototoxicity in cultured cells. The effect of phthalocyanines on different cell populations and different phthalocyanines on cell populations is shown. The mechanism and factors effecting directed cell killing are addressed. The affinity of phthalocyanines to biological tissues is presented along with toxicity data. A tabulation of in vivo photodynamic therapy experiments with phthalocyanines is given.

The editors have succeeded in collecting reviews to provide a strong start for a series on phthalocyanines. The volume is a welcome addition to the previous phthalocyanine monographs by F. H. Moser and A. L. Thomas (*Phthalocyanine Compounds*, Rheinhold: New York, 1963; and *The Phthalocyanines, Volumes I and II*, CRC: Boca Raton, 1983) and is a valuable resource on the current state of phthalocyanine science and technology.

George E. Renzoni, *Ultra Diagnostics Corp.*

Quantum Chemistry of Organic Compounds—Mechanisms of Reactions. By V. I. Minkin, B. Ya. Simkin, and R. M. Minayaev (Rostov University, USSR). Springer-Verlag: Heidelberg and New York. 1990. xv + 270 pp. $89.00. ISBN 0-387-52530-0.

This monograph deals with the calculation of potential-energy surfaces (PES) and the application of PES to the understanding of reaction mechanisms. The preface states that this book is addressed to "the broad community of organic and physical chemists engaged in studying reactivity and reaction mechanisms". The publisher claims that it was written as a textbook for undergraduates, but in the U.S. it would probably be more appropriate for a graduate-level course.

The book is divided into two parts. The first four chapters describe the main characteristics of PES, the ab initio and semiempirical quantum chemical methods available for the calculation of PES, the inclusion of solvent effects, and the use of frontier-orbital theory as a guide for choosing reaction paths to explore. The second half of the book consists of six chapters describing both computational and experimental investigations of specific reactions—electrophilic and nucleophilic substitution and addition reactions, a separate chapter on intramolecular variants, radical and carbene reactions, electron and proton transfer reactions, and pericyclic reactions.

The authors provide a good overview of the calculations done through 1987, in order to understand the mechanisms of organic reactions, both in the gas phase and in solution. Discussions of the relevant experimental data are nicely integrated with the computational results. The limitations of different types of calculations are clearly pointed out.

Despite the reviewer's favorable reaction to the goals of the book and the author's general success in achieving them, the monograph is flawed by a number of errors, starting with the introduction. It provides an overview of the twelve chapters that the book is purported to contain; but two of these twelve were apparently incorporated into others, for the book contains but ten chapters.

Typographical errors occur in contexts where they could be very misleading to a naive reader who was not already familiar with the material that is covered. For example, on p 44 the calculated angle of approach of a hydride nucleophile to the plane of a carbonyl group is given as 170°, rather than as the 107° that was actually computed. Typographical errors in Table 2.1 on p 68 would lead to reader to believe that RHF/4-31G calculations find staggered ethane to be about 1 hartree more stable than eclipsed ethane and that at the RHF/6-31G** and MP2/6-31G* levels a D_{4h} geometry, with four bridging hydrogens, is the ethane isomer that is computed to be lowest in energy.

More disturbing are passages that suggest genuine misunderstandings on the part of the authors. An example is the authors' discussion of the singlet–triplet splitting in methylene, which appears, rather incongruously, in the midst of the section on semiempirical quantum chemical methods. The authors state that photoelectron spectroscopy initially gave a value of 8 ± 1 kcal/mol for the singlet–triplet splitting, rather than the 19.4 kcal/mol that was actually obtained by Lineberger and co-workers and which is quoted in the 1985 *Science* article by Goddard that the authors cite. Because the authors apparently misread this article, they write, "The difference between theory and experiment was insignificant...". The reader of this section of the book may well wonder why a difference between 10.4 kcal/mol and 8 ± 1 kcal/mol should result in a bet of several bottles of champagne as to who was correct and why a subsequent experiment, which gave a value of 9.0 kcal/mol, should result in the experimentalists having to pay up.

Another apparent misunderstanding on the part of the authors is evident in their description on p 67 of the meaning of the nomenclature for Pople's split-valence basis sets, which are designated M-NPG. The authors write, "Each inner AO is replaced by M GTO orbitals, the valence 2s orbital—by N, while the p orbital—by P GTO functions." This description is incorrect, since in an M-NPG basis set the s and p orbitals in the valence shell are each represented by one set of N, contracted, Gaussian functions plus another set of P Gaussians that are more diffuse. The appearance of such an obvious misstatement in a book that discusses extensively the results of calculations with Pople's split-valence basis sets undermines the credibility of the authors.

This monograph would have profited from more careful editing and checking. Because of the errors that it contains, I would hesitate to recommend this book as the text for a course in quantum chemistry. However, it is useful as a guide to the literature of calculations on organic reactions up to the mid-1980s; and the level of the authors' discussions of the topics covered is usually much higher than the errors cited above might suggest.

Weston Thatcher Borden, *University of Washington*

Sulfur Analogues of Polycyclic Aromatic Hydrocarbons (Thiaarenes). By Jürgen Jacob (University of Hamburg). Cambridge University Press: Cambridge, New York, and Melbourne. 1990. xiv + 281 pp. $110.00. ISBN 0-521-30120-3.

This is the fourth volume in the series of Cambridge Monographs on Cancer Research reviewing the environmental occurrence and chemical and biological properties of important classes of potentially mutagenic and carcinogenic compounds. Previous volumes have covered the benzopyrenes, cyclopenta[*a*]phenanthrenes, and benz[*a*]anthracenes; this is the first to cover a heterocyclic system. The stated intent is to cover compounds that have been detected or are likely to be found in the environment as well as compounds related to them on which substantial information was obtainable. Literature coverage from 1948 through 1986 appears to be quite complete. An unfortunate delay in publication widened the time gap between the literature survey and appearance of the book. Nevertheless, the amount of data included and the concise manner in which it is organized make this volume a useful addition to the literature on polycyclic aromatic sulfur compounds.

The book is organized into two main chapters plus a list of references, alphabetical by first author, and a general index. The general chapter on thiaarenes begins with a concise summary of IUPAC and Chemical Abstracts nomenclature for these polycyclic aromatic compounds. This is followed by surveys of analytical and spectroscopic methods for detection of these compounds, the occurrence of thiaarenes in the environment, and the biological and metabolic activity of those compounds which had been reported. Because of rapid advances in this area, it is here that the lack of recent literature is most apparent. Much of the data in this chapter is organized into 24 tables and 11 figures. Both general and specific synthetic methods for the preparation of many thiaarenes are covered in tables and short summaries.

The long chapter on specific compounds summarizes information on 236 polycyclic thiaarenes containing from two to ten rings. Compounds are systematically arranged by increasing ring size and number of rings such that individual compounds may be easily located without use of the index. A structural formula with all positions numbered, the systematic name, whole number molecular weight, and molecular formula are shown for each compound discussed. Occurrence in the environment, chemical reactivity, biological activity, synthesis, and analytical methods are summarized for each ring system, and comparisons are made to related compounds. Many synthetic sequences from the literature are shown in detail, making this a useful compilation for investigators wishing to prepare these unusual compounds for biological testing or verification of chromatographic detection.

This book brings together a large amount of information on compounds that may be unfamiliar to the non-specialist. It will be a useful source of basic information and an entry into the primary literature through 1986 for workers in environmental chemistry, toxicology, and cancer research. Fuel scientists concerned with sulfur removal from fossil fuels also will find the assembled information welcome.

David H. Buchanan, *Eastern Illinois University*

Liquid Chromatography/Mass Spectrometry Techniques and Applications. By Alfred L. Yergey (National Institutes of Health), Charles G. Edmonds (Battelle Pacific Northwest), Ivor A. S. Lewis (King's College), and Marvin L. Vestal (Vestec Corporation). Plenum Press: New York and London. 1990. ix + 306 pp. $65.00. ISBN 0-306-43186-6.

This nine-chapter book covers specific interfaces, techniques, and applications used in liquid chromatography/mass spectrometry (LC/MS). Eight chapters are devoted to text (148 pages), while the remaining chapter is an extensive bibliography. Descriptions and operating principles of direct introduction, continuous flow fast atom bombardment (FAB), supercritical fluid, moving belt, thermospray, and particle beam interfaces are contained in chapters two through five. Applications of the thermospray technique and, to a lesser extent, the other LC/MS interfaces are covered in chapters six through eight. In these latter chapters the authors focus on the thermospray technique reflecting both the popularity of this interface and the experience of the authors. Comparisons to FAB, atmospheric pressure (APl), and electrospray ionization are brief, and of the mass spectra shown, two-thirds are of the thermospray variety. Thermospray ionization theory is discussed in detail and is especially recommended for those interested. The descriptions and graphs provided in the thermospray section are enlightening. Although the thermospray chapter is particularly informative, the particle-beam chapter is sparse and warrants more attention.

The authors devote the application section of the book to LC/MS of biological molecules such as nucleic acids, amino acids, peptides, proteins, and sugars. Chapters six through eight clearly demonstrate a depth of knowledge in these areas. Other conjugated biomolecules such as glucuronides and acylcarnitines are covered in chapter seven. Because of the immense interest in the mass spectrometry of biomolecules, these chapters are timely; however, the book does not cover the LC/MS of drugs or pesticides in any detail. One would expect such a coverage based on the general title of the book.

As stated by the title, this book focuses on techniques and applications of LC/MS, and while the omission of a discussion of LC and MS theory is understandable, the lack of certain relevant topics is surprising. Appropriate for this volume, but which are not included, are discussions of the LC or MS instrumentation employed in the various experiments presented, as well as the advantages and disadvantages of different types of mass spectrometers used in LC/MS. Also omitted is a chapter on the electrospray inlet/ionization technique. The advantages of LC/MS/MS are mentioned, but could bear expansion to be more useful.

The bibliography is outstanding and consists of over 1200 references. It is well-organized, thorough, and so vast that it amounts to one-half of the book.

This book is primarily recommended to the scientist interested in thermospray and should be in the library of those with a specific interest in LC/MS of biological compounds by this technique. Although the text is weighted toward thermospray, those interested in direct inlet and moving belt interfaces would also find it informative.

Mark E. Bier, *Finnigan Corporation*

Synthetic Zeolites. Volume I: Crystallization. Volume II: Adsorption Properties. By S. P. Zhdanov, S. S. Khvoshchev, and N. N. Feoktistova (Institute of Silicate Chemistry, USSR Academy of Sciences). Gordon and Breach: New York. 1990. Volume I: xiii + 296 pp. $195.00. ISBN 2-88124-720-2. Volume II: xiii + 724 pp. $260.00. ISBN 2-88124-721-0. Two-volume set: $364.00. ISBN 2-88124-675-3.

This two-volume set is an English translation of Russian monographs on Synthetic Zeolites. These works are written by several prominent Russian scientists who have extensive background in zeolite science and technology. The volumes summarize the Russian and international literature in the area of synthetic zeolites and provide a rare but welcome access to Russian work in the field. Although there are numerous translational errors, they do not detract the reader from any essential information. Both volumes survey the Russian and international literature through 1986 and 1984, respectively.

Volume I overviews the literature on zeolite synthesis. It contains seven chapters, three appendices, and 273 references. Chapter 1 gives a brief introduction to zeolites. Chapters 2 and 3 deal with the kinetics and mechanism, respectively, of crystallizing zeolites from alkaline aluminosilicate gels. Next, the feasibility of controlling the zeolite synthesis process by the purposeful manipulation of synthesis parameters is addressed in Chapter 4. Chapter 5 introduces the topic of high silica zeolites and, as expected, primarily discusses the synthesis of ZSM-5. Chapters 6 and 7 are concerned with post-synthetic treatments of zeolites: namely, ion exchange and dealumination, respectively. The topics covered on dealumination concern only aluminum removal techniques, and methods that replace aluminum with silicon, e.g., $SiCl_4$ treatments, are not discussed. Finally, in the appendices, "recent" developments such as aluminophosphate and silicoaluminophosphate molecular sieves are outlined.

Volume II surveys the literature on the adsorption properties of zeolites. It contains nine chapters, nine appendices, and 822 references. Chapter 1 deals with the adsorption characteristics of sodium zeolites, e.g., zeolites A, X, and Y. The following five chapters then describe the adsorption properties of these important zeolites in their various forms; Chapter 2, alkali cations; Chapter 3, Ca^{+2} replacement of Na^{+}; Chapter 4, alkaline earth cations; Chapter 5, rare earth metal cations; and

Chapter 6, transition metal cations. Chapter 7 completes the series of chapters dealing with the adsorption properties of the various cation forms of zeolites by describing the adsorption properties of zeolites that have been decationated. Finally, Chapters 8 and 9 deal with zeolites that have higher silicon-to-aluminum ratios. These chapters describe the adsorption properties of dealuminated and pentasil zeolites, respectively. The volume ends with a series of nine appendices which are devoted to recent developments for the topics covered in each of the nine main chapters. In general, the text is extremely well referenced and contains quite exhaustive heat of adsorption data.

This two-volume set is the most extensive coverage of zeolite synthesis and adsorption properties currently available. Although the references are pre-1987, the inclusion of the Russian literature make these texts unique.

Mark E. Davis, *California Institute of Technology*

Stereochemistry of Organometallic and Inorganic Compounds. Volume 3: Chemical Bonds—Better Ways to Make Them and Break Them. Edited by Ivan Bernal. Elsevier: Amsterdam and New York. 1989. ix + 468 pp. $153.75. ISBN 0-444-88082-8.

A diverse set of topics are covered in this volume and, while the title is somewhat presumptuous, a good effort has been made in describing interesting chemical transformations that involve transition metals. In order, the chapters deal with heterometallic clusters in catalysis; the conformational analysis of groups bound to $[(C_5H_5)Fe(CO)PPh_3]$, steric and electronic effects on photochemical reactions of metal–metal bonded carbonyls, polyhedral skeleton electron-pair theory, and the Sakurai reaction.

The use of clusters in catalysis has been touted for nearly 20 years; the chapter on heterometallic clusters provides a comprehensive review of catalytic reactions in which mixed metal clusters, either generated in situ or presynthesized, are implicated in the catalysis. The best evidence for intact heterometallic clusters is provided by those cases that show a strong synergistic effect. Also included in the review are supported mixed metal clusters. Immobilization of clusters and their subsequent decomposition to metal particles may yet become a viable route to heterogeneous bimetallic catalysts.

The chapter on the polyhedral skeleton electron-pair theory focuses the synthesis, bonding, and reactivity of alkyne-containing clusters. The emphasis here is on the cluster chemistry rather than the chemistry of the alkyne.

Recent advances in the mechanistic aspects of the photochemistry of metal–metal bonded carbonyls is reviewed in Chapter 3. The implication of $19e^-$ intermediates in these reactions is nicely summarized. Use of reaction pathways that lead to $19e^-$ intermediates may certainly be classified as an excellent way to make and break metal–ligand bonds.

The organometallic fragment $[(C_5H_5)Fe(CO)PPh_3]$ is a rare example of a simple widely applicable chiral auxiliary for organic synthesis. A detailed review of the structures and conformations of both the organometallic fragment and the organic groups bonded to it is provided in Chapter 2. Examples of stereoselective transformations of substituents bonded to the auxiliary and the origin of enantioselection are discussed.

In the Sakurai reaction, electrophiles are activated toward allylsilane reagents by the addition of Lewis acids such as titanium tetrachloride. The methodology allows carbon–carbon bond formation under mild conditions with a high degree of regio- and stereochemical control. A comprehensive review of the transformations possible by the Sakurai reaction is provided in Chapter 5.

Several of the chapters in this volume indeed give insight to better ways to make and break bonds. It is unlikely that a single reader will require the information in all five chapters, and the cost is high for individuals who are interested in just one or two chapters. The volume can be recommended to libraries of research institutions where a diverse group of researchers can gain access to the information.

Brian E. Hanson, *Virginia Polytechnic Institute and State University*

Nomenclature of Inorganic Chemistry: Recommendations 1990. International Union of Pure and Applied Chemistry. Edited by G. J. Leigh. Blackwell Scientific Publications: Oxford, London, and Cambridge, MA. 1990. xxiv + 289 pp. $27.50 (paperback). ISBN 0-632-02494-1.

Nomenclature has been an integral part of modern chemistry since its very inception. In fact, the publication of Guyton de Morveau, Lavoisier, Berthollet, and de Fourcroy's *Méthode de nomenclature chimique* (1787), which replaced the ambiguities of alchemical and phlogistic names with those incorporating the reforms of the "new chemistry", preceded by 2 years the publication of Lavoisier's *Traité élémentaire de chimie* (1789), universally regarded as marking the birth of modern chemistry. In accord with the crucial importance of nomenclature, in 1913 the Council of the International Association of Chemical Societies appointed a commission on inorganic and organic nomenclature, but its activities were abruptly ended by World War I. In 1921 its successor organization, the recently formed International Union of Pure and Applied Chemistry (IUPAC), appointed commissions on inorganic, organic, and biological chemistry.

The first report of the IUPAC's Commission on the Nomenclature of Inorganic Chemistry (CNIC), known as the "1940 Rules", was published in the leading journals of different countries, e.g., *Ber.* **1941**, *A73*, 53; *J. Chem. Soc.* **1940**, 1404; and *J. Am. Chem. Soc.* **1941**, *63*, 889. These rules, revised and rewritten, were published as a small book, *Nomenclature of Inorganic Chemistry 1957*; Butterworths: London, 1959; ix + 93 pp; 15.3 × 24.7 cm, known as the "1957 Rules" or the "Red Book" from the color of its cover. A second revision, *Nomenclature of Inorganic Chemistry: Definitive Rules 1970*; Pergamon: Oxford, 1971; xi + 110 pp; 15.8 × 25.2 cm, was more than twice as long as the 1957 Rules because, unlike the latter, it no longer included a French version on each right-hand page. The 1970 Rules were supplemented by a 36-page IUPAC booklet, *How to Name an Inorganic Substance*, and by articles in various publications such as the *Journal of Chemical Education's* bimonthly series "Notes on Nomenclature" beginning in July, 1971 (Fernelius, W. C.; Loening, K.; Adams, R. M. *J. Chem. Educ.* **1971**, *48*, 433).

Since the appearance of the 1970 Rules, many new compounds have been prepared, some of which are difficult to name with these rules because they contain new types of bonding or structures. Therefore trivial and local systems sprouted, especially for coordination and boron compounds, a situation that emphasized the need for a systematic, widely comprehensible nomenclature. Consequently, in 1978 the IUPAC CNIC decided to replace the 1970 Red Book. The result is "not a revision...but a completely new version presented in a new way which it is hoped will be much more useful to the general reader." Many of the new fields of chemistry are very highly specialized and need complex types of names. Therefore the new edition is scheduled to appear in several parts.

Part I, under review here, required 15 years to produce and is almost three times as long as its predecessor. It is concerned with the basic principles of nomenclature for the fundamental areas of inorganic chemistry, and the principal authors, thirteen eminent chemists from the United States, the United Kingdom, France, the Netherlands, and Hungary, hope that "its general principles will not be undermined, and that it should retain its currency for many years." Part II will deal with more specialized areas such as quasi-single strand inorganic polymers, organometallic and labeled compounds, and polyoxoanions; some of its contents have already been published in *Pure and Applied Chemistry*. Scheduled for publication in the near future, it will probably require more frequent revision because of its more specialized nature. Subsequent volumes are also planned.

The 1990 edition is presented in an instructional format with numerous examples, rather than as a series of numbered rules as in previous editions. After two entirely new concise chapters on the history and usages of inorganic nomenclature, the remaining nine chapters of Part I deal with elements, atoms, groups of atoms, formulas, names based on stoichiometry, solids, neutral molecular compounds, ions, substituent groups, radicals, salts, oxoacids and derived anions, coordination compounds, and boron hydrides and related compounds. Each chapter was written by nominated individuals, assisted by working parties, and was repeatedly reviewed and edited by about 15 CNIC members. British spelling is used consistently.

Because of the conflicting use of A and B notation for groups of elements in the periodic table, the unpopular (at least among my acquaintances) 1–18 designation is presented as the preferred one, but the related controversy and other systems are discussed in an appendix, which concludes that "any ultimate recommendation...must be responsive to the broadest possible constituency" (p 280). Another recommendation likely to be disputed or ignored by chemists is the use of "lanthanoid" and "actinoid", although "owing to wide current use, 'lanthanide' and 'actinide' are still allowed" (p 43) even though "the ending -ide normally indicates a negative ion." Similarly, the system recommended for naming elements of atomic numbers greater than 103 which have not yet been discovered and named by their discoverers (p 37), resulting in such awkward names as ununquadrium (element 114), will probably not find favor with most chemists, who are likely to continue referring to these species by atomic numbers. Other recommended changes include the avoidance of the term "radical" in anything other than the context of free radicals, the replacement of the terms "Stock number" (Kauffman, G. B.; Jørgensen, C. K. *J. Chem. Educ.* **1985**, *62*, 243) and "Ewens-Bassett number" (Kauffman, G. B.; Jørgensen, C. K. *J. Chem. Educ.* **1985**, *62*, 474) by the more readily comprehensible terms "oxidation number" and "charge number," the use of oxide names for anhydrides of fully dehydrated inorganic acids, and the use of configuration indexes for *fac* and *mer* isomers "for precise nomenclature purposes."

As expected for such a thoroughly reviewed and edited volume, the errors are few and minor, e.g., Gebieten for Gebiete (p 2), Jorisson for Jorissen, Damens for Damiens (p 8), and entitled for titled (p 9). A useful companion volume dealing with further types of species and providing additional examples has recently been published (Block, B. P.; Powell, W. H.; Fernelius, W. C. *Inorganic Chemical Nomenclature: Principles and Practice*; American Chemical Society: Washington, DC, 1990; for a review see: Kauffman, G. B. *J. Chem. Educ.* **1991**, *68*, A158). CNIC Chairmen Joseph Chatt, Yves Jeannin, and Daryle H. Busch and their dedicated band of collaborators, including editor G. J. Leigh, deserve our profound thanks for melding "established and traditional practices and systems of nomenclature" into a reference book that should be definitive for many years to come.

George B. Kauffman, *California State University, Fresno*

Toxicological Chemistry: A Guide to Toxic Substances. By Stanley E. Manahan (University of Missouri—Columbia). Lewis Publishers, Inc.: Chelsea, Michigan. 1988. 310 pp. $45.00. ISBN 0-87371-149-1.

Professor Stanley Manahan has written several books. His first, *Environmental Chemistry*, was an absolute gem and early classic in the field. His latest, *Toxicological Chemistry*, is also quite good, but perhaps more useful as a reference work than as a text. For chemists its real strength is its reference value. In fact, every chemical department and library, as well as safety officers, project directors, and pertinent administrators, would do well to have this book.

The work is a ready compendium of toxicological substances ranging from alcohols to venoms. The index contains about 700 entries including asbestos, benzene, caffeine, cocaine, lead, ozone, pesticides, radon, thalidomide, etc. In some cases textual information is scant—for example, hexachlorophene rates less than five lines—but in others coverage is adequate (TCDD gets a full page). There are 14 chapters. The first four deal with toxicology in general (except for a nearly useless Chapter 2 on general chemistry). The remaining 10 chapters cover the following groups: toxic elements, organometallics and organometalloids, toxic inorganics, toxic organics, oxygen compounds, nitrogen compounds, organohalides, sulfur compounds, phosphorous compounds, and toxic natural products.

As a textbook for a course dealing with toxicology, I think the book considerably lacks depth, but it seems satisfactory for a survey course within an environmental studies program where students have limited science backgrounds, particularly if supplementary material is used.

From the point of view of a chemist active in research and instruction, I find this to be a nice little book. It provides a wide range of information about toxic substances, information that is useful in both the laboratory and classroom. I would recommend it to chemists, biochemists, and environmentalists without hesitation. Compliments to the author.

K. J. Smith, Jr., *SUNY College of Environmental Science & Forestry*

Standard Methods of the Examination of Water and Wastewater. 17th Edition. Edited by Lenore S. Clesceri, Arnold, E. Greenburg, and R. Rhodes Trussel. American Public Health Association: Washington, D.C. 1989. $120.00. ISBN 0-897553-161-X.

This "standard" work dates from 1905 and is jointly published by The American Public Health Association, The American Water Works Association, and The Water Pollution Control Federation. It is directed primarily to applied analytical chemists. Procedures and general discussions are provided. This new edition has been kept up to date by addition of new material, such as supersaturation of dissolved gases, humic substances, and instrumental measurement of very low concentrations of some organic compounds.

Topics in f-Element Chemistry. Volume 2. Synthesis of Lanthanide and Actinide Compounds. Edited by G. Meyer (Hannover) and L. R. Morss (Argonne National Laboratory). Kluwer: Dordrecht. 1991. xvi + 367 pp. $134.00. ISBN 0-7923-1018-7.

What is one to think, when faced with this text? A book, and a large one at that, on the synthesis of lanthanide and actinide compounds? Did you catch that, lanthanides and actinides? Phase diagrams aplenty and sketches of apparatus, but no NMR spectra? Not even an IR spectrum? Fluoro complexes and hydrides, chlorides and bromides, sulfides and selenides, but no cyclopentadienides or β-diketonates?

I have long argued that, in my own field of magnetochemistry, future progress depends on the preparation and characterization of new compounds. The editors and authors of this volume carry this idea to the limit, and I cannot characterize the book better than by repeating the title, Synthesis of Lanthanide and Actinide Compounds. That's what it's all about!

This is a practical book, concerned with things like safety, experimental procedures and conditions, the kinetics of the preparative reactions, and so on. Numerous tables list the necessary crystallographic information.

The book is limited in scope but marvellous for what it does do. It suffers notably in but one respect and that is, there is no formula nor any other index!

Richard L. Carlin, *University of Illinois at Chicago*

Acid–Base Dissociation Constants in Dipolar Aprotic Solvents. By K. Izutsu (Shinsu University). Blackwell Scientific Publications: London and Boston. 1990. 166 pp. $36.00. ISBN 0-632-02875-0.

This "report" in the IUPAC Chemical Data Series is a compilation of acid–base dissociation constants in 12 aprotic nonaqueous solvents (acetone, dimethyl sulfoxide, nitromethane, etc.). The arrangement is tabular, according to solvent in the first instance, and in alphabetical order of the names of the solutes within each table. The tables give the method of determination, ionic strength, temperature, pK_a values, and references. Many supplementary footnotes are included. An alphabetical index of solutes by their usual names (e.g., acetophenone, toliudine) makes it easy to locate information for more than one solvent.

Interfacial Transport Phenomena. By John C. Slattery (Texas A&M). Springer-Verlag: New York. 1990. xvi + 1159 pp. $89.00. ISBN 0-387-97387-7.

This lengthy monograph provides a mathematical description of dynamic interfacial properties, the focus of which is the development and application of momentum, energy and mass transport laws to nonequilibrium, surfactant-adsorbed, two-dimensional interfaces. Aiming at a graduate or post-graduate research audience well-versed in the principles of classical "bulk-fluid" (i.e. three-dimensional) transport phenomena, the book proceeds most emphatically to advance formal, continuum-mechanical arguments (especially prevalent in the description of frame indifference, kinematics of surfaces, and surface material behavior). Such formalism occasionally occurs at the expense of physical clarification of the interfacial phenomena considered. In this latter context, the motivation behind introducing interfacial viscous or interfacial tension gradient effects into the dynamical description of nonequilibrium interfaces (whose physicochemical origin derives physically from concomitant surfactant adsorption or interfacial temperature gradients) is not emphasized until the second half of the book, wherein species and energy transport phenomena receive explicit mathematical attention. On the other hand, the specific application of interfacial phenomena to the displacement and entrapment of underground oil in capillaries is analyzed in a more physically intuitive manner. Perhaps the best example of a proper balance between mathematical and physical descriptions is achieved in the author's treatment of the kinematics and dynamics of moving contact lines (from which line-tension effects are absent), which includes several helpful photographs of equilibrium contact angles taken from the work of Dussan and Davis (1974).

Chapter divisions of the monograph (which parallel those of Professor Slattery's previous book on transport phenomena) are as follows: Kinematics and Conservation of Mass (Chapter 1, 124 pp); Foundations of Momentum Transfer (Chapter 2, 150 pp); Applications of the Differential Balances to Momentum Transfer (Chapter 3, 243 pp); Applications of Integral Averaging to Momentum Transfer (Chapter 4, 138 pp); Foundations for Simultaneous Momentum, Energy, and Mass Transfer (Chapter 5, 248 pp); Applications of the Differential Balances to Momentum, Energy, and Mass Transfer (Chapter 6, 108 pp); Application of Integral Averaging to Momentum, Energy, and Mass Transfer (Chapter 7, 30 pp). A number of homework exercises are interspersed throughout the text, presumably for self-study purposes. However, this is not done in a clearly systematic way, and the exercises do not appear easily accessible to students.

Particularly detailed attention is given to the nonequilibrium thermodynamics of interfaces (Chapter 5), the statics and dynamics of liquid films devoid of interfacial tension gradients or interfacial viscous effects—including the influence of disjoining pressure upon the contact angle (Chapter 3), and interfacial stability criteria (Chapter 5). Other noteworthy topics are less fully developed. In particular, the surface-excess nature of interfacial properties is touched upon in Chapters 1 and 2, where there appear standard surface-excess integral formulations; yet the physical interpretations of the "normal" interfacial coordinate or the justification for the suggested curvature dependence of interfacial properties is not sufficiently outlined. The possible nonmaterial nature of interfaces furthermore receives little emphasis or physical elucidation. In this context, the author's simultaneous discussions of *material* surface particles (as in the kinematical treatment of interfaces in section 1.2) and the *nonmaterial* nature of the interface (whereby mass is transferred across the interface), as on pp 158 and 159, appears confusing to us.

Generally speaking, the book appears appropriate as a reference for researchers in the field of interfacial transport processes. However, certain nontechnical features, including prose style (exceptionally terse), voice (first person, tending to underline the author's strong inclination to draw material exclusively from his own research publications), notation (e.g. the use of parentheses in the super- and subscripts frequently appended to interfacial variables is unnecessarily obfuscating), and organization (seemingly more beholden to the structure of the author's previous text than any inherent line of reasoning suggested by the subject matter itself), may limit the overall acceptability of the book.

The virtue of the book lies in the fact that it is the first that attempts to deal comprehensively with the subject matter encompassed by the title, and this fact alone suggests that all mature researchers in the field may wish to own a copy for their personal reference.

The authors of this review have themselves recently coauthored a text (Edwards, D. A.; Brenner, H.; Wasan, D. T. *Interfacial Transport Processes and Rheology*; Butterworth-Heinemann: London, 1991) aimed at the same audience. Fairness to Professor Slattery and to the readers of this review requires that this fact be stated explicitly, as some of the personal biases of the authors are clearly reflected in this review.

D. A. Edwards and Howard Brenner, *Massachusetts Institute of Technology*

Inorganic Syntheses. Volume 28. Reagents for Transition Metal Complex and Organometallic Synthesis. Edited by Robert J. Angelici (Iowa State University). Wiley-Interscience: New York. 1990. xxiii + 463 pp. $54.95. ISBN 0471-52619-3.

The 28th volume in the *Inorganic Syntheses* series and dedicated to Professor Fred Basolo on the occasion of his 70th birthday, this volume continues the mission of the series to document reliable syntheses of interesting and useful inorganic compounds which are unavailable commercially at reasonable cost. All preparations are verified by repetition in an independent laboratory, a protocol rare in the world of scientific publication.

This volume, however, differs from previous publications of Inorganic Syntheses in being a topical volume dedicated to the preparation of complexes that are particularly useful as starting materials for further synthesis. Material is collected into subject areas: metal complexes with weakly coordinated ligands, low-valent complexes of Rh, Ir, Ni, Pd, and Pt, substituted metal carbonyl complexes, metal carbonyl anion, metal cluster, cyclopentadienyl, lanthanide and actinide complexes, and finally ligands and other transition-metal complexes. Many sections are preceded by a brief overview of the principles driving the syntheses to follow and all are abundantly supplied with references. Most of syntheses have been taken from earlier volumes of *Inorganic Syntheses* and are selected for their general utility in contemporary research. All have been rewritten, rechecked, and updated. There are nine new preparations. Physical properties, spectral data, hazards, and special apparatus are clearly documented. Access to material is facilitated by the inclusion of contributor, subject, and formula indices.

This volume serves as a primary source of fundamental synthetic procedures in one binding and thus represents a very useful addition to the laboratory reference shelf even if the 27 previous volumes reside there. Volume 28 of *Inorganic Synteses* is to be recommended.

Elizabeth M. Holt, *Oklahoma State University*

Chromatographic Science Series. Volume 53. Chromatographic Analysis of Alkaloids. By Milan Popl, Jan Fähnrich, and Vlastimil Tatar (Prague Institute of Chemical Technology, Czechslovakia). Marcel Dekker: New York and Basel. 1990. viii + 667 pp. $150.00. ISBN 0-8247-8140-6.

Since many alkaloids are important in medicine, toxicology, phytochemistry, and forensic science, analytical samples containing these substances may range from formulated pharmaceuticals to serum and blood, crude plant extracts, and illicit "street" drugs. The authors of this book have surveyed the pertinent literature over the last 15 years or so and have concluded that 60–70% of all published alkaloidal separations are now performed by HPLC, with thin-layer and gas chromatography being less prominent for this purpose than they once were.

Almost all of the compounds commonly regarded as alkaloids are somewhat basic, but they possess a wide range of structures. In Chapter 1 of this volume, the authors group the alkaloids into eight major structural classes, using a scheme that is adhered to throughout the rest of the book. In Chapter 2, alkaloidal dissociation, physicochemical, UV–vis spectroscopic, and electrochemical properties germane to the design of chromatographic methods are discussed. A considerable amount of theoretical detail is provided on chromatography in Chapters 3 to 6, which are entitled Chromatography, Gas Chromatography, Liquid Chromatography, and Thin-Layer Chromatography, respectively, although constant reference is made to the alkaloids throughout. Almost half the volume is devoted to Chapter 7 on Applications, which is composed of several tables which rather courageously summarize the salient features of hundreds of published alkaloidal separations. The concluding short chapter provides a summary of the information in the rest of the book. Over 1200 literature citations are included, but certain sections (e.g., Chapters 1 and 3) are very scantily referenced. A useful index primarily lists chromatographic techniques, compound names, and the Latin names of alkaloid-containing plants.

Overall, the book should succeed in its stated intention of aiding in the solution of analytical tasks for alkaloids using chromatographic methods. Although generally clearly written, the volume is not without flaws and contains several errors. For example, only three rather than six stereoisomers of sparteine are known (p 14), quinine and quinidine free bases are not readily soluble in water (p 47), and the structures of reserpine (p 18) and ergotamine (p 21) are incorrectly drawn. Also, the book is replete with typographical and grammatical errors and could have used more careful editing to avoid this.

Chromatographic Analysis of Alkaloids does fill a useful niche and will be a valuable resource for the many laboratories engaged in the detection and quantitation of alkaloids. It is also to be recommended for purchase by libraries of institutions where natural products research is conducted.

A. Douglas Kinghorn, *University of Illinois at Chicago*

Electron Deficient Boron and Carbon Clusters. Edited by George A. Olah (University of Southern California), Kenneth Wade (University of Durham), and Robert E. Williams (University of Southern California). John Wiley & Sons, Inc.: New York, Chichester, Brisbane, Toronto, and Singapore. 1991. xvi + 378 pp. $59.95. ISBN 0-471-52795-5.

This attractively produced volume contains fourteen articles on boron and carbon clusters and is appropriately dedicated to Professor William N. Lipscomb of Harvard University on the occasion of his 70th birthday. The volume evolved from a research symposium on Electron Deficient Clusters held at the Loker Hydrocarbon Research Institute, University of Southern California, in January 1989. The interactions of boron chemistry with organic and organometallic chemistry are numerous and increasingly significant, as may be gleaned from the titles presented here: General Concepts and Definitions, by G. A. Olah, K. Wade, and R. E. Williams; Geometrical Systematics of *Nido*-Carboranes, -Polyboranes and -Carbocations; Dominance of Aperture Dependent Electron Distribution and Charge Smoothing, by R. E. Williams; Electron Distribution in Boranes and Carboranes, by K. Wade; Ab Initio Geometries and Chemical Shift Calculations for Neutral Boranes and Borane Anions, by M. Buehl and P. v. R. Schleyer; Skeletal Rearrangements in Clusters: Some New Theoretical Insights Involving Lispscomb's Diamond-Square-Diamond Mechanism, by D. M. P. Mingos and D. J. Wales; Some Recently Determined Borane Structures and their Implications, by N. N. Greenwood; Electron Deficiency Aspects of the Small Carboranes, by T. P. Onak and K. Fuller; *Hypho*-Dithioborane Clusters: Links Between Electron Deficient and Electron Precise Cage Systems, by S. O. Kang and L. G. Sneddon; C-Trimethylsilyl-Substituted Carboranes and their Derivatives, by N. S. Hosmane and J. A. Maguire; Boron Transition Metal Cluster Chemistry: Hydroboration of the Unsaturated Cluster $(\mu H)_2OS_3(CO)_{10}$, by D. P. Workman and S. G. Shore; Cyclocarborane-Stabilized Multidecker/Multicluster Sandwich Compounds and Linked Molecular Systems, by R. N. Grimes; Boron-Transition Metal Compounds Containing Direct Metal–Boron Bonds. Recent Progress, by T. P. Fehlner; Oxidative Addition of Carbon–Hydrogen Bonds to Soluble Complexes of Iridium and Osmium, by T. C. Flood; and Hypercarbon Cluster Chemistry of Hydrocarbons, by G. A. Olah.

This volume is highly recommended reading not only for those with specific interests in the topics presented but also for those wishing to experience a rich feast of fascinating chemistry.

Lawrence L. Lohr, *University of Michigan*

Physical Methods of Chemistry. Second Edition. Volume V. Determination of Structural Features of Crystalline and Amorphous Solids. Edited by Bryant W. Rossiter and John F. Hamilton (Eastman Kodak Company). John Wiley & Sons: New York. 1990. xi + 618 pp. $125.00. ISBN 0471-52509-X.

This volume is a part of the latest edition of the well-known *Physical Methods* series originally edited by the late Arnold Weissberger. As befits such a central publication in an advancing set of fields, the book differs substantially from its preceding edition, published in the 1970's. Written by experts in their respective specialties the chapters are the following: X-Ray Crystal Structure Analysis, by W. N. Lipscomb and R. A. Jacobson; The Application of Neutron Diffraction Techniques to Structural Studies, by C. F. Majkrzak, M. S. Lehmann, and D. E. Cox; X-Ray Absorption Spectroscopy: EXAFS and XANES, by S. M. Heald and J. M. Tranquada; Mössbauer Spectroscopy, by F. J. Berry; Solid-State Nuclear Magnetic Resonance, by P. M. Henrichs and J. M. Hewitt; Application of Magnetic Resonance Techniques to the Study of

Defects in Solids, by J.-M. Spaeth; and X-Ray Diffuse Scattering, by R. P. Scaringe and R. Comês. The first chapter is an update of the 1970's edition, the other six are completely new. Typically, each chapter begins with a section on basic theory, presented on a level reasonably accessible to scientists not experienced in the method in question. This is followed by a description of apparatus and experimental procedures and a section on applications, that is, a discussion, with examples, of the structural-chemical questions amenable to elucidation by the technique in question. An extensive bibliography follows each chapter, and a good 15-page index concludes the volume.

This book is to be welcomed as an authoritative and accessible source of information on experimental methods in structural chemistry.

Christer E. Nordman, *University of Michigan*

Organophosphorus Chemistry. Volume 21. Specialist Periodical Reports. Edited by B. J. Walker and J. B. Hobbs. Royal Society of Chemistry: Cambridge, UK. 1990. xii + 428 pp. £120.00. ISBN 0-85186-196-2.

This volume is the latest in a continuing, in-depth series of reviews of the ever-expanding field of organophosphorus chemistry. Specifically, it surveys the literature published between July 1988 and June 1989 in a collection of eight separate chapters dealing with the following topics: (1) Phosphines and Phosphonium Salts (by D. W. Allen, 50 pp, 360 references); (2) Pentacoordinated and Hexacoordinated Compounds (by C. D. Hall, 22 pp, 47 references); (3) Phosphine Oxides and Related Compounds (by B. J. Walker, 17 pp, 40 references); (4) Tervalent Phosphorus Acids (by O. Dahl, 30 pp, 102 references); (5) Quinquevalent Phosphorus Acids (by R. S. Edmundson, 70 pp, 251 references); (6) Nucleotides and Nucleic Acids (by J. B. Hobbs, 121 pp, 500 references); (7) Ylides and Related Compounds (by B. J. Walker, 47 pp, 118 references); and (8) Phosphazenes (by C. W. Allen, 37 pp, 236 references).

Readers who are familiar with earlier volumes in this series will find no substantial changes in the rather simple but functional format, style, and organization of the various topics. The primary emphasis throughout is on factual information, reported without bias or interpretation on the part of the author. As a detailed catalogue of compounds, structures, and reaction types, this work is extremely useful to the specialist in any of the fields noted above. There is also a complete author index which is very useful for tracking all of the papers in a variety of fields by a particular author. As usual in such volumes, there is no subject index. This may be a small deterrent to the non-specialist, but given the very large number of drawn structures, reactions, etc., it is not too difficult to flip through a chapter and locate the type of compound that is of interest. Literature reference numbers are conveniently given right among the structures as well as separately in the main text. This feature greatly increases the utility of the work to the casual reader searching either for a very specific piece of information or for an overview of a more general topic.

Robert H. Neilson, *Texas Christian University*

PIXE: A Novel Technique for Elemental Analysis. By Sven A. E. Johansson (Lund Institute of Technology) and John L. Campbell (The University of Guelph). John Wiley and Sons: Chichester and New York. 1988. xii + 347 pp. $95.00. ISBN 0-471-92011-8.

Johansson and Campbell have, within one nicely compact volume, provided a comprehensive reference and a state-of-the-art appraisal of where proton-induced X-ray emission (PIXE) analysis stands at the beginning of this decade. An introduction and Chapters 1 through 10 represent detailed discussions of the history, fundamentals of X-ray emission, technical preparation of samples (thick and thin), beam handling and chamber design, and methodology of PIXE. Chapters 11 through 15 are discussions of how PIXE has been applied in Biology, Medicine, Atmospheric research, Geology, Analytical Chemistry, Forensics, and my own discipline, Archaeology. All discussions of applications within disciplines sample the relevant literature up to 1988. The sample studies drawn upon do not constitute a complete listing but are usefully employed to evaluate the success and problems of PIXE in each discipline. Chapters 16 through 18 include an introduction to microbeam PIXE, comparisons with other elemental-analysis techniques, and a brief projection of PIXE's future in scientific endeavors.

Each chapter stands alone as an independent presentation, yet all 18 form a well-integrated text, probably a consequence of two authors doing all of the writing rather than multiple authors in the usual edited volume. Overall, this volume is clearly written and well-illustrated without loosing the scientific detail and depth required of an effective reference. A 5-page index is provided, as is an appendix containing six abbreviated tables of PIXE data (K X-ray energies, K-shell ionization cross-sections, L-shell ionization and X-ray emission, parameters for the mass attenuation coefficients of X-rays, and coefficients for the calculation of proton electronic stopping powers). Individual chapters will be useful reading for the nonspecialist and for classroom use, while the volume as a whole is an excellent guide and overview essential for the specialist.

Timothy R. Pauketat, *University of Illinois at Urbana—Champaign*

High Value Polymers. Edited by A. H. Fawcett (The Queen's University of Belfast). The Royal Society of Chemistry: Cambridge, U.K. 1991. xix + 480 pp. £55.00. ISBN 0-851866-867-3.

This book contains the Proceedings of a Symposium organized by the Macro Group in association with the Industrial Division, Ireland Region of the Royal Society of Chemistry. It consists of an Introduction, 22 chapters in typescript form, and a subject index. Affiliations of the authors are given in the headings of each chapter.

Computer Simulation of Polymers. Edited by R. J. Roe (University of Cincinnati). Prentice Hall: Englewood Cliffs, NJ. 1991. xii + 404 pp. $70.00. ISBN 0-13-161480-0.

This book was developed from a symposium sponsored by the Division of Polymer Chemistry at the 198th National Meeting of the ACS in Miami Beach, FL, September 11-15, 1989. It consists of a preface and 28 chapters; an abstract precedes each chapter. There is only a subject index. The affiliations of the authors are given at the headings of each chapter.

Materials for Nonlinear Optics. Chemical Perspectives. ACS Symposium Series 455. Edited by Seth R. Marder (California Institute of Technology), John E. Sohn (AT&T Bell Labs), and Galen D. Stucky (University of California, Santa Barbara). American Chemical Society: Washington, DC. 1991. xvi + 750 pp. $129.95. ISBN 0-8412-1939-7.

This book was developed from a symposium sponsored by the Divisions of Inorganic and Organic Chemistry of the American Chemical Society at the 199th National Meeting of the ACS in Boston, April 22-27, 1990. It consists of a Preface and 48 chapters (in typescript form) organized under the following headings: Introduction to Nonlinear Optics (a primer for the rest of the material); Understanding Structure-Property Relationships on the Second-Order Microscopic Susceptibility; Preparation and Characterization of Poled Polymers; Organic and Inorganic Crystals; Novel Approaches to Orientation of Molecular Units; Composite Materials; Molecular and Supramolecular Metal-Based Systems; and Sigma and Pi Delocalized Third-Order Nonlinear Optical Materials. There is an Author Index, a Subject Index, and an Affiliation Index.

High-Tech Fibrous Materials. Composites, Biomedical Materials, Protective Clothing, and Geotextiles. ACS Symposium Series 457. Edited by Tyrone L. Vigo (U.S. Department of Agriculture) and Albin F. Turbak (Southern College of Technology). American Chemical Society: Washington, DC. 1991. x + 398 pp. $84.95. ISBN 0-8412-1985-0.

This book was developed from a symposium sponsored by the Cellulose, Paper, and Textile Division of the ACS at the 198th National Meeting at Miami Beach, FL, September 10-15, 1989. It consists of a Preface and 25 chapters in typescript form organized under the following headings: Composites; Biomedical Materials; Protective Clothing; and Geotextiles. There are Indexes of Authors, their Affiliations, and Subjects.

Pesticide Transformation Products. Fate and Significance in the Environment. ACS Symposium Series 459. Edited by L. Somasundaram and Joel R. Coats (Iowa State University). American Chemical Society: Washington, DC. 1991. xii + 305 pp. $66.95. ISBN 0-8412-1994-X.

This book was developed from a symposium sponsored by the Division of Agrochemicals at the 200th National Meeting of the ACS in Washington, DC, August 26-31, 1990. It consists of a Preface and 20 chapters in typescript form organized under the following headings: Overviews; Fate; and Significance. There are Indexes of Authors, Affiliations, and Subjects.

Advances in Polymer Science. No. 98. Separation Techniques. Thermodynamics. Liquid Crystal Polymers. By M. G. Northolt (Akzo Research Laboratories), M. T. Rätzsch ("Carl Schorlemmer" Technical University, FRG), D. Sikkema (Akzo), L. Wild (Quantum Chemical Corp., Cincinnati), and C. Wohlfahrt ("Carl Schorlemmer" Technical University). Springer-Verlag: New York, Berlin, and Heidelberg. 1991. x + 198 pp. $98.00. ISBN 0-387-53135-1.

This volume contains the following three chapters: Temperature Rising Elution Fractionation by Wild; Continuous Thermodynamics of Copolymer Systems by Rätzsch and Wohlfahrt; and Lyotropic Main Chain Liquid Crystal Polymers by Northolt and Sikkema. There is an author index to Volumes 1-98 and a subject index for this volume.

The beginning of the book contains a tribute to John Stille (who was killed in an airplane crash in 1989) by H. K. Hall, Jr. I am bothered by the fact that in this tribute John Stille is described as having been educated as a polymer chemist "in the illustrious school of G. S. Marval".

John Stille studied under C. S. Marvel while at the University of Illinois. One hopes that this error will be corrected quickly in a reprinting and that this type of error is not typical of the volume as a whole.

Bioelectrochemistry III. Charge Separation Across Biomembranes. Edited by G. Milazzo (Bioelectrochemical Society, Rome) and M. Blank (Columbia University). Plenum Press: New York and London. 1990. xii + 337 pp. $79.50. ISBN 0-306-43606-X.

A series of review papers related to the lectures given at the Third Course on Bioelectrochemistry held at Erice, Italy, in November 1988 makes up this book. There are 13 papers by an international group of authors. Affiliations of the speakers are given at the headings of the papers, and there is a list at the end of the book of other participants in the symposium. A list of symbols and acronyms (at the beginning) and a short index (at the end) complete the book.

Fluorine. International Thermodynamic Tables of the Fluid State-11. By K. M. de Reuck (Imperial College, London). Blackwell Scientific Publications: London, Edinburgh, Boston, Melbourne, Paris, Berlin, and Vienna. 1990. xviii + 193 pp. $51.00. ISBN 0-632-02871-8.

This little book of tables represents in part the efforts of the Thermodynamic Tables Project initiated by the Commission on Thermodynamics and Thermochemistry of the Division of Physical Chemistry of IUPAC. It follows other books of tables, all published since 1971, on the following elements and compounds: argon, carbon dioxide, helium, methane, nitrogen, propene, oxygen, ethene, and chlorine.

Food Polymers, Gels, and Colloids. Edited by Eric Dickinson (University of Leeds). The Royal Society of Chemistry: Cambridge, U.K. 1991. xii + 575 pp. £69.50. ISBN 0-85186-657-3.

This book is based on the Proceedings of an International Symposium organized by the Food Chemistry Group of the Royal Society of Chemistry at the University of East Anglia in Norwich, March 28–30, 1990. The 34 papers presented are printed here, as is the record of discussions of these papers. The Food Chemistry Group Senior Medal Lecture by Dr. George Stainsby is also included. In addition, there are printouts of 20 posters that were presented at the meeting. There are no indexes, but the names and affiliations of the authors are given in the headings of the papers and posters.

Triazenes: Chemical, Biological, and Clinical Aspects. Edited by Tullio Giraldi (University of Trieste, Italy), Thomas A. Connors (Medical Research Council Toxicology Unit, U.K.), and Guiseppe Cartei (Ospedale S Maria della Misericordia, Italy). Plenum Press: New York and London. 1990. viii + 277 pp. $69.50. ISBN 0-306-43667-1.

This volume contains contributions by the participants in the International Conference on the title subject held in Trieste, Italy, November 28–29, 1989. There are 16 papers and a summary of 20 posters. A list of 58 contributors and their affiliations and a subject index complete the book.

Trace Elements in Health and Disease. Edited by Antero Aitio (Institute of Occupational Health, Finland), Antti Aro (National Public Health Institute, Finland), Jorma Järvisalo (Social Insurance Institution, Finland), and Harri Vainio (International Agency for Research on Cancer, France). The Royal Society of Chemistry: Cambridge, U.K. 1991. vi + 236 pp. £45.00. ISBN 0-85186-976-9.

The major contributions made at the International Symposium on Trace Elements in Health and Disease held June 5–8, 1990 in Espoo, Finland, comprise this book. The papers published, in typescript form, treat the analytical, metabolic, nutritional, and toxicological aspects of trace element research with attention given to the relationship between the elements and human health and disease. There is a 2-page subject index, but no index of the authors or their affiliations. This information, however, can be obtained from the Table of Contents and the headings of each paper.

Central and Peripheral Significance of Neuropeptide Y and Its Related Peptides. Volume 611. Annals of the New York Academy of Sciences. Edited by Janet M. Allen (Royal Postgraduate Medical School, London) and James I. Koenig (Massachusetts General Hospital). The New York Academy of Sciences: New York. 1990. xiii + 533 pp. $112.00. ISBN 0-89766-653-4.

This book resulted from a meeting held by the New York Academy of Sciences on April 2–4, 1990 in Baltimore, Maryland. It consists of 27 papers and 66 posters presented on the title subject. The 27 papers are organized under the following headings: (I) Neuropeptide Y: Structure and Function; (II) Role of Neuropeptde Y in the Regulation of the Circulatory System; (III) Neuropeptide Y and the Central Nervous Systems; and (IV) Functions of Neuropeptide Y in the Hypothalamus. There is an index of all contributors, and their affiliations are given in the headings of the papers and posters.

Density Functional Methods in Chemistry. Edited by Jan K. Labanowski (Ohio Supercomputer Center) and Jan W. Andzelm (Cray Research, Inc.). Springer-Verlag: New York, Berlin, Heidelberg. 1991. xvi + 443 pp. $59.00. ISBN 0-387-97512-8.

This book grew out of a workshop held May 7–9, 1990 in Columbus, Ohio. After an introduction by Brett I. Dunlap, it contains 29 contributions by experts in the field from all over the world. In the preface, the editors claim that the Density Function method satisfies the goals of predicting molecular structure and energy and of explaining the nature of bonding, the central goals in quantum chemistry. There is a list of the contributors to the book and their affiliations in the front of the book. A list of all of the workshop participants and their affiliations appears at the end of the book. There is no subject index.

Growth of Crystals. Volume 16. Edited by Kh. S. Bagdasorov and E. L. Lube (Academy of Sciences of the USSR, Moscow). Translated by Dennis W. Wester. Consultants Bureau (a division of Plenum Publishing Corp.): New York. 1991. viii + 278 pp. $95.00. ISBN 0-306-18116-9.

This 16th volume of the series is comprised of papers from the Sixth All-Union Conference on Growth of Crystals. The papers are organized into six parts: (1) Mechanisms of Crystal Growth from the Melt; (2) Growth of Crystals from Melts and High-Temperature Solutions; (3) Crystallization of Films; (4) Crystallization of Biological Substances; (5) Experimental Methods for Studying Crystallization Processes; and (6) Mathematical Modeling and Regulation of Crystallization Processes.

The contributors are apparently all from the Soviet Union, although no affiliations are given. There are references at the end of each paper, but there are no indexes.

Enzyme Engineering 10. Volume 613. Annals of the New York Academy of Sciences. Edited by Hirosuke Okada (Osaka University), Atsuo Tanaka (Kyoto University), and Harvey W. Blanch (University of California, Berkeley). The New York Academy of Sciences: New York. 1990. xxii + 897 pp. $225.00. ISBN 0-89766-625-9.

The papers in this volume were presented at the Tenth International Enzyme Engineering Conference held in Kashikojima, Japan, on September 24–29, 1989. There is no apparent organization of the 141 papers, but in the Introduction it is stated that the main subjects of the papers were the following: (1) protein-engineered enzymes, (2) analytical application of biomolecules, (3) enzyme engineering in medicine, (4) biocatalytic production of useful substances, (5) reactors and purification processes, and (6) fundamentals in enzyme engineering. Following the Introduction there is an overview of the conference in which a summary and critique of the papers on each of the subjects listed above is made. There is an index of the contributors; their affiliations are given in the headings of the papers.

Heterocycles in Bio-organic Chemistry. Edited by J. Bergman (The Royal Institute of Technology, Sweden), H. C. Van der Plas (Agricultural University de Dreyen, The Netherlands), and M. Simonyi (Hungarian Academy of Sciences). The Royal Society of Chemistry: Cambridge, U.K. 1991. viii + 239 pp. £42.50. ISBN 0-85186-877-0.

This book consists of the lectures presented at the 6th FECHEM Conference on Heterocycles in Bio-Organic Chemistry, held at Solbacka, Sweden, in May 1990, plus some updated versions of selected lectures from the 5th Symposium presented at Bechyne, Czechoslovakia, in May 1988. The 14 papers are printed in typescript form and contain structural formulas, figures, tables, and spectra. Affiliations of the authors are given at the headings of each paper. There is a Subject Index.

Peptides 1990. Edited by Ernest Giralt and David Andreu (University of Barcelona). Escom: Leiden. 1991. lii + 951 pp. $155.00. ISBN 90-72199-08-1.

This book contains the proceedings of the Twenty-first European Peptide Symposium, which was held in Platja d'Aro, Spain, on September 2–8, 1990 and attended by over 700 scientists from nearly 30 countries. The preface is followed by a list of the chairman, the committees, the Council, the supporters, sponsors, and contributors of the symposium. A thorough list of abbreviations used in the proceedings is also included. The first article is the Josef Rudinger Memorial Lecture given by R. B. Merrifield. The remaining articles are organized according to the Sessions of the Symposium: (1) Recent Developments in Synthetic Methodology; (2) Analytical Methods; (3) Peptide Mimetics; (4) Glyco-, Lipo-, and Phosphopeptides; (5) Peptide Conformation and Engineering; (6) Bioactive Peptides; and (7) Peptides in Immunology. There is an author index and a subject index. The affiliations of the authors are given at the heading of each article.