Book Reviews *

Cyclophane Chemistry. By Fritz Vögtle (Institut für Organische Chemie und Biochemie der Universität Bonn, Germany). Translated by P. R. Jones (Department of Chemistry, University of New Hampshire). John Wiley and Sons: Chichester, U.K. 1993. vii + 501 pp. $123.95. ISBN 0-471-93199-3.

This book, which is divided into 12 chapters, provides both a simple introduction to the chemistry of cyclophanes and a comprehensive review of nearly all that has been done in this most fascinating of scientific subfields. The importance of the field and the well-written, highly readable nature of this text make the present volume recommended reading for all those involved in the synthesis and study of non-natural products.

Cyclophanes, or more commonly phanes, are bridged aromatic systems. In the broadest sense, therefore, the chemistry of cyclophanes touches on nearly all aspects of both macrocyclic chemistry and modern aromatic chemistry. Indeed, it is the special union of these two seemingly dissimilar topics that has served to animate this field of research for the roughly half century or so that it has been at the chemical fore.

In this book Prof. Vögtle does an excellent job of communicating the special sense of excitement inherent in this area of chemistry while at the same time summarizing a vast body of experimental information. The introduction, for instance, puts the field of cyclophanes into an appropriate historical context while highlighting some of the aesthetic aspects associated with research in the cyclophane and macrocyclic areas. This chapter also provides a detailed description of cyclophane nomenclature, a description that is critical to an understanding of both later chapters and the current cyclophane-related literature. As such, this chapter is a "must read" for all those interested in working in this area.

The first scientific chapter, presents in detail the chemistry of [*n*] phanes, compounds in which a single aromatic entity is strapped by a single aliphatic or heteroaliphatic chain. Both synthetic accomplishments and the results of ensuing physical characterization studies are summarized. In the context of the latter, special emphasis is placed on detailing the effects that chain-induced strain has on the structure and electronic properties of various aromatic subunits such as, e.g., simple benzene rings. The chapter itself, however, is organized in sections according to the general nature of the aromatic subunit and bridging strap and the way in which the latter is attached. References follow each section, and these serve both to provide a proper historical perspective and to provide an entry into the current literature.

Chapters 2–4 follow the same general format as Chapter 1 but provide coverage of [2.2], [3.3], and [*m.n*] ($m, n \geq 2$) phanes, systems in which aromatic subunits are doubly bridged by straps of 2, 3, or 2 *and* more atoms, respectively. As in Chapter 1, the coverage is comprehensive both from a synthetic organic and from a physical chemical characterization perspective. In addition, insights into transannular reactivity effects and more generalized molecular properties are provided in these chapters in a way that was neither necessary nor appropriate for Chapter 1. The result is a detailed look "behind the scenes" at what is now recognized as being classic cyclophane chemistry as originally promulgated by such luminaries as Cram, Boekelheide, Staab, Vögtle, Misumi, and many others.

Chapters 5 and 6 serve to cover the chemistry of multiply bridged phanes and multilayered cyclophanes, respectively. Whereas this first class of compounds consists of systems in which more than two bridges serve to connect two aromatic entities (or two distinct aromatic ensembles), the second consists of those systems in which multiple aromatic subunits are constrained by straps to be stacked on top of one another. In both cases, the systems are ones of significant aesthetic appeal and not inconsiderable challenge in terms of synthetic design. This is also true for many of the [m_n] cyclophane systems discussed in Chapter 7, wherein more than two aromatic subunits are strapped together by a total of more than two bridges.

In addition to presenting the pure cyclophane chemistry of [m_n]-type systems, Chapter 7 also presents an overview of the chemistry of the so-called calixarenes, which may be considered formally as being [1_n] cyclophanes, and that of their multiply bridged congeners, the cavitands and carcerands. As such, this chapter serves to presage the discussion of molecular recognition aspects of cyclophane chemistry that appears in Chapter 12 of this book. While the latter treatment is thorough and does serve to highlight the current excitement associated with this aspect of the field, the interested reader would also be advised to consult the equally excellent book on the subject by François Diederich (*Cyclophanes*; Royal Society of Chemistry: London, 1991). Likewise, those interested in the chemistry of calixarenes would be advised to consult the text by C. David Gutsche (*Calixarenes*; Royal Society of Chemistry: London, 1989) that appeared in the same Monographs in Supramolecular Chemistry series.

Chapter 8 summarizes the highly topical subject of porphyrinophanes. It provides an excellent and up-to-date review, at least from synthetic perspective, of the numerous strapped, capped, and otherwise functionalized porphyrins that have been prepared recently as models for various hemoproteins. Since few other recent summaries of this chemistry are presently available, this chapter is likely to be one of interest to all those working in the hemoprotein modeling area, even if such individuals might not necessarily consider themselves to be cyclophane chemists *per se*. Thus, a strength of this chapter is that it serves, in part, to highlight the breadth of the cyclophane field.

Chapters 9, 10, and 11 serve to emphasize further the breadth of the cyclophane field. Chapter 9 provides a summary of "cyclophane-like" systems in which non-aromatic subunits are used in lieu of aromatic ones. Chapter 10, Exotic Phanes, provides summaries (albeit very brief ones) of a number of interesting arene-containing ring systems, including expanded porphyrins, ferrocenophanes, and multiply condensed cyclophanes, as well as catenanes, belts, and rotaxanes. Chapter 11, on the other hand, provides an overview of known natural products that might be formally considered as being cyclophanes. Taken together, therefore, these three chapters help define the range and scope of cyclophane chemistry while establishing further its central importance in the lexicon of modern organic chemistry.

In summary, this book, which contains detailed author and subject indexes, is recommended for inclusion in any practicing chemists personal library.

Jonathan L. Sessler, *University of Texas, Austin*

Analysis with Supercritical Fluids: Extraction and Chromatography. Edited by B. Wenclawiak. Springer-Verlag: Berlin. 1992. xiv + 214 pp. $99.00. ISBN 0-387-55420-3.

This slim volume contains 11 review chapters by a total of 21 different authors, 14 from laboratories in USA and 6 from Germany. It covers a range of topics in supercritical fluid extraction (SFE) and chromatography (SFC) at both introductory and advanced levels; while often treading well-worn ground—a variety of review compilations have recently appeared describing progress in SFE and SFC—the book contains enough novelty to justify interest by the active researcher in analytical methods employing supercritical fluids.

The editor provides a short introduction "for novices", and G. M. Schneider describes the physical chemistry of supercritical fluids. J. W. King and J. E. France discuss the principles of analytical SFE with characteristic thoroughness and S. B. Hawthorne introduces the coupling of SFE to gas chromatography, but these are the only two chapters devoted to SFE.

While the balance of the book is therefore tipped in favor of SFC, the coverage here has commendable emphasis on analysis on both packed and capillary columns. Thus, C. F. Poole and his colleagues address the vexed problem of stationary phases for packed column SFC, appealing for the evolution of materials specifically for this application instead of the current practice of using HPLC columns. E. Klesper and F. P. Schmitz review the use of gradients in SFC—one of the features which makes chromatography with a supercritical mobile phase unique; the theory and practice of changing temperature, pressure, density, and mobile phase velocity are comprehensively described.

The emphasis in chapters by T. Greibrokk (injection techniques) and M. Schleimer and V. Schurig (enantiomer separation) is on SFC with capillary columns. The latter review is of special interest in view of recent progress in chiral separation by SCF, which promises to be a growth area for the technique.

The final three chapters concern the coupling of SFC to spectroscopic techniques. J. D. Pinkston charts a clear path through the multiplicity of methods for SFC–mass spectrometry, L. T. Taylor and E. M. Calvey describe the different approaches to SFC–FTIR, and C. H. Sin and colleagues outline the comparatively new technique of supersonic jet spectroscopy with supercritical fluids.

The book ends with short lists of basic references and recommended

*Unsigned book reviews are by the Book Review Editor.

SFE/SFC literature up to and including 1992. The analyst using supercritical fluids will find enough material of interest to read this book with profit.

Keith D. Bartle, *University of Leeds*

Marine Biotechnology. Volume I. Pharmaceutical and Bioactive Natural Products. Edited by David H. Attaway (National Oceanic and Atmospheric Administration) and Oskar R. Zaborsky (National Academy of Science). Plenum: New York. 1993. xx + 500 pp. $89.50. ISBN 0-306-44174-8.

This first volume of what promises to be a worthwhile series focuses on biologically active marine natural products. A fascinating assortment of cytotoxic, antiinflammatory, antiviral, and anthelmintic compounds are described in a series of 13 chapters written by some of the leading figures in this discipline. As might be expected, many chapters deal principally with the authors' own contributions to the field and each differs from the others with respect to style and organization.

The book opens with an introductory chapter (by Chris M. Ireland *et al.*) that groups together many well-known and structurally diverse marine natural products by their particular biological activities—tumor promoters, antivirals, and so on. There follow chapters by Nakanishi, Jacobs, and Gerwick in which these authors describe some interesting recent work from their laboratories as well as chapters by Sharma and Renn which discuss marine proteins and polysaccharides. The next three chapters (contributed by Schmitz, Rinehart, and Crews in that order) deal with antitumoral, antiviral, and antiparasitic marine natural products. Shimizu reviews the rich chemistry of dinoflagellates—the group of organisms responsible for elaborating saxitoxin, okadaic acid, ciguatoxin, and the brevetoxins. Ben-Amotz then describes the use of the alga *Dunaliella* as a commercial source of β-carotene. In recent years, natural products chemists have begun to tap the potential of marine bacteria and fungi, and the status of these efforts is reviewed in a chapter by Fenical. The volume ends with a chapter by Faulkner which, besides outlining some interesting chemistry, adopts a more philosophical tone in arguing the value of marine natural products as a resource for medicinal chemistry and in offering prescriptions for effective academic/industrial collaboration in the development of these unique metabolites.

It is difficult to find anything negative to say concerning this book. It is up-to-date and well-referenced. There is, unavoidably, some overlap of material between different chapters, but the editors have succeeded in keeping redundancy to a minimum. All in all this book is a useful contribution to the marine natural products chemistry literature and will be of interest to both casual students and serious practitioners of the science.

Chris A. Broka, *Syntex Discovery Research*

2D NMR: Density Matrix and Product Operator Treatment. By Gheorghe D. Mateescu and Adrian Valeriu (Case Western Reserve University). PTR Prentice-Hall: Englewood Cliffs, NJ. 1993. xi + 195 pp. $39.00. ISBN 0-13-013368-X.

Over the past few decades, NMR spectroscopy has become a widely utilized analytical technique in the chemical and biological sciences. The spectacular developments in multidimensional NMR spectroscopy rely on analyses of the quantum mechanical evolution of spin systems. The resulting spin dynamics are beyond the purview of the classical vector model of nuclear magnetism that is applicable to simple NMR experiments. *2D NMR: Density Matrix and Product Operator Treatment (2D NMR)* by Gheorghe D. Mateescu and Adrian Valeriu is a tutorial on the use of density matrix and product operator formalisms in NMR spectroscopy. The text is based on lectures given by the authors in a graduate-level course in instrumental analytical chemistry at Case Western Reserve University. *2D NMR* is appropriate for chemists and biochemists familiar with the applications of modern two-dimensional Fourier transform NMR spectroscopy and for students enrolled in courses on NMR spectroscopy.

2D NMR is divided into two roughly equal halves: Part I, The density matrix formalism, and Part II, The product operator formalism. An extensive series of appendixes present a mathematical review, a recapitulation of the quantum mechanics of spin systems, tables of matrix representations of product operators, and short discussions of specialized topics. The body of the text is devoted to didactic, step-by-step (or pulse-by-pulse) dissections of common NMR experiments. Derivations of the central theorems and necessary equations are presented in the appendixes. The separation of applications from derivations is both a strength and weakness. For the novice, the examples will be difficult without frequent reference to the appendixes and other texts; however, for the more advanced reader, the detailed calculations provide solid training.

In the first section of *2D NMR*, the density matrix formalism is used to calculate the time-dependence of the density operator in multidimensional NMR spectroscopy. The 2D-HETCOR, INADEQUATE, and COSY experiments serve as exemplars. The classical vector model and density matrix descriptions of the 2D-HETCOR experiment are compared to delineate aspects of spin dynamics that cannot be capitulated within the vector model. Phase cycling procedures for coherence selection and quadrature detection are presented briefly during discussions of the INADEQUATE and COSY experiments. In the second section, the product operator formalism is applied to the 2D-HETCOR, INEPT, DEPT, and APT experiments. Product operators are introduced by demonstrating that angular momentum operators do not form a complete basis set for a two-spin system. The simplicity of the product operator formalism, compared to the full density matrix theory, is illustrated by analysis of the 2D-HETCOR experiment.

Although the balance between rigor and accessibility usually is appropriate in *2D NMR*, certain topics are oversimplified. Coherence is defined as an unsigned, rather than signed, quantity. The discussion of phase cycling for quadrature detection implies that phase modulation is preferable to amplitude modulation. The treatment of coherence selection would be strengthened by inclusion of coherence order diagrams. A brief discussion of relaxation would clarify the distinction between coherent and incoherent phenomena. The existence of NMR problems that are treated preferably by the density matrix method is not emphasized.

The authors characterize *2D NMR* as a guide to density matrix and product operator calculations in NMR spectroscopy. As such, *2D NMR* is a useful and accessible introduction for these theoretical methods.

Ann McDermott and Arthur G. Palmer, III, *Columbia University*

Redox Mechanisms in Inorganic Chemistry. By A. G. Lappin (University of Notre Dame). Ellis Horwood: New York. 1994. 286 pp. $95.95. ISBN 0-13-770751-7.

This book was developed from the meeting of the Royal Society of Chemistry Inorganic Mechanisms Discussion Group in 1986. After the preface by the author, there are five chapters covering the trends in mechanism which are found in inorganic redox chemistry: Introduction, The Outer-sphere Mechanism, The Inner-sphere Mechanism, Intramolecular Electron Transfer, and Multiple Electron Transfer. There is also a short subject index.

Annual Review of Biophysics and Biomolecular Structure. Volume 23. Edited by R. M. Stroud (University of California), C. R. Cantor (Center for Advanced Biotechnology), and T. D. Pollard (Johns Hopkins University School of Medicine). Annual Reviews: Palo Alto, CA. 1994. xii + 896 pp. $62.00. ISBN 0-8243-1823-4.

This is Volume 23 of the continuing series published by Annual Reviews Inc., a nonprofit scientific publisher established to promote the advancement of sciences. The volumes are organized by editors and editorial committees who invite qualified authors to contribute critical articles. After a preface by the editor, there are 29 chapters organized under the following headings: Structural Principles, Structure and Function, Dynamics, Emerging Techniques, and Biotechnology. There is also a subject index, cumulative index of contributing authors (Volumes 18–23), and cumulative index of chapter titles (Volumes 18–23).

Relativistic and Electron Correlation Effects in Molecules and Solids. NATO ASI Series. Series B: Physics Volume 318. Edited by G. L. Malli (Simon Fraser University). Plenum Press: New York. 1994. viii + 478 pp. $129.50. ISBN 0-306-44625-1.

This book was developed from the NATO Advanced Study Institute on Relativistic and Electron Correlation Effects in Molecules and Solids sponsored by Simon Fraser University and the Natural Sciences and Engineering Research Council of Canada held on 10–21 August 1992 in Vancouver, BC. After a preface by the editor, there are 16 chapters covering aspects of the effects of relativity and electron correlation on the electronic structure, bonding, and physical and chemical properties of molecules and solids, especially those involving heavy elements. There is also a list of participants and an index.

Trace Element Analysis in Biological Specimens. Edited by R. F. M. Herber (University of Amsterdam) and M. Stoeppler (Forschungzentrum Julich GmbH). Elsevier: Amsterdam. 1994. xiv + 576 pp. $475.00. ISBN 0-444-89867-0.

This is Volume 15 in the ongoing series of Techniques and Instrumentation in Analytical Chemistry. After a list of authors and a preface by the editors, there are 25 chapters covering the basic principles and methods involved in the trace analysis of several elements. There is a subject index.

Handbook of Natural Products Data. Volume 3. Isoquinoline Alkaloids. By Atta-ur-Rahman (University of Karachi, Pakistan). Elsevier: Amsterdam. 1994. x + 774 pp. $428.50. ISBN 0-444-81888-x.

This book is the third in the continuing series of spectral data of natural products, containing data of about 700 isoquinoline alkaloids, and covers the literature up to 1992 with a continuing volume to be published within a year. After a forward by the editors, there are spectral data and other physical characteristics of the isoquinoline alkaloids, most of which are derived from plant sources. There are also compound, molecular formula, molecular weight, compound-type, plant source, and numbering system indexes.

The Colloid Chemistry of Silica. Advances in Chemistry Series 234. Edited by Horacio E. Bergna (DuPont). ACS: Washington, DC. 1994. xviii + 696 pp. $129.95. ISBN 0-8412-2103-0.

This book was developed from the symposium sponsored by the Division of Colloid and Surface Chemistry at the 200th National Meeting of the American Chemical Society held on 26-31 August 1990 in Washington, DC. After a preface by the editor, a dedication to Ralph K. Iler, and an introductory overview chapter by the editor, there are 32 additional chapters organized under the following headings: Preparation of Sols, Stability of Sols, Surface Chemistry of Silica, Particle Size and Characterization Techniques, Sol-Gel Technology, Silica Gels and Powders, Silica Coatings, Uses of Colloidal Silicas, and Research in Russia. There are author, affiliation, and subject indexes.

Diagnostic Biosensor Polymers. ACS Symposium Series 556. Edited by Arthur M. Usmani (Firestone Building Products Company) and Naim Akmal (Teledyne Brown Engineering). American Chemical Society: Washington, DC. 1994. xii + 330 pp. $89.95. ISBN 0-8412-2908-2.

This book was developed from the symposium sponsored by the Division of Industrial and Engineering Chemistry, Inc., of the American Chemical Society held March 28–April 2, 1993, in Denver, CO. After a preface by the editor, there are 24 chapters organized under the following headings: Biosensors, Biosensor Polymers and Membranes, Biocompatibility and Biomimetics, and Immobilization and Stabilization Methods. There are author, affiliation, and subject indexes.

Synthesis of Lactones and Lactams. Updates from the Chemistry of Functional Groups. By M. A. Ogliaruso and J. F. Wolfe. J. Wiley and Sons: New York. 1993. xiv + 1086 pp. $520.00. ISBN 0-471-93734-7.

This book is one of the most recent additions to the collection of updates of the classical and well-established series of treatises edited by Saul Patai. The new volume is in two parts. The first of these is the original chapter on The Synthesis of Lactones and Lactams by the same two authors which appeared in Chapter 19 of *Supplement B: The Chemistry of Acid Derivatives* in 1979. The second major part is an appendix which updates the original material, covering the primary literature from 1975 to 1987. The same two authors have repeated this format in another addition to the update collection on Synthesis of Carboxylic Acids, Esters and their Derivatives.

The original chapter on the synthesis of lactones and lactams is nicely organized along the lines both of functional groups present in the precursors and starting materials and of the types of transformation used in assembling the target molecules. This structure is such that the reader may access the desired information from the dual perspectives of synthesis and mechanism. Thus, the section covering the synthesis of lactones begins with an overview of cyclization methods, including intramolecular cyclizations of hydroxy acids, esters, and related compounds and ring-closure reactions of unsaturated acids and esters. There follow sections on nucleophile-driven methods for lactone synthesis (aldol, Perkin/Stobbe, Grignard/Reformatsky, and Wittig-based processes), oxidative transformations, rearrangement processes, and finally a useful collection of miscellaneous methods. The section on the synthesis of lactams is divided into four broad categories: ring-closure reactions (chemical and photochemical), cycloaddition reactions, rearrangement reactions, and oxidation reactions. There also are sections dealing with the functionalization of preformed lactams and with miscellaneous preparative methods. This format and means of classification is closely reproduced in the appendix covering the later literature, and this will surely be a help for those readers familiar with the content of the original who wish to have an update on the area. As might be expected for a new review which builds on earlier work, in the Appendix, much of the material is collected in tabular form, and this treatment allows rapid evaluation and comparison of work carried out in closely-related areas. Highlights of the new work covered since the 1979 review include the reaction of vinylic sulfoxides with dichloroketene to give (arylthio)-γ-lactones, new intramolecular Diels–Alder-based methods for the assembly of bicyclic lactones, and the expansion of the section dealing with the functionalization of pre-formed lactams.

The book has seveal features which recommend it as an easy-to-use guide for workers in the area. There is a single, continuous numbering system for both structures and references, the structures are clearly drawn, and the tables are comprehensive and well-annotated. The reader is directed toward recent reviews which deal with some of the sections in greater depth. The author index allows rapid identification and location of contributions from specific groups. In particular, the choice of keywords in the subjects index enables searching to be carried out on the basis of either the functional group or the nature of the transformation. This is an excellent addition to this superb series and is a highly recommended acquisition for specialists in the field and for workers requiring a comprehensive introduction to the chemistry of these important functional groups.

Donald Craig, *Imperial College*

On Clusters and Clustering. From Atoms to Fractals. Random Materials and Processes. Edited by P. J. Reynolds (Office of Naval Research). North Holland: Amsterdam. 1993. xx + 402 pp. $80.00. ISBN 0-444-89022-x.

This book is a compendium of 29 chapters, each written by different authors and stretching nearly 400 pages. There are three major divisions: I. Small Atomic and Molecular Clusters: Production, Properties, and Electronic Structure; II. Larger Clusters: "Phase Transitions" in Clusters, Growth, Aggregation, and the Road to Condensed Matter; and III. Clusters in Condensed Matter and Fractal Behavior.

The breadth of material presented is truly impressive. Detailed experiments and calculations of the electronic structure of C_3 and C_4 can be found in Chapters 1 and 2. Later, a wonderfully descriptive historical review of the discovery and chemistry of fullerenes is contained in Chapter 9. The use of clusters to make thin films is reviewed in Chapter 14, while the general features of cluster dynamical simulations are presented in Chapter 18. Theoretical descriptions of the fractal nature of clusters and the cluster structures resulting from the diffusion-limited kinetic aggregation model are contained in Chapters 24 and 25.

With such breadth, the book must be aimed at a very general audience. In each chapter contained an extensive and well-written introduction and then covered a topic in the style of an expository review, the book might be suitable for advanced graduate students. Unfortunately, this is not the case. The writing is uneven, as might be expected in a compilation from different authors. The wide variation in introductory material in each chapter is less each to overlook. This reviewer found about one-third of the introductions to be of little use, simply 1–2 paragraphs of cursory material for the expert. Another third made some effort at introducing the subject to the nonexpert. Of the remaining good introductions, only Chapter 9 on The Third Form of Carbon contains an engrossing well-written introduction which enables the reader to understand the intellectual and technological importance of the subject.

This book must then be considered as a general reference. On this score, I found many chapters succeeded, including 8 of 9 in Part I, 7 of 10 in Part II, and 4 of 10 in Part III. None provided an authoritative review of the literature, but each was a reasonable short overview of the topic, emphasizing the authors' own research. For the professional theoretical chemist seeking such an overview of clusters science, especially of small- and medium-sized clusters in Part I and II, this is a worthwhile book. For those wishing either textbook level introductory material or comprehensive literature reviews, this is not the book.

Andrew E. DePristo, *Ames Laboratory and Iowa State University*

Biophysical Labeling Methods in Molecular Biology. By Gertz I. Likhtenshtein (Ben-Gurion University). Cambridge University Press: Cambridge and New York. 1993. vix + 306 pp. $54.95. ISBN 0-521-43132-8.

There is an acceleration in the spectroscopic investigation into biological structure and dynamics. This book serves to give an historical perspective to the field of biophysical labeling methods. It contains eight chapters. The first five chapters review the physical basis of the method, while the last three chapters are concerned with the use of these labeling techniques to investigate molecular biology.

Chapters 1 and 2 discuss the use of ESR. Topics covered in Chapter 1 include nitroxide radicals, rotational diffusion, and spin traps. Formulas are given that describe the various physical processes. Numerous examples and figures are provided to reinforce the basic concepts. Chapter 2 is

focused on double labeling techniques and discusses spin–spin interaction, exchange, and the effect of paramagnetic complexes. Also covered is a brief section on determination of the distance between spins by spin probes which left this reader wanting more detail and examples that would make clearer the limitations of this approach to determining distance. Chapter 3 is about fluorescent labeling methods and gives a survey of commonly used techniques, including inductive resonance energy transfer, dynamic quenching, and a sketchy section on exciplexes as luminescent probes. Chapter 4 is brief and barely scratches the surface of triplet labeling methods. Chapter 5 discusses some Mössbauer labels, NMR probes, and electron scattering labels.

In the remaining chapters, many of the commonly studied structures of molecular biology are surveyed. Chapter 6 concerns proteins, enzymes, and their mechanism of action. Chapter 7 covers model and biological membranes. Chapter 8 tries to cover too many topics in too few pages since it is impossible to do justice to nucleic acids, polysaccharides, cells, tissues, organisms, and biological assays in a chapter of only 36 pages! The reader would be better served if this chapter were expanded to provide a more complete description of just nucleic acids.

The interested reader should view this book as a text which is far from comprehensive. The description of ESR methods is the most complete aspect of this book. It is a useful adjunct to other works on this subject. Overall more than 600 references are cited. This text should be of use to graduate students and those considering research in biophysical chemistry who want an historical overview of labeling methods. This book would not be suitable as the primary text in a biophysical course because of a lack of derivations for the matematical formulas that describe the phenomena being discussed.

Bruce E. Eaton, *Washington State University*

Low Energy Ion-Surface Interactions. Edited by J. Wayne Rabalais (University of Houston). J. Wiley and Sons: New York. 1994. xiv + 594 pp. $120.00. ISBN 0-471-93891-2.

While low-energy ion-surface interactions may seem esoteric to the average chemist, these interactions are critical to surface analysis, semiconductor processing, thin film growth, and mass spectrometry. Despite their importance and perhaps because of the multidisciplinary nature of the field, no single book has previously existed which encompasses all the phenomena relevant to these interactions. *Low Energy Ion-Surface Interactions* admirably fills this gap in the literature.

As editor, Professor Rabalais has successfully achieved his pronounced goals of both reviewing the fundamental processes important to ion–surface interactions and describing a representative selection of related applications. The 11 chapters each cover a distinct topic and include low-energy ion scattering for surface analysis, charge transfer, electron emission, and molecular ion scattering. Thin-film deposition and modification with ions are also covered, including morphology and growth models. The chapter on sputtering is meant to supplement rather than supplant the existing accounts given in numerous other books on secondary ion mass spectrometry. The contributors to this volume constitute a representative cross-section of the low-energy ion-surface research community. The balance between experimental detail, theory, and phenomenological description is excellent and makes the text accessible to a wide audience, including chemists.

The topics covered by this volume reflect that most work on ion-surface interactions has focused on atomic, diatomic, and triatomic ions. Much recent work on larger polyatomic and cluster ion scattering off surfaces has not been covered here (a personal bias of the reviewer). However, a compelling argument can be made that the inclusion of polyatomic and cluster ion-surface experiments would have been premature given the ongoing developments in their fundamental understanding. Finally, the restriction of this volume to the low ion energy regime, <1 keV, is standard practice in the field and reasonable given the fundamental and practical differences from the medium- and high-energy regimes.

This volume constitutes an accessible and current review of low-energy ion-surface interactions: prior to its appearance, no single authoritative volume existed. Despite the reflexive cringe caused by any book which costs $120, this book will be a worthwhile acquisition for students in academia and industry, experts in the field, and science libraries.

Luke Hanley, *University of Illinois at Chicago*

Modern NMR Spectroscopy, Second Edition. By Jeremy K. M. Saunders (Cambridge University) and Brian K. Hunter (Queen's University at Kingston). Oxford University Press: Oxford, New York, and Toronto. 1993. xiv + 314 pp. $88.00 (cloth edition). ISBN 0-19-855566-0.

Most people who spend a lot of time with NMR spectroscopy have a large number of NMR books, in part because different texts are written with different objectives and any given book will do some things better than others. This book, subtitled a guide for chemists, is written for chemists with no background in chemical physics and little in physical chemistry. Its stated purpose is to bridge a gap between synthetic chemists interested in structural problems and the advances in NMR methodology that began with widespread application of time domain acquisition and continued through the first generation of 2D and spectral editing methods. The intended audience is advanced chemistry students with access to spectrometers and a desire to improve their skills without delving into mathematics more advanced than the rotating frame of reference. In the context of the book's objectives, it succeeds reasonably well. The price quoted above for the cloth edition is a little steep, but the inexpensive paperback version puts the book within a student's budget.

The second edition, modestly improved from the first, retains the original's format of wide outer margins packed as necessary with structures and small figures. Most of the spectra were acquired on the medium field (200–400 MHz) spectrometers that most spectra are run on these days. The text balances typical organic examples with inorganic compounds and pharmaceuticals. A good qualitative treatment of exchange phenomena introduces spectroscopic time scales and exchange equilibria by comparing ultraviolet and NMR spectra. Another thing the book does well is its presentation of hands-on problems in data acquisition and processing. I can imagine this book helping synthetic chemists make the transition between submitting their samples and becoming an operator.

I felt that the avoidance of equations went a little too far. The target audience of this book is typically vague on relaxation, and a more rigorous presentation in terms of correlation functions, spectral densities, transition probabilities, and mechanisms is needed. Most qualitative NMR books end up treating relaxation phenomena piecemeal and miss an opportunity to better organize otherwise unrelated issues. Similarly, the qualitative approach usually means an ad hoc introduction of solids as a special topic near the back, and the present case is no exception. But, for much of the target audience, solids is a special topic and the coverage is balanced.

The book concludes with a case study that pulls together some of the solution methods developed in the text. A workbook that accompanies this text is also available.

James F. Haw, *Texas A&M University*

Organic Reaction Mechanisms. 1991. Edited by A. C. Knipe and W. E. Watts (University of Ulster). J. Wiley and Sons: New York. 1993. x + 616 pp. $375.00. ISBN 0-471-93794-0.

This multiauthored treatise, the 27th volume in a continuing series, surveys the chemical literature between December 1990 and November 1991. The volume consists of 15 chapters, as follows (the number of literature references cited in each chapter is given in brackets): Reactions of Aldehydes and Ketones (M. I. Page, 20 pp [174]); Reactions of Acids and their Derivatives (W. J. Spillane, 58 pp [316]); Radical Reactions (two chapters, W. R. Bowman, 38 pp [242], and C. J. Rhodes, 44 pp [289]); Oxidation and Reduction (G. W. J. Fleet, 46 pp [406]); Carbenes and Nitrenes (R. A. Aitken, 22 pp [171]); Nucleophilic Aromatic Substitution (M. R. Crampton, 18 pp [155]); Electrophilic Aromatic Substitution (R. G. Coombes, 14 pp [84]); Carbocations (H. Maskill, 22 pp [114]); Nucleophilic Aliphatic Substitution (J. Shorter, 30 pp [192]); Carbanions and Electrophilic Aliphatic Substitution (A. C. Knipe, 22 pp [132]); Elimination Reactions (A. Thibblin, 22 pp [102]); Polar Addition Reactions (P. Kocovsky, 36 pp [140]); Cycloaddition Reactions (N. Dennis, 30 pp [227]); Molecular Rearrangements (128 pp [583]). The book concludes with author and subject indexes (42 and 21 pp, respectively).

The format of each presentation is to survey a given topic in a style that is similar to that employed by contributors to the Royal Society of Chemistry's *Annual Reports on the Progress of Chemistry*. Thus, coverage of any individual subtopic is generally confined to a brief summary statement, perhaps a structure drawing or a chemical equation, and a pertinent literature reference. No in-depth discussion of any particular subtopic is attempted. The scope of the present volume is more focused than that of *Annual Reports*, thereby permitting more comprehensive coverage of the literature for the chosen topics. There is some duplication of coverage among chapters, but this is probably inevitable in a multiauthored volume; such duplication has been kept to a minimum in the present volume. The text is relative error-free.

Persons who desire rapid access to the 1991 chemical literature on a given topic of mechanistic interest that falls within the volume's scope of coverage are likely to find this book to be valuable. However, the book's usefulness in this regard is mitigated by the fact that it was published *ca.* 2 years after the closing date of the review (November 1991). The "dated" nature of the subject matter, the necessarily limited scope of

coverage, plus the forbidding retail price of the volume all conspire to insure that relatively few copies will find their way into private hands.

Alan P. Marchand, *University of North Texas*

Introduction to Modern Vibrational Spectroscopy. By Max Diem (City University of New York). John Wiley and Sons: New York. 1993. xiii + 285 pp. ISBN 0-471-59584-5.

Vibrational spectroscopies have a rich history as tools for elucidating molecular structure and dynamics. This field has blossomed from its modern origins in the seminal theoretical works of the 1940s and 1950s into a broad discipline encompassing a large variety of techniques and applications. A proliferation of techniques has brought an increasing measure of specialization. The intent of this work is to bridge the gap between basic theory and specialized applications on a level that is tractable to advanced undergraduate and graduate students. These are lofty aims, especially for so compact (<300 pp) a text. They are, however, largely met. Professor Diem has produced an eminently readable book that nicely synthesizes an overview of both the physical bases for infrared and Raman spectroscopies and discussions of current instrumental techniques and applications. This work will be of considerable interest to students embarking on their first real exposure to vibrational spectrocopies and more seasoned practitioners seeking a reference to basic theory and applications.

The first four chapters deal with the fundamental classical and quantum mechanical aspects of molecular vibrations. The treatment is not intended to be rigorous and derivational. It does, however, present some well-written heuristic arguments and timely figures concerning the vibrational Schrödinger equation, selection rules, and electromagnetic radiation. The discussion of polyatomic normal modes (Chapter 3) is a bit more extensive, and the sample derivation of H_2O modes is particularly instructive. Finally, Chapter 4 considers the role of molecular symmetry in vibrational motions. Together, these initial chapters provide a concise and readable background necessary to appreciate molecular vibrations. Much rigor is sacrificed for brevity's sake, but readers desiring more depth are referred to the original works of Hertzburg, Cotton, Wilson, Decius, Cross, etc.

The remaining two-thirds of the text are devoted to the specifics of vibrational spectroscopy and selected applications. Chapter 5 presents a brief overview of Raman spectroscopy and its various nonlinear manifestations. This presentation is quite useful from a pedagogical standpoint since most undergraduate students have only minimal exposure to Raman scattering. The instrumentation discussed in Chapter 6 concentrates largely on IR methods. The description of interferometric methods contains a nice summary of the general aspects of Fourier transform protocols. The descriptions of the vibrational behavior of selected small molecules in Chapter 7 amply illustrate the applications of the basic principles discussed in earlier chapters. This section will be particularly useful to the student because the author does an excellent job of explaining the nuances of real spectra and the effects of symmetry, isotopic substitution, degeneracy, etc.

The last chapters amount to mini-reviews of two emerging areas of vibrational spectroscopy: biophysical applications and vibrational optical activity. The treatment of biophysical systems is too broad to be anything more than an introduction for the uninitiated. The description of vibrational optical activity in Chapter 9 is much more illuminating. It is clear that Professor Diem's specific expertise lies in this area.

In general, this is a thoughtful and well-written work. Its only possible weakness is that it often strives to be both textbook and review. As a result, it sometimes lacks the rigor of the former and is quite under-referenced for the latter. However, its hybrid nature allows it to span very effectively the gulf between basic physics and practical application. On the whole, I believe that the author has succeeded in producing a concise and lucid text that appeals to a broad audience. It is an excellent addition to the chemical literature.

Mark R. Ondrias, *University of New Mexico*

CRC Handbook of Chemistry and Physics. 75th Edition. Edited by David R. Lide (NIST). CRC: Boca Raton, FL. 1994. 2453 pp. $99.50. ISBN 0-8493-0475-x.

This book is the 75th edition and is known for covering all types of data commonly encountered by physical scientists and engineers. This edition differs considerably from earlier editions in that the table of "Physical Constants of Organic Compounds" has been replaced with a table compiled from the CRC Database "Properties of Organic Compounds". There are also the following new tables on topics in physics: Elasto-Optic, Electro-Optic, and Magneto-Optic Constants; Elastic Constants of Single Crystals; Infrared Laser Frequencies; Infrared and Far Infrared Absorption Frequency Standards; and Neutron Scattering and Absorption Properties. Also, to shorten the volume, several tables have been removed or shortened, such as magnetic susceptibility, nutritive value of foods, chemical nomenclature, and a few other topics. As always, the tables are updated with the most recent values from evaluated sources. After a preface by the editor, the book contains the following 16 sections: Basic Constants, Units, and Conversion Factors; Symbols, Terminology, and Nomenclature; Physical Constants of Organic Compounds; Properties of the Elements and Inorganic Compounds; Thermochemistry, Electrochemistry, and Kinetics; Fluid Properties; Biochemistry; Analytical Chemistry; Molecular Structure and Spectroscopy; Atomic, Molecular, and Optical Physics; Nuclear and Particle Physics; Properties of Solids; Polymer Properties; Geophysics, Astronomy, and Acoustics; Practical Laboratory Data; and Health and Safety Information. There are also appendixes on Mathematical Tables and CAS Registry Numbers and Molecular Formulas of Inorganic Substances and a comprehensive index.

Kirk-Othmar Encyclopedia of Chemical Technology. Fourth Edition. Volume 11. Edited by Jacqueline I. Kroschwitz and Mary Howe-Grant. Wiley Interscience: New York. 1994. xxviii + 1112 pp. $295.00. ISBN 0-471-52680-0.

This is the 11th volume of a 25 volume encyclopedia set, four volumes being published each year. The Fourth Edition is similar in format to the earlier editions with updates to the entries as necessary and the addition of several new subjects. This volume contains 26 entries ranging from Flavor Characterization to Fuel Cells. This volume does not contain an index; however, paperback indexes are published every four volumes and the supplement and index volumes are scheduled for publication in 1998.

Electroanalytical Stripping Methods. Volume 126 in Chemical Analysis. By Kh. Brainina (Ural Institute of National Economy) and E. Neyman (Central Special Inspection of Russian Environmental Protection Committee). John Wiley and Sons: New York. 1993. x + 198 pp. $79.00. ISBN 0-471-59506-3.

This is the first new book to appear on the subject of stripping analysis in the past 10 years, and nearly two decades have passed since Professor Brainina's first book on stripping voltammetry was published. This volume offers a thoroughly up-to-date guide to the latest theoretical and experimental developments. A particularly attractive feature of the book is the coverage of Russian literature; fully one-third of the references are to the research performed in the former Soviet Union.

The preface to the book expounds on the importance of electrochemical methods in analytical chemistry. After a brief introduction to the scope of stripping electroanalytical methods, Chapter 1 presents modern theoretical concepts on the discharge-ionization of individual and binary metal systems based on adatom formation conditions and electrocrystallization overvoltage. Chapters 2–4 present the basic principles of the major stripping techniques in the analysis of solutions. Coverage in Chapter 2 includes auxiliary elements to lower detection limits, the "third"-element effect, and the application of an internal standard. An assessment of electrode materials and cell design is presented in Chapter 3. Brief discussion is given to traditional metal, carbon, and film electrodes. Two tables cover electrodes modified with complex-forming reagents, polymer membranes, ion-exchange polymers, and extractants and by in-situ methods. Flow-through and ultramicroelectrode designs highlight cell developments. In Chapter 4, traditional amalgam-based preconcentration methods are presented alongside newer adsorptive and extractive methods. The chapter concludes with analysis of natural and industrial materials, focusing on nonferrous metallurgy, microentities (film coatings and crystals), and environmental and biological materials. Extensive use is made of summary tables. Unique to this book is the material presented in Chapter 5 on phase analysis of solids (alloys, chalcogenides, and oxides) with the carbon paste electroactive electrode and in Chapter 6 on the investigation of defect structure of solids.

The authors have succeeded in their task of presenting newly accumulated materials without excessive review. Indeed, fully 80% of the references are less than 15 years old. This book will be a useful reference to the established practitioner of stripping analysis but will be less helpful to those initiating work of this type who are looking for a practical guide. As in many recent stripping books, there is inadequate discussion on speciation analysis. One unfortunate aspect of the text is the large number of grammatical errors in the references, especially in the spelling of author names.

Howard D. Dewald, *Ohio University*

Structure and Properties of Polymers. Volume 12 of Materials Science and Technology. Edited by R. W. Cahn (University of Cambridge), P. Haasen (University of Göttingen), and E. J. Kramer (Cornell University). VCH: New York. 1993. xiii + 786 pp. $270.00. ISBN 0-89573-700-3.

This beautifully produced handbook contains 15 chapters, contributed by an international panel of authors, that span a range of topics in polymer physics and engineering. Each chapter is accompanied by a list of symbols and abbreviations, cited references that generally survey the literature to 1991–1992, and a general reading list. The subject index runs 19 pages.

The topics covered include model polymers, computer modeling of amorphous microstructures, crystal structures, semicrystalline polymers, liquid crystals, blends, elastic properties of crystalline polymers, rubber elasticity, viscoelasticity, plastic deformation, dielectric properties, optical properties, high-performance fibers, polymer surfaces, and fracture. Polymer processing is the central theme of Volume 18 of the series. Surprisingly, there is little discussion of the NMR and IR spectroscopies of polymers and of electroactive polymers (e.g., poly(acetylene)). More importantly, there is an unfortunate lack of physical organic chemistry in this volume—at the very least, some discussion of functional group properties should have been included in the introductory chapter. This volume contains a nice blend of experimental results and theoretical models—profitable digestion of the latter will require a moderate background in statistical mechanics.

These comments notwithstanding, this is a useful addition to the polymer science literature. The goal of producing a reference work that focuses on structure–property relationships has largely been realized. It is unfortunate that its high cost will preclude widespread purchase of copies for individual use.

Walther R. Ellis, Jr., *University of Utah*

Biochemistry of Zinc. By Ananda S. Prasad (Wayne State University School of Medicine). Plenum Publishing: New York. 1993. xiv + 304 pp. $79.50. ISBN 0-306-44399-6.

This 1993 book authored by Dr. Prasad, a noted researcher in zinc biochemistry, is Volume 11 in the series *Biochemistry of the Elements* (Series Editor Earl Frieden, Florida State University). The book consists of 13 chapters with subjects ranging from historical aspects in Chapter 1 to specific aspects of zinc biochemistry in the remaining chapters. For each chapter, an introduction provides information basic to an understanding of the subsequent detailed literature-based discussions.

Chapter 2, entitled Zinc and Enzymes, categorizes zinc metalloenzymes on the basis of their roles: catalytic, structural, regulatory, or noncatalytic. Characteristics and functions of specific enzymes are described. Under the topic Zinc and Gene Expression in Chapter 3, the concept of zinc fingers and their role in DNA binding and transcription are covered, and this concept is extended to an array of hormone receptors. Biochemistry of Metallothionein, the topic of Chapter 4, describes structure, induction, and functional aspects of metallothionein and the characteristics of Cd, Cu, and Zn binding by this low molecular weight protein. Little appears to be known about the function of metallothionein except for its potential roles in protecting cells from several types of toxic metals and the damaging effects of free radicals.

Chapter 5, Zinc and Hormones, contains many examples of growth retardation and delayed sexual development related to zinc deficiency and inadequate hormone expression in humans. The importance of zinc in the synthesis of various hormones and its role in hormone receptor sites, as alluded earlier, are detailed.

Similarities between deficiencies of Zn and essential fatty acids (Chapter 6) are thought to be due to the inhibition of zinc-dependent steps involving desaturation of linoleic acid in the formation of longer-chain metabolites. While zinc deficiency lowers formation of HDL, an increase in blood cholesterol levels in humans with an excessive intake of zinc appears to be due to a zinc-imposed copper inadequacy.

In addition to cellular effects of the many zinc enzymes, multiple cellular effects of zinc appear to be related to free-radical suppression (Chapter 7). This may involve the synthesis of metallothionein, which acts as a free radical scavenger. An involvement of zinc in DNA synthesis and cell division, as discussed in Chapter 8, is related to several of the neurobiological consequences of zinc deficiency. Protection of brain cells against damage by superoxide radicals may involve the cuprozinc enzyme superoxide dismutase. Specific relationships of zinc deficiency with various neurological conditions are detailed in this chapter.

The relationship of zinc deficiency to reduced immunocompetence and immune functions is discussed in Chapter 9. Discussions on the metabolism of zinc (Chapter 10) encompass intestinal absorption, intracellular transport, blood transport, excretion, and homeostasis of zinc. Chapter 11, entitled Clinical Spectrum of Human Zinc Deficiency, covers subtopics related to several diseases known to be manifestations of zinc deficiency, whether mild or severe. Interactions of zinc with other micronutrients (Chapter 12) involve the inorganic elements Cu, Mn, Pb, Ca, Mg, and Na, the vitamins A, D, E, and B_6, folic acid, and biotin. This chapter blends animal and human studies and describes zinc administration as a treatment for Wilson's disease, a potentially fatal inborn error involving excessive accumulation of copper in tissues. In this procedure, zinc is believed to increase intestinal metallothionein, which has a higher affinity for copper than zinc. The increased metallothionein is believed to bind copper, which is ultimately exreted in the feces when the cells are sloughed off.

The final chapter (Chapter 13) describes preparative procedures for the atomic absorption determination of zinc in blood plasma and for flameless atomic absorption determination of zinc in platelets, lymphocytes, and granulocytes.

This book provides a wealth of information and literature references on zinc biochemistry. It is a highly recommended reference text.

Royce J. Emerick, *South Dakota State University*

Modern Methods for Trace Element Determination. By C. Vandecasteele (University of Leuven) and C. B. Block (Industriele Hogeschool Groept). John Wiley and Sons: New York. 1993. viv + 330 pp. $74.95. ISBN 0-471-94039-9.

The authors of a monograph on trace element determination are faced with a most difficult task. Of necessity, a wide series of analytical techniques for determination of trace levels must be covered as illustrated by the chapter headings of this book: Spectrochemical Measurements, Atomic Absorption Spectrometry, Atomic Emission Spectrometry, Atomic Fluorescence Spectrometry, Comparison of Atomic Spectrometric Analytical Techniques, Mass Spectrometry, X-ray Methods, and Activation Analysis.

Further, they have to address the problems peculiar to trace analysis: sample preparation, separation, preconcentration, standardization, calibration, detection and determination limits, and a detailed treatment of sources and treatment of error. Subjects are considered here in the chapters headed Sample Preparation and Methodology in Trace Element Determination.

How to strike a balance between superficiality and duplication of other, single technique texts is not frequently solved. Unfortunately, that balance has not been achieved here. To be fair to the authors, perhaps only a multivolumed text could do justice to this area. One remembers, for example, the two-volume NBS special publication *Accuracy in Trace Analysis: Sampling, Sample Handling, Analysis*, edited by Philip LaFleur in 1974. This 1300-page effort treats only a portion of the topics covered in the Vandecasteele and Block book in 323 pages of text. The biennial Fundamental Reviews issue of *Analytical Chemistry* gives more space to cover some of the techniques described in the present book and is, inevitably, more up-to-date.

What is the intended readership of this book? The general attributes of the various techniques are treated as they might be in an undergraduate general analytical or instrumental text. If this text is to be the basis of a course in trace analysis, then much of it would have been covered in prior courses. If the intended audience is largely non-analytical chemists, however, then this book provides an adequate overview of principles, instrumentation, and environmental, biological, and some industrial applications. The references and suggested further reading cover the literature up to 1990 and are appropriate and useful.

Henry Freiser, *University of Arizona*

Handbook of Hot Atom Chemistry. Edited by J.-P. Adloff, P. P. Gaspar, M. Imamura, A. G. Maddock, T. Matsuura, H. Sano, and K. Yoshihara. VCH: New York. 1992. xviii + 702 pp. $225.00. ISBN 1-56081-271-0.

This book is a compilation of information on many aspects of hot atom chemistry. In the preface the editors state that their goal is "to make the methods, findings, and point of view of hot atom chemists available to workers in many fields". The book is intended to serve as "a guidepost to the future as well as a record of the past". It covers many of the same general topics as its 1984 predecessor, *Hot Atom Chemistry*, edited by T. Matsuura, though the present book is more extensive and covers some newer material.

The book consists of eight chapters each containing a series of sections by different authors. The chapters range from historical reviews to reviews of current work. Chapter 1 presents an historical overview of hot atom chemistry. Chapter 2 contains sections on individual elements whose high-energy reactions have been studied by nuclear recoil techniques. Surprisingly, fluorine is not included in this chapter, although there is a section devoted to each of the other halogens. Some fluorine studies are referred to in other chapters, but no systematic discussion of hot atom fluorine research is presented. This is a serious omission since the study of nuclear recoil fluorine reactions has contributed much to the

understanding of hot atom dynamics. Following the discussion of individual elements in Chapter 2, Chapter 3 addresses fundamental dynamics studies related to hot atom chemistry. Molecular beam studies and theoretical calculations of hot atom dynamics are included here. Chapter 4 deals with studies of hot atom reactions in condensed phases. Chapter 5 discusses both experimental and theoretical studies of radiation-induced effects. Chapter 6 is a short chapter discussing other nuclear techniques related to hot atom chemistry. The last two chapters in particular serve to illustrate the applications of hot atom chemistry to diverse areas of current research. Chapter 7 introduces several interesting applications of hot atom chemistry to other fields such as life sciences, geochemsitry, and space science. Chapter 8 illustrates the relevance of hot atom chemistry to energy and environmental issues.

As can be expected in a book written by many authors, the style and clarity of writing varies from chapter to chapter. Some sections give more extensive discussion of methods and results of experiments or calculations, others simply outline the topic and direct the reader to references for further information.

Overall, the book succeeds in presenting the field of hot atom chemistry as one that has something to offer to chemists in a wide range of disciplines. Some of the sections are essentially historical in nature, while others fulfill the editors wish to point to the future of hot atom chemistry as well as chronicle the past. Given that the field of hot atom chemistry has not been well publicized to a wide audience in the past, this combination of historical review and new directions is appropriate to advertise the wealth of chemical information that has been gained through hot atom studies. Although not quite comprehensive in its coverage, the book provides a valuable starting point for studying the literature of hot atom chemistry including references to recent studies in this field as well as to the extensive literature from previous decades.

Kathleen D. Knierim, *University of Southwestern Louisiana*

Advances in Detailed Reaction Mechanisms. Volume 3. Reactions of Importance. Edited by James M. Coxon (University of Canterbury). JAI Press: Greenwich, CT. 1994. x + 290 pp. $90.25. ISBN 1-55938-741-6.

This book is volume three in an ongoing series devoted to the recording of reactions of importance in synthesis. After a list of contributors, an introduction to the series by Albert Padwa, and a preface by the editor, there are seven chapters with the following headings: Stereochemistry and Mechanism of Allylic Tin-Aldehyde Condensation Reactions by Yoshinori Yamamoto and Naomi Shida; Stereoelectronic Rules in Addition Reactions: "Cram's Rule" in Olefinic Systems by Koichi Mikami and Masaki Shimizu; 1,4-Addition Reactions of Organocuprates with α,β-Unsaturated Ketones by Robin A. J. Smith and A. Samuel Vellekoop; Diastereofacial Selectivity in the Diels-Alder Reaction by James M. Coxon, D. Quentin McDonald, and Peter J. Steel; Template Effects of Distannoxanes by Junzo Otera; N-Alkylation of Nitrogen Azoles by Paul A. Benjes and M. Ross Grimmett; and Generation and Cyclization of Unsaturated Organolithiums by William F. Bailey and Timo V. Ovaska. There is a subject index.

Order in Thin Organic Films. By R. H. Tredgold (University of Manchester). Cambridge University Press: Cambridge, U.K., New York, Australia. 1994. xii + 199 pp. $49.95. ISBN 0-521-39484-8.

This little book (elegantly printed by Cambridge University Press on high-quality paper) aims at providing graduate students and established research workers with a review of the methods used in the deposition and characterization of highly ordered organic thin films. It consists of two introductory chapters, one chapter on films at the air/water interface, two on LB films, and one each on self-assembly, liquid crystals, and biomolecules. It is probably not appropriate to speak of it as a real book because of the relatively small size, the rather uneven distribution of subjects, and the lack of completeness in the coverage. On the other hand, it is also difficult to consider it a monograph, since this type of publication would normally cover less ground in exchange of greater depth and sophistication, which is not the case here.

Indeed, the description of the physical principles behind the formation of the films and the characterization of their structure is kept at the qualitative level and is carried out in a somewhat random (and in one occasion, incorrect) way. For example, the description of X-ray scattering techniques is split into two parts: half in the characterization chapter and half in the chapter which deals with films at the air/water interface where grazing incidence synchrotron methods are described. Furthermore, several pages are dedicated to neutron scattering while it is acknowledged that this technique has, so far, contributed very little to this field. On the other hand, frequency-sum spectroscopy is left out, which is questionable given the great potential and the excellent results already obtained on organic monolayers by several workers, such as Y. R. Shen, A. Harris, and others. The incorrect statement "...given the existence of stable molecules, London forces are not truly quantum mechanical in origin and may be understood in terms of purely classical arguments..." can be found in the section on Intermolecular Forces and is quite surprising since it is at odds with the generally accurate level of the book.

Definitely the best part of the book is the chemical and phenomonological description of the various systems since it contains useful qualitative summaries and collections of facts written in an easily readable style. On the other hand, I found it very questionable to include (and limit to) the discussion of computer simulation methods in the chapter on liquid crystals, given the substantial activity of this kind in progress also in the other areas. Finally, it is also difficult to see why organic thin films formed by molecular beam deposition (intensively studied by the optoelectronic community) have been left out of the scope of the book since these films are closely related to those discussed and the preface of the book gives microelectronic applications as one of the main motivation behind the study of organized organic films.

The literature quoted is fairly extensive and up to date but of uneven coverage. From this point of view, the areas which have suffered more are self-assembly and, in general, the more physics-oriented literature.

Overall, the recent book by Ulman (*Ultrathin Organic Films*), which is quoted in a few places in this book, does a better job at reviewing this area of science. However, given the enormous amount of information which has to be digested at present, I feel that all books that meet minimum standards (as this certainly does) serve a useful purpose even if they cannot be recommended as "mandatory reading" to all researchers (and would be researchers) in the field.

G. Scoles, *Princeton University*

Advances in Supramolecular Chemistry. Volume 3. Edited by George W. Gokel (Washington University School of Medicine). JAI Press: Greenwich, CT. 1993. xii + 220 pp. $90.25. ISBN 1-55938-546-4.

The third book in this timely series continues the tradition of excellence started with the first two volumes. The book comprises six chapters written by internationally recognized scientists and covers widely different areas in which the common theme is supramolecular chemistry. All chapters are up to date reviews (latest reference 1992 and many in the 1990) on specific aspects of supramolecular chemistry and are intended not only for supramolecular chemists but for a wide range of scientists working in related fields.

Chapter 1 is an excellent review on Collet's work on cryptophanes. They discuss in details the synthesis, the structure, and the recognition ability of these ball-shaped receptors related to Cram's carcerands. The second chapter by Takemoto and Miyata presents an account on the polymerization of monomers included in steroidal canals. This is an interesting chapter that bridges polymer and organic chemistry through supramolecular chemistry. The third chapter by Kaden is an excellent and informative review on the structural aspects, complexation properties, and applications of tetraazamacrocyles. The section on the medical applications of such compounds is particularly interesting. This chapter is followed by a review on Shinkai's work on calixarenes. Though calixarenes have been the subject of an entire book by Gutsche, this review presents a summary of Shinkai's personal contribution to this area with an emphasis on the ionophoric properties of modified calixarenes. The next chapter by Czarnik is devoted to the development of molecular sensors using the chelation-enhanced fluorescence (CHEF) strategy. With a very good introduction on the subject, this chapter present a novel concept for the detection of metal and non-metal ions as well as some applications. The book ends by a thorough and up to date review (237 references) by Reinhoudt and co-workers on the recognition of neutral molecules by synthetic receptors. In this review, receptors are divided into three classes: macrocyclic receptors, clefts, and metalloreceptors. This chapter is of interest to all chemist involved in the complexation and detection of neutral organic molecules.

In summary, this timely book is a worthy acquisition for anyone, experts and novices alike, interested by the topics covered.

Normand Voyer, *Université de Sherbrooke*