

Book Reviews*

Metallothioneins: Synthesis, Structure and Properties of Metallothioneins, Phytochelatins, and Metal-Thiolate Complexes. Edited by Martin J. Stillman (University of Western Ontario), C. Frank Shaw III (University of Wisconsin), and Kazuo T. Suzuki (National Institute for Environmental Studies, Japan). VCH: New York. 1992. xii + 444 pp. \$125.00. ISBN 0-89573-758-X.

This book was developed from the symposium on the Chemistry of Heavy Metals in Physiologically Important Roles sponsored by the 1989 PACIFICHEM conference held in Hawaii. After a short preface by the editors and a list of the contributors with their affiliations, there are 16 chapters with emphasis on current research on the isolation, structure, and reactivity of the metallothionein and metallothionein-like peptides. There is also a subject index.

Reagent Chemicals. 8th Edition. American Chemical Society Specifications. American Chemical Society: Washington, D.C. 1993. x + 906 pp. \$149.95. ISBN 0-8412-2502-8.

This book was developed by the Committee on Analytical Reagents of the ACS to provide requirements and instructions for the analytical methods to be used in determining conformity to the requirements for reagents used in precise analytical work. This edition is mainly an update for the general test methods, which include gas chromatography, water determination, and the replacement of flame emission techniques by atomic absorption for metal determination. The general methods for chromatography and atomic absorption have been revised to reflect use in the typical analytical laboratory. Also new to this volume is the elimination of boiling points and density requirements, the use of liquid chromatography in assay determinations, and the addition of 24 new reagents. After a preface, this book contains two detailed sections: Definitions, Procedures, Standards and Specifications; and Specifications for Reagent Chemicals. There is also a subject index.

Advances in Applied Lipid Research. Edited by Fred B. Padley. JAI Press: Greenwich, CT. 1993. x + 272 pp. \$78.50. ISBN 1-55938-317-8.

Dr. Padley has selected five areas to illustrate the rapid changes occurring in applied lipid research. His choices of contributors are excellent. Their combined efforts have produced, on the whole, an interesting, solid perspective of the following topics.

The chapter entitled Enzymes and Lipid Modification, by Peter Eigtved, is concerned primarily with microbial lipases. The scope of the well-documented article, with appropriate references to more extensive reviews, extends beyond the usual description of enzyme sources, purification, and specificity to include well-presented subtopics of (a) reaction systems, (b) process technology, (c) applications, and (d) products. The latter includes (1) flavor in food, (2) fatty acid production, (3) detergent lipases, (4) pulp and paper, (5) fatty acid esters, (6) specialty lipids, (7) oil refining, and (8) digestive and analytical use. This in-depth survey is highly useful and a good point of departure for additional exploration of individual lipases.

The Interaction of Oxidized Lipids with Proteins, by Peter N. Gillatt and J. Barry Rossell, is almost entirely descriptive, detailing various theoretical free radical mechanisms proposed for the interaction of oxidized lipids with protein. The impact of the chapter would be greater if there had been data relating the kind and extent of oxidative and covalent modifications quantitatively to the taste and odor of the protein products.

The in-depth focus on yeast as a source of single cell oil, Synthesis of Lipids in Yeast: Biochemistry, Physiology, and Production, by R. Julian Davies and Jane E. Holdsworth, is timely in view of the expanding knowledge base for genetic engineering of yeast. The carefully developed review encompasses all aspects of adaptation of genetically engineered yeast for commercial purposes and is highly recommended for its four case studies.

The chapter Long-chain Polyunsaturated Fatty Acids: Sources, Biochemistry, and Nutritional/Clinical Applications, by Robert G. Ackman and Stephen C. Cunnane, is satisfying. The high level of general interest in long-chain polyunsaturated fatty acids (PUFA) belies the difficulty of evaluating the confusing literature. Their perspective is refined, addressing in particular the differences in the biochemistry of PUFA among species, organs, and cell types that exist and preclude easy

generalizations. They achieve a balanced presentation of the complex, controversial, and unknown aspects of the nutritional and clinical applications of PUFAs. As stated in their summary, much more basic information concerning the absorption, distribution, and metabolism of PUFAs in humans is needed before it is possible to understand the potential of and then to optimize this form of disease management.

Keith D. Bartle and Tony A. Clifford, in *Supercritical Fluid Extraction and Chromatography of Lipids and Related Compounds*, give a thorough explanation of supercritical fluid phenomena with detailed useful examples of its impact in the processing of lipids and related compounds. The excellent in-depth summary of the field makes it easy to appreciate the rapidly growing importance of supercritical fluid technology.

In summary, the book is highly recommended for specialists in lipid research, first, as a comprehensive introduction to these specialized topics, and second, as a source for relevant literature. The volume will also serve well those with a more general interest in developing applications of diverse technologies.

Louis C. Smith, *Baylor College of Medicine*

Polymer Applications for Biotechnology. Edited by David S. Soane (University of California, Berkeley). Prentice Hall Press: Englewood Cliffs, New Jersey. 1992. xi + 314 pp. \$55.00. ISBN 0-13-683251-2.

This interesting book reporting on polymer applications for biotechnology is edited by David S. Soane, Professor of Chemical Engineering at Berkeley. It contains nine chapters written by 11 scientists of various origins.

The first chapter is an overview of the problem of the production of proteins from recombinant DNA in relation to the ability to transfer genetic information between prokaryotic organisms. The attention of the reader is attracted by the fact that, among the various physicochemical methods used at each step of purification, the biomolecules are contacted with natural or synthetic polymers which can act in various manners on these molecules. We agree with the authors to consider that a minimal knowledge of the synthesis and the physical and physicochemical properties of polymers is essential for the understanding of the various aspects of biotechnologies.

The second chapter called Fundamentals of Polymers deals with the main aspects of polymer science. The basic concepts and principles of chemistry and physics are briefly reviewed. They include synthesis, characterization, structure-property relations, and processing. The important topic of synthetic polymers used for biomacromolecular separations is also included. This chapter is obviously insufficient, but a lot of references including the most important books appearing in the field of polymer science are provided for those who want to know more.

The third chapter is devoted to polymeric membranes which play an important role for various separations in biological fluids. This chapter shows how an understanding of polymer science and engineering can be used to enhance membrane performance. The various parameters which depend upon these performances are described as well as what should be done to try to improve their effectiveness.

Chapter 4 concerns the polymeric packing materials in liquid chromatography for biological applications. Liquid chromatography is a technique largely employed for the recovery of high-value products from biotechnological processes. A theoretical approach and a description of the various modes in relation with the nature of the polymeric material used are presented here. Some problems but also some perspectives are discussed. A few lines are thus devoted to new techniques such as supercritical fluid chromatography and continuous annular chromatography.

Chapter 5 is a short chapter focused on the description of the principles of electrophoretic separations in polymer matrices. The two basic theories known as the Ogston and the biased-reptation models are presented.

The next chapter is a continuation of the previous one and describes the use of polymers as matrices in electrophoresis. Various chemical and physical aspects concerning polyacrylamide gels as well as their applications are discussed. Recent aspects in relation to new matrices, thermally reversible gels, and capillary electrophoresis are also briefly presented.

Chapter 7 deals with aqueous two-phase partitioning in biotechnology. A brief overview of the theories proposed to predict phase separation and biomolecules partitioning in aqueous two-phase systems is presented. The applications and the recent developments are then discussed. This method can be considered an important development.

Chapter 8 is a presentation of the use of crosslinked gels as water

*Unsigned book reviews are by the Book Review Editor.

absorbents in separation operations. Such gels are useful for concentration and recovery of solutes from dilute aqueous solutions and can be considered as a convenient alternative to ultrafiltration. Fundamentals of gel chemistry, swelling, and selectivity are outlined.

The last chapter is a general review on the analysis of polymer structure and transport properties by laser-light scattering. It concerns an overview of the basic concepts of dynamic light scattering. The usefulness of this technique for the characterization of biological systems is well demonstrated.

Though this book has only a little more than 300 pages, it is relatively well written with easy access for a wide range of readers. A sufficient number of references including very recent papers is provided at the end of each chapter.

I particularly recommend this book to two types of readers, whether they are in an industrial or a research structure: those working in the field of biology or pharmacy who are interested in improving their performances with a knowledge of polymer science and those who are polymerists and will discover very interesting applications of polymers in the field of life science, in particular biotechnologies.

Alain Domard, Lyon University, France

Pulsed Magnetic Resonance: NMR, ESR, and Optics. Edited by D. M. S. Bagguley (University of Oxford). Clarendon Press: New York. 1992. xvi + 550 pp. \$135.00. ISBN 0-19-853962-2.

This book, a tribute to E. L. Hahn for his seventieth birthday, compiles current research in chemistry and physics which has grown out of the original NMR papers of E. L. Hahn. After a list of contributors and an introduction about Erwin Hahn, there are 22 chapters, a list of published papers by Hahn, a glossary of abbreviations, an author index, and a subject index.

Protein Folding: In Vivo and In Vitro. ACS Symposium Series 526. Edited by Jeffrey L. Cleland (Genentech, Inc.). American Chemical Society: Washington, DC. 1993. xii + 282 pp. \$54.95. ISBN 0-8412-2640-7.

This book was developed from the symposium sponsored by the Division of Biochemical Technology at the 203rd National Meeting of the American Chemical Society held in San Francisco, CA, on April 5–10, 1992. After a preface and an introductory chapter by the editor, there are 18 additional chapters organized under the following headings: In Vivo Protein Folding; and In Vitro Protein Folding. There are also author, affiliation, and subject indexes.

Handbook of Enzyme Inhibitors. Second, Revised, and Enlarged Edition. Parts A & B. By Helmward Zollner (Karl Franzens Universität, Graz). VCH: New York. 1993. viii + 1066 pp. \$360.00. ISBN 1-56081-219-2.

This is a two-volume update of the first edition of the Handbook of Enzyme Inhibitors. Part A contains an Enzyme → Inhibitor List, with the enzymes ordered alphabetically along with their EC numbers. The list is organized under the following column headings: Inhibitors; Types of Inhibitors; Effective Inhibitor Concentration (K_i values); Comments; and Reference Numbers. Part B contains an Inhibitor → Enzyme List, with the inhibitors listed alphabetically with the enzymes they affect. The list is organized under the following headings: Type of Inhibition; and Effective Concentration (K_i value). Part B also contains a Common → Systematic Inhibitor Names glossary, which is a list of common names of inhibitors listed alphabetically together with the systematic names. There is also an EC numbers list.

Detergents. The Handbook of Environmental Chemistry. Volume 3, Part F, Anthropogenic Compounds. Edited by N. T. de Oude (University of Bayreuth). Springer-Verlag: New York. 1992. xvi + 402 pp. \$175.00. ISBN 0-387-53797-x.

This book is part of a five-volume series which concentrates on the chemistry of the environment and the chemical reactions occurring in the environment. After an introduction and a list of contributors, there are 15 chapters that cover the major raw materials used in consumer and industrial detergents and a subject index.

Measurement Challenges in Atmospheric Chemistry. Advances in Chemistry Series 232. Edited by Leonard Newman (Brookhaven National Laboratory). American Chemical Society: Washington, DC. 1993. xiv + 408 pp. \$94.95. ISBN 0-8412-2470-6.

This book was developed from a symposium sponsored by the Division of Analytical Chemistry of the American Chemical Society. After a biographical sketch of the editor and a preface by the editor, there are 13 chapters dealing with sampling, dry deposition to surfaces, aerosol analysis, measurements of nitrogen compounds and hydrocarbons, and the development of personal air monitors. There are also author, affiliation, and subject indexes.

Stability and Stabilization of Enzymes. Studies in Organic Chemistry 47. Edited by W. J. J. van den Tweel (DSM Research), A. Harder (Gist-brocades), and R. M. Buitelaar (Agrotechnological Research Institute). Elsevier: New York. 1993. xiv + 520 pp. \$242.75. ISBN 0-444-89372-5.

This book was developed from the Proceedings of an International Symposium on Stability of Enzymes sponsored by the Working Part on Applied Biocatalysis of the European Federation of Biotechnology, held in Maastricht, The Netherlands, on November 22–25, 1992. The symposium was organized under the following topics: Stability and Stabilization of Enzymes; Fundamentals of Enzyme Stabilization; Analytical Tools to Measure Enzyme Stability and Stabilization; and Industrial Enzyme Stabilization. After a preface by the editors and acknowledgements, there are 62 chapters, including both oral and poster presentations. There is also an author index.

Synthetic Microstructures in Biological Research. Edited by Joel M. Schnur and Martin Peckerar (Naval Research Laboratory). Plenum Press: New York. 1992. xii + 250 pp. \$75.00. ISBN 0-306-44347-3.

This book was developed from the Third International Conference on Synthetic Microstructures in Biological Research held in Williamsburg, VA, on September 9–12, 1991. After an introduction by Schnur, there are 23 chapters organized under the following headings: Fabrication; Characterization; Biological Interfaces; and Applications. There are also a list of contributors and a short subject index.

Asymmetric Synthesis. Edited by R. A. Aitken (University of St. Andrews) and S. N. Kilényi (Sanofi Research). Blackie Academic & Professional: London, Glasgow, New York, Tokyo, Melbourne, and Madras. 1992. vii + 233 pp. \$159.00. ISBN 0-7514-0059-9.

This is a multiauthored book aimed "as an introduction to the area for advanced undergraduate and postgraduate students...and also for chemists in industry who are not familiar with the area." The result is both more and less than the authors imply. It is more in the sense that the broad definition of asymmetric synthesis of J. D. Morrison and H. J. Mosher (*Asymmetric Organic Reactions*; American Chemical Society: Washington, DC, 1976; pp 4–5) is used, albeit without attribution. This allows descriptions of all of the major methods available for preparation of chiral molecules in enantiomerically enriched form as well as introductory chapters on Chirality, The Description of Stereochemistry, and Analytical Methods: Determination of Enantiomeric Purity. The model provided by *Asymmetric Synthesis* (Morrison, J. D., Ed.; Academic Press: Orlando, FL, 1982–1984; Vols. 1–5) is apparent here, and the reliance by the authors on this monograph is evident throughout. The book is less than I expected in that the inevitable compromise between depth and breadth in a book of this type meant that some topics were covered in only a cursory manner.

Chapter 1, Chirality, by R. A. Aitken defines the term and is introductory to the volume. Chapter 2, The Description of Stereochemistry, by the same author, introduces nomenclature systems, including that of Cahn–Ingold–Prelog. This chapter leaves something to be desired in that few students would be able to use CIP based on the descriptions provided. A useful list of approved descriptive terms as well as older, or disfavored terms, is given. One only wishes that the authors had been as discerning in their usage. After a careful description of what is, and is not, chiral (pp 30 and 31), the use of "chiral gas chromatography" (pp 36) is particularly gratifying. Chapter 3, Analytical Methods: Determination of Enantiomeric Purity, by D. Parker and R. J. Taylor, gives a good analysis of the state of the art in this area. As opposed to the later chapters, references for the first three chapters seem to have been only an afterthought. Better reference to the primary literature would have been of benefit here.

Chapter 4, Sources and Strategies for the Formation of Chiral Compounds, by R. A. Aitken and J. Gopal provides a good overview of the topic and sets the tone for the rest of the book. Chapters 5, 6, and 7, First- and Second-Generation Methods: Chiral Starting Materials

and Auxiliaries, by S. N. Kilényi, Third- and Fourth-Generation Methods: Asymmetric Reagents and Catalysts, by S. N. Kilényi and R. A. Aitken, and Asymmetric Total Synthesis, by S. N. Kilényi, give specific methodologies for asymmetric synthesis and examples of their applications. The choices are good and reflect the state of the art in the area.

From a technical point of view, the book is good, with relatively few typographical errors. The authors' styles are clean and crisp, making it easy to read. This reviewer would have preferred to see more thought given to the presentation of the structures. In some cases, the chiral relationship of a starting material and product was not immediately evident. In order to retain the logical pattern of the book, constant forward and back references ("further examples of...are found in section...") are used; this reader found this distracting rather than helpful. The statement that tartaric acid is the source of molecular asymmetry in the Sharpless epoxidation (p 93) while the method itself appears first on p 160 is another example where the book's organization can confuse the novice reader.

Despite the limitations noted above, this book meets its goals as a text for advanced students. It serves also as a convenient overview of the subject for the industrial organic chemist not intimately involved in the preparation of chiral molecules.

John W. Scott, *Hoffmann-La Roche Inc.*

Inorganic Materials. By Duncan W. Bruce and Dermot O'Hare. John Wiley and Sons: Chichester and New York. 1992. xiv + 543 pp. \$99.00. ISBN 0-471-92889-5.

This book consists of nine multiauthored chapters on various aspects of inorganic species that are important in the area of materials. The specific chapters include discussion of superconductors, magnetic materials, nonlinear optics, intercalation compounds, biogenics, clays, polymers, liquid crystals, and electronic materials. Some of the chapters focus on one specific class of material, while others are more general. A primary audience would be researchers new to these fields. This book might be used in a special topics course for undergraduates.

Chapter 1 is an overview of molecular inorganic superconductors with most of the discussion on 1,3-dithiol-2-thione-4,5-dithiolate complexes. The synthesis, structure, nature of conductivity, dimensionality, and electronic properties are discussed. An excellent rudimentary discussion of molecular magnetic materials with various structures is found in Chapter 2. The origins of ferrimagnetism and ferromagnetism and antiferromagnetism are clearly related to structural and bonding properties.

The concepts of nonlinear optics and specific organometallic and coordination complexes as nonlinear optical materials are discussed in Chapter 3. A primary emphasis is in the magnetics chapter is on finite systems. Two- and three-dimensional inorganic intercalation compounds such as metal dichalcogenides, oxides, oxyhalides, phosphates, phosphonates, clays, NbSe₃, one-dimensional systems, zeolites, sodium β -alumina, and WO₃ are discussed in Chapter 4. Syntheses, structural properties, staging, and resultant physical properties are discussed.

Biogenic inorganic materials and how they differ from natural systems are discussed in Chapter 5. The primary emphasis is on the structure of biomaterials and structural methods for characterization. Two-dimensional clays, pillared clays, and reactions catalyzed by clays are summarized in Chapter 6.

Conducting polymers, principles of doping, and various ways to measure electrical properties are discussed in Chapter 7. Chapter 8 describes the thermotropic, lyotropic, and mesophase liquid crystals as well as the possibilities of exploiting both coordination and organometallic compounds in liquid crystal materials. The final chapter concerns studies of precursors for electronic materials including semiconductors and p-n junctions. Methods such as chemical vapor deposition and molecular beam epitaxial methods are examined. Several types of semiconductor materials such as II/VI, III/IV, high T_c superconductors, and others are discussed.

In summary, this book is a collection of review articles concerning different aspects of inorganic materials that could be used either as a starting point for researchers new to these areas or in the undergraduate curriculum.

Steven L. Suib, *University of Connecticut*

Polymer Synthesis Oxidation Processes. Advances in Polymer Science. Volume 102. By A. Amédouri, B. Boutevvin, K. E. Geckeler, R. Grubbs, H. K. Hall, M. Lazâr, B. Novac, M. Okada, A. B. Padias, J. Penelle, W. Risse, B. Rivas, J. J. Robin, J. Rychly, and H. Tanaka. Springer-Verlag: New York. 1992. viii + 228 pp. \$119.00. ISBN 0-387-55090-9.

This book is a continuing volume in a distinguished series of review compendia. As is true in prior volumes, this volume contains a collection of reviews pertaining to the volume title. Each is written by authors with

acknowledged expertise in their respective fields. The practice of having each review edited by an identified member of the editorial board likely contributes to a generally high quality for each review.

Specific topics reviewed in this volume include ring-opening polymerization of bicyclic and spirocyclic compounds, ring-opening metathesis polymerization (ROMP), the importance of captodative alkene monomers in radical polymerization chemistry, the synthesis and properties of fluorinated diols, the synthesis and application of fluorinated telechelic monodispersed compounds, the synthesis and metal complexation of polyethyleneimine, and a general review about oxidation of hydrocarbon polymers. The reviews generally have up-to-date references. While there are comparatively few references to the 1990s, the individual reviews do focus on the recent literature.

The individual reviews vary somewhat in their tone. Some, including those dealing with ROMP, the captodative effect, and hydrocarbon polymer oxidation, provide a good general overview along with specific information that would be generally useful to someone in polymer science who wanted to bring themselves up-to-date in a more general sense. The review by Grubbs et al. on ROMP chemistry is illustrative of this in that it presents a reasonable historical summary along with an overview of ring-opening metathesis and metathesis polymerization generally. The other reviews tend to be more focused and detailed. For example, the review on ring-opening polymerization of bicyclic and spirocyclic compounds is probably too detailed to serve as a general introduction to the area but does provide exhaustive details for someone who wants specific information about this aspect of condensation-like polymerizations.

This volume, like previous volumes in the series, is probably most appropriate for library rather than individual purchase. Indeed, I would expect any good library that expected to cover chemistry broadly should have this series in its collection.

David E. Bergbreiter, *Texas A&M University*

The Design of Drugs to Macromolecular Targets. Edited by C. R. Beddell (Wellcome Laboratories). John Wiley & Sons: West Sussex, U.K., and New York. 1992. xi + 287 pp. \$145.00. ISBN 0-471-92080-0.

The aim of this eight-chapter volume is to describe the current state of expertise available to develop molecular tailoring of new drugs. Unfortunately, the delayed publication of these collected examples of computer modeling methods in drug design falls short of its goal, as indicated by the lack of recent references. Despite its dated material, the eight chapters are well written by acknowledged experts in the field and are well documented. They also present an excellent cross section of examples for students of molecular design. It is also a historical perspective on this rapidly developing field. Though not rigorous in methodological detail, it is very readable and easy to understand.

The theme that connects the various contributions is the concept of the role of macromolecules in drug design. The introductory chapter, *The Role of Macromolecules in Drug Action*, by Garland Marshall, reviews the diverse ways in which macromolecules are involved in drug action, a concept now well established. The contribution of A. S. Gilbert and J. N. Champness, *Ligand Fitting Methodology*, briefly describes basic concepts of molecular interactions, quantitative estimates of binding energies, and visualization methods, each with well-documented examples. These two chapters set the stage for the more specific examples of the evolution of current structure-based drug design strategy.

More detailed examples of structure aided drug design are presented in the chapters by R. Wootton, *Compounds Designed to Bind to Haemoglobin*, by B. Roth and D. K. Stammers, *Drug Interactions With Target Enzymes of Known Structure*, in which species selectivity is maximized by the design of antimetabolites, and by de la Paz et al., *Multiple Modes of Binding of Thyroid Hormones and Other Iodothyronines to Human Plasma Transthyretin*, in which these authors document in detail one of the first examples of multiple binding modes for analogues and extend the concept to a proposed binding site for thyroid hormone in thyroxine binding globulin, whose structure is as yet unknown. However, much of the impact of these examples is weakened by the volume of new material published since these excellent contributions were written.

The contribution of S. Neidle, *Computer Modelling of Drug-DNA Intercalative Interactions*, describes modeling methodologies for DNA ligand interactions and describes the additional complexities inherent in the nucleotide systems. The contribution of W. G. J. Hol and R. K. Wierengs, *Crystallographic Investigations of Glycolytic Enzymes from *Trypanosoma brucei*: Potential Starting Points for the Design of New Sleeping Sickness Drugs*, offers an excellent review of a specific disease and presents a model for structure-based design of drugs. And finally, the contribution of A. S. Gilbert and R. M. Hyde, *Drug Discovery and Invention: Some Approaches Compared*, summarizes the process of

quantitative structure activity relationships (QSAR) as applied to modeling ligand binding and points to the need of integrating such factors as hydrophobicity into the drug design process.

Despite its expensive price and the number of outdated chapters, it is a recommended addition to the library of any molecular modeling and drug design laboratory. The readable style and historic perspective in the development of a rapidly changing field make it a worthwhile contribution.

Vivian Cody, *Medical Foundation of Buffalo*

Frontier Orbitals and Properties of Organic Molecules. By Valery F. Traven (Mendeleev Institute of Chemical Technology). Ellis Horwood: New York and London. 1992. xiv + 401 pp. \$111.00. ISBN 0-13-327487-X.

In the last several decades, the use of molecular orbitals to predict and organize the behavior of organic molecules has moved from the realm of the theorist to that of the bench chemist. This book is an attempt to illustrate the utility of MO methods in modern organic chemistry. General background information about quantum mechanical calculations and related physical organic techniques, such as NMR and PES, is given in Part I of the text, and Part II comprises a collection of applications of these methods to the analysis of classic problems in organic chemistry. Problems related to the text are provided in Part II.

The treatment of quantum mechanics in the first section is not without its flaws, most of which are probably unimportant to the organic reader. For example, the author states that allowed values of experimental quantities can be obtained by applying the appropriate operator to the wave function, which is true for some operators and some wave functions, but not all. A bit more troublesome is the assertion that quantum mechanics very reliably predicts the shapes of molecular orbitals. Since unitary transformations of the MOs can substantially change their form without affecting any of the observables such as total energy or total electron density, it is misleading to imply that MO shapes reflect reality. The theoretical basis for assigning charges, another area important to the practicing chemist, is also not well treated.

Part II analyzes the molecular orbitals for a wide range of structural classes ranging from simpler alkanes to polycyclic heteroaromatic compounds. The analyses are generally more detailed than those presented in advanced organic chemistry texts. Examples are chosen from the literature of five to ten years ago, which does not affect the pedagogical utility of the book but would present difficulties for those looking for the latest applications of MO theory to organic systems. The problems at the ends of the chapters are more directed at developing skills which will assist the reader in analyzing future problems than they are in eliciting details about the examples presented in the text, a strong point if one wishes to use this text in a graduate course.

This book would be most useful to those looking for a collection of classic problems that have been addressed by quantum mechanical techniques. The second part of this book in particular would be a useful adjunct text for a beginning graduate course in physical organic chemistry, as long as the shortcomings in the treatment of quantum chemistry in Part I are remedied by the lecturer.

Michelle M. Francl, *Bryn Mawr College*

Ferroelectric Materials and Their Applications. By Yuhuan Xu (University of California, Los Angeles). Elsevier: Amsterdam and New York. 1991. xiv + 391 pp. \$171.50. ISBN 0-444-88354-1.

Research in the area of electroceramics—capacitors, transducers, ferrites, varistors, thermistors, and packaging materials—has been neglected by the community, and as a result much of the manufacturing has shifted to the Far East. Ferroelectrics are a very important segment of the electroceramics market, and they were a hot topic forty years ago following the discovery of barium titanate during World War II and lead zirconate titanate a few years later. Ceramics made from these two materials have dominated the multibillion dollar capacitor, thermistor, and piezoelectric transducer markets ever since. Scientific interest in the physics of ferroelectrics declined in the intervening years when ferroelectric memories lost out to magnetic storage media, but in the past decade there have been several brief revivals focused on nonlinear optics, ferroelectric thin film memories, pyroelectric vidicons, and most recently, smart sensors and actuators for active optic systems and vibration control.

The standard reference book on ferroelectric materials is *Ferroelectric Crystals* by Franco Jona and Gen Shirane, written more than thirty years ago and recently reprinted by Dover. *Ferroelectric Materials and Their Applications* by Yuhuan Xu updates this wide-ranging treatment of the structure, chemistry, and physics of the ferroelectric materials used in engineering applications. The first two chapters introduce the basic

concepts of ferroelectricity and the experimental techniques for measuring the dielectric permittivity, electromechanical coupling coefficients, and nonlinear optical properties. The remaining seven chapters are classified according to structural families: perovskites, lithium niobate, tungsten-bronze ferroelectrics, water-soluble crystals, miscellaneous inorganics, piezoelectric polymers, and composite materials. Each section is well illustrated and thoroughly documented with many recent references, including a number of Chinese papers previously unavailable in English. The sections on piezoelectric and electrooptic properties are especially well done, reflecting the author's chief interests. Perhaps the major omission in the book is a discussion of the ferroelectric ceramics used as multilayer capacitors. A chapter devoted to BaTiO₃ and its many commercial modifications would have been a welcome addition.

Professor Xu has written the book at a level suitable for advanced undergraduates or beginning graduate students. The clear description of ferroelectric materials and devices will also prove useful to research scientists and electronic engineers and as a guide to managers and administrators involved in the electronics industry.

Robert E. Newnham, *The Pennsylvania State University*

New Methods for Polymer Synthesis. Edited by W. J. Mijs (University of Technology, Delft). Plenum Press: New York. 1992. xvi + 317 pp. \$75.00. ISBN 0-306-43871-2.

While there appears to be a plethora of polymer synthesis books on the market, this book fills a need because it deals with the art and science of molecular architecture. It concentrates on synthetic methods which lead to specific structures. For each method, the book deals with the background, mechanism(s), scope, and limitations as well as illustrative procedures so sorely needed by the experimentalist for whom this book is intended. The book is not intended to be an encyclopedia or handbook; rather it brings together recent developments such as group transfer polymerization, anionic, cationic, and free radical ring-opening polymerization, cationic polymerization of acyclic monomers, phase transfer catalyzed polycondensation, activated polycondensation, polymer synthesis via metathesis chemistry, and synthesis of polymers of isocyanides.

The subjects are timely and well covered, and there are copious references. However, as with many books of this genre, there are no references to patents—an omission of great importance to experimentalists, especially those who work for industry. This book will be a good reference text for those working in the fields covered, particularly the fields of group transfer and ring-opening polymerization. I highly recommend this book as a reference source for those who need to keep up with developments in polymer synthesis especially if they are also looking for illustrative procedures.

Frederick H. Owens, *Rohm and Haas Company (retired)*

Organic Synthesis via Organometallics. (OSM 4 Aachen). Edited by Dieter Enders (Institut für Organische Chemie), Hans-Hoachim Gais (Institut für Organische Chemie), and Wilhelm Keim (Institut für Technische Chemie und Petrochemie). Vieweg: Wiesbaden, Germany. 1993. viii + 224 pp. DM 84.00. ISBN 3-528-06481-1.

This book was developed from the Proceedings of the Fourth Symposium on the title subject held in Aachen, Germany, on July 15–18, 1992. After a preface by the editors, there are 15 chapters in typescript form covering recent developments in main group and transition metal mediated asymmetric synthesis, oligomerization, asymmetric catalysis, oxidation, and organometallic reaction mechanisms. There is no subject index.

Food Colloids and Polymers: Stability and Mechanical Properties. Edited by E. Dickinson (University of Leeds) and P. Walstra (Wageningen Agricultural University). Royal Society of Chemistry: Cambridge, U.K. 1993. x + 428 pp. £69.50. ISBN 0-85186-325-6.

This book was developed from the proceedings of a conference organized by the Food Chemistry Group of the Royal Society of Chemistry and the Netherlands Society for Nutrition and Food Science, held at Lunteren, The Netherlands, on April 8–10, 1992. After a preface by the editors, there are 50 chapters organized under the following headings: Aggregation Phenomena; Polymer–Polymer Interactions; Structure, Rheology, and Fracture Properties; and Interfacial Phenomena. There is also a subject index.

Handbook of Infrared Standards II with Spectral Coverage of 1.4 μm –4 μm and 6.2 μm –7.7 μm . By Guy Guelachvili (Universite Paris-Sud) and K. Narahari Rao (Ohio State University). Academic Press: San Diego, CA. 1993. x + 716 pp. \$149.00. ISBN 0-12-305362-5.

This book is the second in the Handbook of Infrared Standards series. It contains information concerning closely spaced spectral lines occurring mainly in the 1.4–4 μm region. After an introduction by the editors, there are four sections: Maps and Wavenumber Tables for the New Spectral Coverage 1.4 μm –4 μm , which is organized with the spectral maps on one side of the pages and wavenumber data on the other; Heterodyne Frequency Measurements, which supplements the frequency information in the previous handbook with more recent measurements; Saturation Absorption Spectroscopy Update of OsO₄ Measurements, which contains the most recent standards for OsO₄ lines using saturation absorption resonances of OsO₄ and CO₂; and Methyl Chloride Spectral Maps and Wavenumber Data (6.2 μm –7.7 μm), which contains spectral maps and wavenumbers using a reference spectrum of CH₃Cl. There is no index.

Advances in Biophysical Chemistry, Volume 2. Edited by C. Allen Bush (University of Maryland Baltimore County). JAI: Greenwich, CT, and London. 1992. xii + 180 pp. \$78.50. ISBN 1-55938-396-8.

This book, the second in the series edited by C. A. Bush, contains five chapters dealing with quite diverse subjects. The first of these, by A. J. Howard and T. L. Poulos deals in a general way with methodology in the X-ray crystallography of macromolecules. This is followed by a chapter by R. W. Woody, which is concerned with circular dichroism of unordered polypeptides. Next comes a chapter by M. R. Eftink on the luminescence of horse liver alcohol dehydrogenase. The fourth chapter, by T. M. Cotton, J. H. Kim, and R. E. Holt, describes surface-enhanced resonance Raman spectroscopy. The final chapter, by C. A. Bush and P. Cagas, discusses the three-dimensional conformations of complex carbohydrates.

From the above it can be seen that the range of topics is quite wide. The first chapter by Howard and Poulos, which describes the X-ray crystallography of macromolecules, is perhaps the most general. The other chapters are relatively specialized. All five chapters are quite up-to-date and bring the reader close to the cutting edge in their particular areas. The level of coverage of the literature is uniformly comprehensive, and the quality of writing, acceptable or better.

The chapter by Woody on the circular dichroism of unordered polypeptides provides an important service in bringing into focus the nature of the problem and in presenting clearly the arguments in favor of an explicit model. The chapter by Eftink summarizes efficiently the luminescence data for a single protein. The chapters by Cotton et al. and Bush and Cagas deal competently with their respective areas.

The primary value of this book is in providing comprehensive reviews of specialized topics which have not been summarized previously. For

the biophysical chemist interested in one of these restricted areas, it should prove highly useful.

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Advances in Developmental Biochemistry. A Research Annual. Volume 1. Edited by Paul M. Wassarman (Roche Institute of Molecular Biology, New Jersey). JAI Press Inc.: Greenwich, CT. 1992. xi + 268 pp. \$78.50. ISBN 1-55938-347-x.

Differential regulation of gene expression has captivated the attention of a large number of investigators over the last several decades. However, these highly complex mechanisms primarily exerted by trans-acting factors or binding proteins, which are able to recognize a specific DNA gene sequence (cis-acting element) and to promote, to enhance, or to inhibit the mRNA transcription, are not fully understood. An excellent overview of the literature in regards to transcriptional and post-transcriptional regulation of gene expression in development is presented in this well-written and well-organized book.

This book is comprised of six chapters analyzing gene expression in different experimental models, including mice, worms, flies, and amphibia. A detailed description of several subcellular organelles involved in gene transcription in the amphibian terminal vesicle, including ribonucleoprotein components, is analyzed in the first chapter. Studies using in situ hybridization and immunofluorescence staining with antibodies directed against ribonucleoproteins are described, and results are presented in high-quality micrographs. An excellent overview of the role of transcriptional elements in DNA replication during animal development is described in Chapter 2. This chapter also contains an abundance of informative figures and tables in regards to cis- and trans-acting components of DNA replication in eukaryotic cells. The third chapter is focused on the transcriptional regulation during early *Drosophila* development. In this chapter, different mechanisms of activation and repression of regulatory genes during early embryogenesis, and regulatory factors that modulate transcription, are discussed. The translational regulation of maternal messenger RNA in *Xenopus oocytes* is presented in Chapter 4. The role of intracellular environment, masked mRNA, mRNA recruitment, and the poly(A) tail in the translation of maternal mRNA is analyzed. Chapter 5 is related to the expression of the gut esterase in the nematode *Caenorhabditis elegans*. This chapter is subdivided into several sections describing the biochemical expression and genetic regulation of this enzyme in *C. elegans*. In addition, preliminary studies on the molecular analysis of this gut esterase gene expression are also included. In the last chapter, an excellent overview and description of cis-acting elements and trans-acting factors involved in the transcriptional regulation of crystalline genes in different experimental models are presented. The effect of nuclear proto-oncogene products and growth factors on crystalline gene expression is also addressed. This book includes over 1000 references organized in alphabetical order and a subject index.

Overall, this book is a collection of detailed, well-referenced, and intellectually stimulating reviews of information in regards to the transcriptional and post-transcriptional regulation of gene expression. It will be a good source of information for new investigators in this field, as well as in general biochemistry.

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