Additions and Corrections

Tunneling in Elimination Reactions. Structural Effects on the Secondary β-Tritium Isotope Effect [*J. Am. Chem. Soc.* **1994**, *116*, 6107–6110]. SUE LIN AND WILLIAM H. SAUNDERS, JR.*

Page 6110: The absorbances of products and reactants in Table 4 are interchanged. Table 4 should read:

Table 4. Molar Absorbances of Products and Reactants

compd	λ, nm	ε × 10⁻⁴
4[b]	249.9[a]	1.73
5[b]	248.0[a]	1.62
6[b]	298.4[a]	1.52
1	249.9	0.032
2	248.0	0.014
3	299.0	<0.01

[a] Position of maximum absorbance. [b] Olefins from **1**, **2**, and **3**, respectively.

The correct values were used in the calculations so this error did not affect the results given in the paper.

Book Reviews *

Bioinorganic Catalysis. Edited by Jan Reedijk (Leiden). Marcel Dekker: New York. 1993. xiii + 496 pp. $195.00. ISBN 0-8247-9004-9.

Except for the broadly oriented introductory chapters, this book consists of in-depth research treatises written by an impressive collection of experts in their fields. The coverage does not include all types of bioinorganic catalysts but is dominated by a fairly broad spectrum of those involved in electron transfer processes. Not too many years ago "Bio" in the title of this excellent volume would have figuratively been written in lowercase subscripts as far as emphasis was concerned. Early $_{bio}$inorganic chemists were primarily concerned with measuring the interactions between metal ions and ligands that had something to do with biology, e.g. amino acids. The results of these initial studies gave birth to uninhibited speculation as to how metal ions behave in biological media. Then came the spectroscopists. Extraordinarily detailed analyses of exotic spectra bored all but the most avid practitioners of the art. Uninhibited speculation as to how metal ions behave in biological media flowed forth. The present volume, which focuses on the catalytic aspects of a number of biologically important metal ions, well demonstrates how the field has matured and changed to the point where "Bio" and "Inorganic" almost deserve equal billing on the title page. Biological function is increasingly recognized as something worthy of consideration. In this book there still remain vestiges of a gap between the two fields. To some extent, certain of the authors' vantage points are more suited to a bioinorganic conference than to one, say, on enzyme mechanisms, but there are a number of exceptions.

The three introductory chapters are entitled Introduction to Bioinorganic Chemistry (Jan Reedijk), Introduction to Homogeneous Catalysis (Roger A. Sheldon), and Relationship Between Enzymatic and Heterogeneous Catalysis (Edward A. Stiefel). These chapters cover a total of 27 pages in all and only partially succeed in satisfying the editor's goal of providing a bridge between biology and the broader aspects of catalysis in inorganic chemistry. Although, the authors present interesting insight, these are the weakest chapters in the book owing to the unresolvable tension between the scope of the material to be covered and constraints imposed by brevity. However, the concept is sound and deserves further development in the future.

Chapter 4, by E. Tsuchida and K. Yamamoto, dealing with oxidative polymerization of phenols and thiophenols by metal ion complexes, is written in the older $_{bio}$ style. About 10% of the chapter is devoted to enzymic reactions with the remainder concentrating on the "model" reactions studied by the authors. Chapters 5 (D. J. Evans, R. A. Henderson, and B. E. Smith) and 6 (R. S. Pilato and E. I. Stiefel) present a natural and up-to-date pairing of nitrogenase and molybdenum-cofactor chemistry. These are followed by an interesting chapter written by R. Cammack on five classes of nickel enzymes: one class comprises the more familiar plant urease enzymes while the other four classes are involved in bacterial electron transfer processes. Another chapter presenting a current survey of the two vitamin B-12 cofactors has been written by L. G. Marzilli.

A grouping of four chapters focuses on reactions involving metal ions and oxygen in its various oxidation states in biological systems: K. D. Karlin, Z. Tyeklar, and A. D. Zuberbühler have combined forces to produce a lengthy (55 pages) section dealing with the formation, structure, and reactivity of copper dioxygen complexes; G. D. Dismukes reviews the chemistry of the oxidation states of Mn and then describes the pertinence of this chemistry to polynuclear manganese enzymes, including those active in photosynthesis; a chapter by L. Que on oxygen activation at non-heme iron centers followed by one on oxygen activation at heme centers (D. Mansuy and P. Battioni) provide thorough coverage of these areas. Novel enzyme systems exhibiting very interesting chemistry are described in the next two chapters. A. Butler writes on vanadium bromoperoxidase, found in marine algae and a terrestrial lichen. This enzyme catalyzes the oxidation of bromide and iodide by hydrogen peroxide, leading to a variety of products including halogenated organic substrates. J. A. Duine and J. A. Jongejan describe redox metalloenzymes that occur in certain archeobacteria and methylotrophs and that are unusual in that they require a quinone cofactor for activity. The book concludes with a chapter in which the editor speculates on future developments in the title area. All in all, this text is an excellent source for becoming informed about a considerable amount of fascinating chemistry and biochemistry involving metal ions. All sections are reasonably up-to-date, with references into 1991 being cited throughout.

An amusing peculiarity of the book requires comment. The authors consistently use the word "hydron" where "hydrogen ion" is appropriate. It seems this is another example of some committee or the other dictating the replacement of a familiar and perfectly good scientific usage with one that is strange and arcane.

Daniel L. Leussing, *The Ohio State University*

Time-of-Flight Mass Spectrometry and Its Applications. Edited by E. W. Schlag (Universitäte München). Elsevier: Amsterdam, The Netherlands. 1994. x + 414 pp. $122.75. ISBN 0-444-818875-8.

This book was previously published in 1994 as a special issue of the *International Journal of Mass Spectrometry and Ion Processes*, Volume 131, and is being published in book form to provide a survey of current applications from many of the active groups in the field. After a foreward by the editor, there are 21 chapters with the following headings: Laser Assisted Reflectron Time-of-Flight Mass Spectrometry by B. A. Mamyrin; How to Specify the Ion Optical System of a Time-of-Flight Mass Spectrometer by T. Bergmann and T. P. Martin; The Application of Ion

*Unsigned book reviews are by the Book Review Editor.

0002-7863/94/1516-9809$04.50/0

Optics in Time-of-Flight Mass Spectrometry by D. Ioanoviciu; Design Considerations in Energy Resolved Time-of-Flight Mass Spectrometry by A. E. Giannakopulos, D. J. Reynolds, T.-W. D. Chan, A. W. Colburn, and P. J. Derrick; Laser Ion Sources for Time-of-Flight Mass Spectrometry by U. Boesl, R. Weinkauf, C. Weickhardt, and E. W. Schlag; Photoemission Electron Impact Ionization in Time-of-Flight Mass Spectrometry—An Examination of Experimental Consequences by S. M. Colby and J. P. Reilly; High-Resolution Mass Spectrometry in a Linear Time-of-Flight Mass Spectrometer by J. M. Gründwurmer, M. Bönisch, G. R. Kinsel, J. Grotemeyer, and E. W. Schlag; The Design and Performance of an Ion Trap Storage-Reflectron Time-of-Flight Mass Spectrometer by B. M. Chien, S. M. Michael, and D. M. Lubman; Pulse Amplitude Analysis—A New Dimension in Single Ion Time-of-Flight Mass Spectrometry by P. V. Bondarenko, P. G. Grant, and R. D. Macfarlane; Mass Analyzed Threshold Ionization—Structural Information for a Mass Spectrum and Mass Information for Ionic Spectroscopy by P. M. Johnson and L. Zhu; Decay Energetics of Molecular Cluster Studied by Multiphoton Mass Spectrometry and Pulsed Field Threshold Ionization by H. J. Neusser and H. Krause; Using Reflectron Time-of-Flight Mass Spectrometer Techniques to Investigate Cluster Dynamics and Bonding by S. Wei and A. W. Castleman, Jr.; The One Dimensional Photofragment Translational Spectroscopic Technique—Intramolecule Clocking of Energy Redistribution for Molecules Falling Apart by H. J. Hwang, J. Griffiths, and M. A. El-Sayed; Quantitative Determination of Kinetic Energy Releases from Metastable Decomposition of Sputtered Organic Ions Using a Time-of-Flight Mass Spectrometer with a Single-stage Ion Mirror by D. F. Barofsky, G. Brinkmalm, P. Håkansson, and B. U. R. Sundqvist; Kinetic Energy Analysis in Time-of-Flight Mass Spectrometry—Application of Time-of-Flight Methods to Clusters and Pyrolysis Studies in Supersonic Expansions by J. S. Riley and T. Baer; Photodissociation of Magnesium Ion/Molecule Complexes in a Reflectron Time-of-Flight Mass Spectrometer by C. S. Yeh, K. F. Willey, D. L. Robbins, and M. A. Duncan; Resonance-Enhanced Two-Photon Ionization Time-of-Flight Spectroscopy of Cold Perfluorinated Polyethers and their External and Internal van der Waals Dimers by D. S. Anex, M. S. de Vries, A. Knebelkamp, J. Bargon, H. R. Wendt, and H. E. Hunziker; Time-of-Flight Mass Spectrometry of DNA Laser-Ablated from Frozen Aqueous Solutions—Applications to the Human Genome Project by P. Williams; Factors Affecting the Resolution in Matrix-Assisted Laser Desorption–Ionization Mass Spectrometry by A. Ingendoh, M. Karas, F. Hillenkamp, and U. Giessmann; Sequencing of Peptides in a Time-of-Flight Mass Spectrometer—Evaluation of Postsource decay following Matrix-assisted Laser Desorption–Ionization (MALDI) by R. Kaufmann, D. Kirsch, and B. Spengler; and Energy-Isochronous Time-of-Flight Mass Analyzers by H. Wollnik. There are also author and subject indexes.

FT-ICR/MS: Analytical Applications of Fourier Transform Ion Cyclotron Resonance Mass Spectrometry. Edited by Bruce Asamoto (B. P. American Research). VCH Publishers: New York. 1991. xii + 306 pp. $69.50. ISBN 0-89573-767-1.

This book is a refreshing departure from previous volumes dedicated to review of the rapidly developing field of Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR, also known as FTMS), in that it is intended to emphasize practical applications of the method to solve real problems, as opposed to reviewing academic research. An initial chapter by Dunbar provides a worthwhile historical overview of the development of FT-ICR, including a chronological summary of the primary patents in the field. Chapter 2, by Dunbar and Asamoto, is a concise but reasonably comprehensive discussion of the instrumentation. Eight additional chapters are devoted to applications.

In the first of the application chapters, Laude and coauthors consider gas chromatography–FTMS and include an excellent discussion of the suspended trapping technique, which they introduced to make possible much extended dynamic range and low detection limits. Next, a group of seven authors from Bruker Instruments and Spectrospin AG contribute a chapter devoted to applications of their external source instrument, including examples of fast atom bombardment and GC–FTMS. Chapter 5 is a brief discussion of applications of low pressure chemical ionization FT-ICR written by Smith of B. P. Research. Subsequent chapters by Asamoto and Brenna deal with the important area of laser desorption FTMS and its application to organic polymer and polymer additive analysis. Chapter 8 is a discussion of structural analysis of peptides using a quadrupole FT-ICR instrument of the design pioneered by McIver, Hunt, and their Finnigan-MAT collaborators. In this chapter Griffin and Shabanowitz provide a nice discussion of how techniques as diverse as FAB, laser photodissociation, and electrospray ionization can be mated with Fourier transform ICR to solve peptide structural analysis problems. Two final chapters by Stockton and coauthors of American Cyanamid Company describe first (Chapter 9) the FT-ICR spectrometer they developed for the specific industrial application needs of their organization and then (Chapter 10) its application to agricultural chemical analysis. Their instrument has both GC and liquid chromatography interfaces, in addition to FAB capabilities, consistent with Cyanamid's needs for analysis of complex and often nonvolatile samples.

In summary, this book does an excellent job of presenting the state-of-art of FT-ICR applications as they existed in 1991. The historical overviews and reviews of the basic instrumentation are especially worthwhile parts of this volume. As is inevitable when a book reviews rapidly developing new analytical techniques, some important more recent developments are not covered. Most significant among these are the recent spectracular achievements in high-mass analysis made possible by introduction of matrix-assisted laser desorption/ionization (MALDI) and electrospray sources for high-performance FT-ICR. However, the present volume is a well done introduction to the topic of FT-ICR for those wanting to assess its practical potential.

Charles L. Wilkins, *University of California, Riverside*

Advances in Near-Infrared Measurements. Volume 1. Edited by Gabor Patonay. JAI Press: Greenwich and London. 1993. xii + 144 pp. $95.00. ISBN 1-55938-173-6.

In this, the first in a series of monographs on near-infrared (NIR) spectroscopy, one finds a nice collection of chapters written by experts in the field. NIR is a spectral region often neglected by analytical chemists. The perception is that absorption due to vibrational overtones is weak and that detectors are relatively insensitive. Recent research results clearly show the unique advantages of NIR measurements. So, this monograph is a timely addition to the bookshelves of every serious laboratory.

The book starts with a chapter on remote monitoring in conjunction with fiber optics. There is a good summary of the principles of fiber-optic transmission. Although applications in the NIR are in their infancy, the author does provide a range of examples to illustrate the potential of the technique. The next chapter highlights Raman methods based on NIR and fiber optics. FT-Raman has already established itself as an important spectroscopic probe. Diode lasers and CCD (charge-coupled device) devices are now routinely available. The successes listed in this chapter are thus not surprising. In fact, it would have been appropriate here to expand on the discussion on these types of instrumentation. The readers would then be able to avoid digression to other references. A chapter on data transformation follows. While these concepts are useful, they are not unique to NIR. The lack of actual examples also makes this chapter somewhat imbalanced. The features of Hadamard-transform NIR are presented next. The absence of moving parts in such spectrometers is an important consideration. One would have liked to find more on the principles of Hadamard transform and perhaps the authors' recent work on imaging. Still, this represents a fine contribution. The next chapter discusses pharmaceutical applications. Actually, the involvement of pattern recognition schemes is a substantial part of the material presented. This is entirely appropriate, since it has contributed greatly to the rediscovery of NIR spectroscopy. The editor then winds up with a summary of NIR fluorescence application. This is an emerging area with lots of promise. Again, the availability of diode lasers and CCD detectors is a key element in its development.

The monograph provides a good introduction to this active field. The brevity of the chapters prevents this from being a self-contained reference source. Indeed, one is anxious to see the subsequent volumes in this series. Collectively, they should represent a valuable addition to any library.

Edward S. Yeung, *Iowa State University*

The Chemistry of Heterocyclic Compounds. Volume 48. Pyrroles. Part 1: The Synthesis and the Physical and Chemical Aspects of the Pyrrole Ring. Part 2: The Synthesis, Reactivity, and Physical Properties of Substituted Pyrroles. Edited by R. Alan Jones (University of East Anglia, Norich, U.K.). John Wiley and Sons: New York. Part 1: 1990. xix + 742 pp. $225.00. ISBN 0-471-62753-4. Part 2: 1992. xv + 628 pp. $225.00. ISBN 0-471-51306-7.

These books are continuing volumes of the series *The Chemistry of Heterocyclic Compounds*, which has been established as the backbone compendium for heterocyclic chemistry. That backbone has been strengthened by two more vertebrae. The aim of the series is defined by the series editor as "...(the) attempt to make the extraordinarily complex and diverse field of heterocyclic chemistry as organized and readily accessible as possible". This goal has been met and exceeded.

The chapters are authored by well-known scientists in the field, which is reflected in the high quality of the individual chapters. Part 1: Physical and Theoretical Aspects of 1*H*-Pyrroles by D. J. Chadwick; The Synthesis of 1*H*-Pyrroles by G. P. Bean; Reactivity of the 1*H*-Pyrrole Ring Systems by A. H. Jackson, M. Artico, H. J. Anderson, C. E. Loader, A. Gossauer, P. Nesvadba, and N. Dennis; Physical and Theoretical Aspects, Synthesis, and Chemical Reactivity of 2*H*- and 3*H*-Pyrroles by M. P. Sammes. Part 2: Acylpyrroles by T. P. Toube; Vinylpyrroles by B. A. Trofimov; Aminopyrroles by G. Cirrincione, A. M. Almerico, E. Aiello, and G. Dattolo; 3-Hydroxypyrroles by H. McNab and L. C. Monahan.

In total, the two volumes cover the work reported in nearly 5000 papers spanning 150 years of research. The references were also up to date at the time of publication. The chapters are diverse in that they cover the occurrence of pyrroles as natural products to spectroscopic and theoretical considerations relating to structure and reactivity.

The chapters have all been carefully edited, providing a uniform style throughout both volumes. The innumerable schemes are clear and comprehensive, and the extensive use of tables contributes to overall clarity. Taking into account the colossal amount of compiled information, it is surprising how few mistakes there are in the schemes (e.g. Part 2: p 110, conversion 825 to 826, or p 488, scheme 116, 416 to 419 and 417).

The reviewers see only minor shortcomings of the books. An author index would have been of great use as would a much more thorough subject index.

Like the previous volumes in the series, the books are most appropriate for libraries. However, as this monograph is an indispensable information source for any researcher dealing with pyrroles, it should not be absent from their desks and is certainly worth the high price. It can be safely predicted that these books will replace older monographs on pyrroles.

David Dolphin and Christian Brückner, *The University of British Columbia*

Advances in Biophysical Chemistry. Volume 3. Edited by C. Allen Bush (University of Maryland, Baltimore County). JAI Press: Greenwich, CT. 1993. xiv + 264 pp. $90.25. ISBN 1-55938-425-5.

This third volume contains five excellent review articles covering a spectrum of topics in the field of biophysical chemistry. In the spirit of the previous volumes of the series the articles are of excellent quality and are well-presented. The volume contains five informative articles covering different aspects of experimental and theoretical biophysical techniques.

In the first chapter, G. J. Thomas and M. Tsuboi present a review of Raman spectroscopy of nucleic acids and their complexes with proteins and drugs. This article provides a clear and extensive review of the current status of Raman spectroscopic studies of nucleic acid molecules and their complexes. General theoretical foundations and well-characterized Raman spectroscopic assignments of nucleic acids are presented first. These sections are followed by presentation of a variety of Raman spectroscopic analyses of a variety of types of nucleic acids in different structural conformations such as the A, B, and Z forms and RNA–DNA hybrids. With this article, an up-to-date review of current applications of Raman spectroscopy to the study of nucleic acid conformations is provided.

The second article by A. Imberty and co-workers describes studies of oligosaccharide conformations in protein carbohydrate complexes. Basic structural elements of oligosaccharide conformations are described, and structural studies of these compounds are summarized. Experimental methods that have provided considerable insight into the behavior of these very interesting biological molecules are presented.

In the third article, S. Scheiner provides a review of the geometric requirements of proton transfer in simple well-characterized systems. Results described are mainly derived from computational studies. This article does an excellent job of explaining the state of understanding of proton transfer in simple systems. The formalism is clearly presented and refreshingly not overbearing in the mathematical presentation. The article provides a clear and cogent description of intermolecular proton-transfer processes. Results of calculations using different molecular force fields are provided and compared with results of experimental proton-transfer studies.

In the fourth article, R. F. Steiner provides a comprehensive review of the structure and dynamics of calcium binding proteins. Approximately half of the article is dedicated to a thorough description of fluorescence spectroscopy, dynamic fluorescence, and the time-dependent properties of molecules that can be obtained from dynamic fluorescence measurements. Results of studies where these techniques have been applied to investigate a variety of calcium binding proteins are presented. The results are summarized such as to provide an exposure to the underpinnings of dynamic fluorescence and its large utility in the determination of the structure and dynamics of calcium binding proteins.

In the last article, C. Abeygunawardana and C. A. Bush present an extremely interesting description of applications of heteronuclear NMR spectroscopy to the determination of the chemical structures of complex polysaccharides. The various structural and chemical classes of polysaccharides are first described, and then utilization of heteronuclear and homonuclear NMR methodology to gain insight into their solution structure and dynamics is presented. The variety of different heteronuclear and homonuclear NMR spectroscopic techniques is clearly and elegantly presented and provide an excellent introduction to application of NMR methodology to the study of the solution conformation of these very complex and highly significant biological systems.

In summary, this book maintains the tradition of this series and presents highly readable and informative articles consistent with what has been presented in previous volumes. The cited literature is extensive and current. This series provides undergraduates, graduate students, and researchers at all levels an exposure to some very interesting areas in the field of biophysical chemistry. Every complete science reference library should carry this series.

Albert S. Benight, *University of Illinois at Chicago*

Biocatalytic Production of Amino Acids and Derivatives. By David Rozzell (Exogene Corporation) and Fritz Wagner (Technical University of Braunschweig). Oxford University Press: New York. 1992. xii + 411 pp. $98.00. ISBN 0-19-520982-6.

This book is a compilation of biological methods for the production of several amino acids and their derivatives. These chapters, dealing in the main with particular products, are supplemented by three more general discussions on immobilized cells, immobilized enzymes, and reactor design. The contributors are an international group of respected authorities. The targeted audience is mainly that of biochemical engineers responsible for large-scale production of these products. Samples of chapters describing the production of amino acids include those on L-alanine and L-serine, the use of transaminases to prepare aromatic and branched-chain amino acids, and specific production of D- and L-amino acids from racemic hydantoins. Examples of the preparation of amino acid derivatives are found in the chapters on peptide synthesis in water and in nonaqueous solvents and on the production of sulfur and seleno amino acid analogs.

The chapter on transaminases (Crump and Rozzell) describes the use of immobilized enzymes and of coupling enzymes to drive transamination reactions to completion. Transaminases are now readily available in quantity thanks to recombinant DNA technology.

In two of the longer chapters, Syldatk *et al.* provide a broad survey of historical and current chemistries for the synthesis of 5-substituted hydantoins. These compounds are readily and cheaply realized as racemates. The enzyme 5,6-dihydropyrimidase that hydrolyzes dihydrouracil to β-ureidopropionate also stereoselectively hydrolyzes the racemic hydantoin to the *N*-carbamoyl-D-amino acid, which can be decomposed to the D-amino acid by, *inter alia*, an enzyme readily prepared from rat liver. Microorganisms have been selected that have high chiral hydantoinase activity. Similar technology is described for the production of L-amino acids.

Although it was once believed that protein synthesis was effected by proteolytic enzymes running in reverse, it is now understood that the equilibria strongly favor the hydrolysis products. For this reason, only modest and selective success has been achieved in the use of proteases for peptide synthesis. Oyama covers the principles of this technology and discusses some of the uses of proteases in *e.g.* the now commercially obsolete enzymatic conversion of porcine to human insulin.

The longest chapter in the book (85 pages) is on enzyme kinetics and reactor design by Flaschel, who provides mathematically dense derivations of the basic laws of enzyme kinetics. This material is already covered at a more accessible level in many texts, but the latter do not make the explicit connections to the problems of mass transfer that concern the chemical engineer and are made here.

This book is recommended not only for those involved in commercial amino acid production but also for other chemical engineers interested in becoming cognizant with the increasingly wide range of applications of biotechnology. Enzymologists as well might find it useful to become familiar with some practical applications of the discipline.

Jack F. Kirsch, *University of California at Berkeley*

Studies in Natural Products Chemistry. Volume 14. Stereoselective Synthesis (Part I). Edited by Atta-ur-Rahman (University of Karachi). Elsevier: Amsterdam, The Netherlands. 1994. xiv + 924 pp. $442.75. ISBN 0-444-81780-8.

This book is Volume 14 in an ongoing series covering a variety of topics of interest to organic chemists. After a forward by Herbert C. Brown, a preface by Atta-ur-Rahman, and a list of contributors, there are 22 chapters on the stereoselective synthesis of the anticancer anthracycline antibiotics, tetramic acid antibiotics, 3- and 4-deoxyhexoses, polysaccharides, and levoglucosenone (as a precursor to natural products), the synthesis of oligoribonucleotides, the oxidation of gualazulene, and the synthesis of hydroazulene sesquiterpenes and thujone. There is a subject index.

Applied Laser Spectroscopy: Techniques, Instrumentation, and Applications. Edited by David L. Andrews (University of East Anglia). VCH: New York, Weinheim, and Cambridge. 1992. x + 472 pp. $125.00. ISBN 1-56081-23-8.

This book is a well-assembled collection of review articles on various aspects of laser spectroscopy. It consists of 10 chapters on different topics. The first two chapters cover fundamentals of spectroscopy and lasers. The remaining chapters cover photoabsorption, laser-induced fluorescence, high-resolution infrared, conventional and nonlinear Raman, multiphoton absorption, laser mass, and ultrafast spectroscopies. There is also a very useful appendix on acronyms employed in the field.

The book is intended to flow from one chapter to the next, so the whole would be greater than the sum of its parts. This is very difficult to do when each chapter is authored by different parties, but the effort is not totally in vain. The topics build on one another and gradually remove themselves from the realm of ordinary spectroscopy. I enjoyed reading the chapters with which I had little initial familiarity, particularly Demtroder's contribution on photoabsorption spectroscopy. For topics that I am familiar with, I found the chapters tiresome. In particular, I was disappointed with the chapter on multiphoton absorption, which totally ignores the z-scan technique and work on solids.

The book is aimed at readers on the graduate level who are in need of overviews and are generally new to the field. Each chapter does a very good job of explaining experimental techniques as well as the background theory. The references, mostly from the last decade, are decent. The tendency for authors to reference their own work is not too prevalent here. Because of the time lag in publication, the references are three years from current. The ideal use for this book is as a hook into the literature. Read the chapter of interest, look up references, and be on the way. For this task, it is a very good work to have around. It is not the kind of book that I would keep on my shelf but rather the kind that I expect to find in the library.

Jeffrey Meth, *E. I. DuPont de Nemours & Co., Inc.*

Polymeric Drugs and Drug Administration. ACS Symposium Series 545. Edited by Raphael M. Ottenbrite (Virginia Commonwealth University). American Chemical Society: Washington. 1994. x + 246 pp. $69.95. ISBN 0-8412-2744-6.

This book was developed from the symposium sponsored by the Division of Polymer Chemistry, Inc., at the 204th National Meeting of the American Chemical Society held on 23–28 August 1994 in Washington, DC. After a preface by the editors, there are 19 chapters covering the use of polymer-based systems in oncology for treatment of inflammatory processes and diabetes, for prevention of gastric ulcers, and for management of central nervous system conditions. There are author, affiliation, and subject indexes.

Biomembrane Electrochemistry. Advances in Chemistry Series 235. Edited by Martin Blank (Columbia University) and Igor Vodyanoy (Office of Naval Research). American Chemical Society: Washington, DC. 1994. xiv + 606 pp. $135.95. ISBN 0-8412-2524-9.

This book was developed from the Accelerated Research Initiative of electrochemical research on biological and model membranes by the office of Naval Research, in which the findings were presented and discussed at contractor's meetings in 1988 (Elkridge, MD) and 1991 (Airlie, VA). After a preface by the editors, there are 26 chapters organized under the following headings: Interfaces and Membranes; Channel Structure; Dynamic Properties; and Signal Transduction. There are author, affiliation, and subject indexes.

Inorganic Fluorine Chemistry: Toward the 21st Century. ACS Symposium Series 555. Edited by Joseph S. Thrasher (University of Alabama) and Steven H. Strauss (Colorado State University). American Chemical Society: Washington, DC. 1994. xii + 452 pp. $105.95. ISBN 0-8412-2869-8.

This book was developed from a symposium sponsored by the Division of Fluorine Chemistry at the 203rd National Meeting of the American Chemical Society held on 5–10 April 1992 in San Francisco, CA. After a preface by the editors, a dedication to George H. Cady, and an introductory chapter by the editor, there are 26 additional chapters organized under the following headings: Main-Group Chemistry; Organometallic Chemistry; and Transition Metals, Lanthanides, and Actinides. There are author, affiliation, and subject indexes.

Biological Mass Spectrometry: Present and Future. Edited by Takekiyo Matsuo (Osaka University), R. M. Caprioli (University of Texas), M. L. Gross (University of Nebraska), and Y. Seyama (University of Tokyo). J. Wiley and Sons: New York. 1994. xxii + 666 pp. $180.00. ISBN 0-471-93896-3.

This book was developed by the Mass Spectroscopy Society of Japan and the Japanese Society for Biomedical Mass Spectrometry at the Kyoto '92 International Conference on Biological Mass Spectrometry held in Kyoto, Japan. After a foreward by Tamio Yamakawa, a foreward by J. H. Beynon, a preface by the editors, and a list of contributors, there are three chapters with the following headings: Introduction to Modern Biological Mass Spectrometry; New Instrumentation and Methodologies (Part A—Ionization; Part B—Mass Analysis; and Part C—Structure Methods); and New Applications (Part A—Peptides and Proteins; Part B—Oligosaccharides and Lipids; Part C—Nucleic Acids; Part D—Xenobiotics and Metabolites; Part E—Environmental and Endogenous Toxic Compounds; and Part F—Analytical and Organic Chemistry). There is a subject index.

Separation Technology: Process Technology Proceedings. 11. Edited by E. F. Vansant (University of Antwerp, Belgium). Elsevier: Amsterdam, The Netherlands. 1994. xx + 974 pp. $400.00. ISBN 0-444-89977-4.

This book was developed from the Third International Symposium on Separation Technology held on 22–27 August 1993 in Antwerp, Belgium. After a preface by the editors and two introductory chapters (Measurement of Diffusion in Microporous Solids by D. M. Ruthven and State-of-the-art in Cryogenic Air Separation by T. F. Fisher), there are 89 chapters organized under the following headings: Thermodynamics and Modeling of Separations; Separation Technology and Ultrapurification (Part A—Using Sorbents; Part B—Using Membranes; Part C—Using Chemical Processes; and Part D—Using Other Techniques); Separation Technology in Environmental Applications; and Gas Measurements. There is an author index.

Small Peptides. Chemistry, Biology and Clinical Studies. Pharmacochemistry Library, Volume 19. By A. Dutta (Zeneca Pharmaceuticals, Cheshire, U.K.). Elsevier: Amsterdam, The Netherlands. 1993. xvi + 616 pp. Dfl 450.00. ISBN 0-444-88655-9.

This book is basically an expansion and updating of Dr. Dutta's 1991 chapter in *Advances in Drug Research*. It covers most of the same peptides treated in that work. There are chapters on angiotensin II, bombesin/gastrin-releasing peptide, bradykinin, cholecystokinin, enkephalin, luteinizing hormone releasing hormone, somatostatin, and the tachykinins (substance P, neurokinins A and B). Then follow three chapters on enzyme inhibitors: aspartyl protease inhibitors (renin, HIV protease) and metallopeptidase inhibitors (angiotensin converting enzyme, enkephalinase, and atrial natriuretic factor degrading enzyme). The book closes with a chapter on formulation of peptides. Agonist and antagonist analogs that have been described in the literature are covered extensively, with structural formulas for unnatural amino acids and other compounds. Excellent coverage, complete with structures, is also given to nonpeptide antagonists of peptide hormones, a very "hot" topic in the drug industry at this time. In this regard, the extensive clinical data will be welcome. In the final chapter, formulations for sustained delivery, improved oral delivery, intranasal delivery, and transdermal delivery of peptides are covered. Although not all published analogs are described—that would be a truly daunting task—representative analogs are described, and good references will give access to the primary literature; most chapters contain references from 1992 and 1993. The book will be a true gold mine for

newcomers to any one of these fields, and we can hope for similar coverage of other peptides and enzymes.

John M. Stewart, *University of Colorado School of Medicine*

Molecular Nonlinear Optics, Materials, Physics and Devices. Edited by Joseph Zyss (Centre National d'Etudes des Telecommunications). Academic Press: San Diego, CA. 1994. xiii + 478 pp. $150.00. ISBN 0-12-784450-3.

This book in the Academic Press series on Quantum Electronics—Principles and Applications eminently marks progress in the field of molecular nonlinear optics as it now advances from its foundational phase toward the realm of novel devices and realized applications. Researchers have long recognized the technological potential of molecular (organic) nonlinear optical materials, but thus far, challenges to fundamental understanding and the search for substances and structures with suitable material properties have taken center stage. A set of 10 review chapters, authored by workers active in chemistry, physics, and engineering aspects of molecular nonlinear optics, documents this history and offers a solid foundation for further development. Its organization reflects well current issues of active concern, including (1) the search for fundamental understanding of the underlying mechanisms for molecular nonlinear response, (2) the translation of that understanding to molecular design, (3) the incorporation of designed moieties in compounds and aggregates with desirable materials properties, and (4) the integration of molecular, polymeric, and crystalline materials in structures with device potential.

The book is divided in three sections, Fundamentals, Nonlinear Optics in Molecular Media, and Nonlinear Optics in Polymeric Media. Fundamental chapters focus on theoretical methods incorporating many-body effects and nonlocal fields to determine higher-order susceptibilities and experimental probes of structural and electronic factors affecting the magnitude and dynamics of the nonlinear response. Chapters on molecular media explore the extent to which one can engineer macroscopic nonlinear optical properties by choosing particular molecular and crystal structures. The third section, comprising nearly half of the book, reflects the now intensifying effort to build on principles to construct novel and practical devices. Emerging methods of microlithography and organic molecular beam epitaxy are beginning to exploit advantages of organic nonlinear optical materials, particularly the opportunities they afford to build pattered and multilayered architectures in semiconductor-compatible thin films. Latter chapters focus both on the emerging potential of novel hybrid structures and on progress in achieving stability and performance goals through materials and process engineering.

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Organic Synthesis with Oxidative Enzymes. By Herbert L. Holland (Brock University). VCH Publishers, Inc.: Weinheim and New York. 1992. x + 463 pp. $95.00. ISBN 0-89573-779-5.

With one dramatic experiment, the door was opened onto the use of oxidative enzymes in organic synthesis, and at the same time, a major contribution was made toward the treatment of inflammatory diseases. The experiment, reported by Murray and Peterson in 1952, was the oxygenation of progesterone by fermentation with *Rhizopus arrhizus* to produce 11α-hydroxyprogesterone. The synthetic potential of enzymatic oxidations could not have been illustrated by a more striking example. 11α-Hydroxyprogesterone was the key intermediate in the economical production of hydrocortisone, the newest wonder drug of the day, and the enzymatic selection of a single carbon–hydrogen bond for replacement by OH from among 23 such choices was spectacular. There immediately followed an outpouring of results, most frequently from laboratories in the pharmaceutical industry, describing the microbiological hydroxylation, epoxidation, or dehydrogenation of numerous steroidal, terpenoid, alicyclic, and heterocyclic substrates. Several microbial transformations of steroids became cornerstones of industrial processes, routinely carried out in 50 000-L fermentations. The biotransformation of steroids on an industrial scale continues to thrive and has undergone a remarkable evolution in recent years. Microbiological hydroxylations, such as those of progesterone, are being replaced by other oxidative bioconversions of plant sterols, such as sitosterol and stigmasterol, into steroidal synthons.

Accompanying the outpouring of results has been a steady flow of reviews, chapters, and books ranging in coverage from single topics to those which survey all aspects of the subject. Professor Herbert Holland, an able practioner of microbial oxidations, has assembled a broad survey of oxidative reactions in the book *Organic Synthesis with Oxidative Enzymes*, one of the most recent entries in the field of biotransformation literature. While Holland's coverage of oxidative biotransformations is broad, the book fails on several levels to qualify as reader-friendly. The author makes a serious attempt to elucidate the underlying principles of various oxidative processes, but the effort is often lost in a writing style that is difficult to read. An example comes from a section discussing oxidation of thioethers by monooxygenases: "It is of interest that the *P. oleovorans* enzyme, whose normal function is the hydroxylation of alkyl chains at the penultimate position, is capable of sulfoxidation in a manner analogous to that observed for the dehydrogenase of *Saccharomyces cerevisiae* (see **6.23**, ref. 47), when other enzymes capable of the dehydrogenation and β-oxidation of fatty acids are reported not to be active on some alkyl sulfide analogues of their normal substrate in cases where the sulfur atom is adjacent to the normal site of oxidation (81, 82)." Perseverance in reading is required throughout the book in order to extract the author's message.

Despite the power of the method, enzymic oxidations are not practiced in the vast majority of organic synthesis laboratories. One important reason, among several, is that our ability to select a microorganism to carry out the desired transformation of a new substrate is at best poor and relies heavily on that classical tool of organic chemistry, the analogy. For those who turn to books such as this for guidance, the ability to search for the analogous example is an important consideration. The index of this book appears extensive but, on closer examination, is often useless in searching for a structural analogue. Only compounds completely named in the text appear to have been indexed, while numerous structures and compounds identified only by number or a shortened nomenclature are not indexed. The structural formula of progesterone, for example, appears on at least eight separate occasions throughout the book, but only two entries for progesterone are found in the index. A compound such as 2-benzoyl-2-azaspiro[5.5]undec-9-ene can be found only by perusal of structural drawings in the text. The reader must be prepared to scan the book as well as the index when searching for specific information.

The literature of oxidative biotransformations is voluminous, and coverage is necessarily selective in this book. Coverage of the literature is stated by the author to be through mid-1990 and appears to have been well met. A brief summary of fermentation techniques is provided. Yields of the reactions, always of interest to the synthetic chemist, are given only infrequently. Overall, though, this book contains much information which will reward the determined reader. The intervention of a diligent editor could have made the reading considerably more enjoyable and profitable.

Roy A. Johnson, *The Upjohn Company*

Coal: Typology, Physics, Chemistry, Constitution. Third Edition. By D. W. van Krevelen (University of Technology, Delft). Elsevier: Amsterdam. 1993. xxii + 986 pp. $397.00. ISBN 0-444-89586-8.

This book is truly a monumental work. It serves, in part, as a monument to van Krevelen's work on coal. The honor is well-deserved since van Krevelen has probably been the most prolific producer of scientific data on coal.

The encyclopedic nature of the book makes it a valuable addition to the literature. All of the topics pertinent to coal science are included except coal mining and preparation. Anyone working on or contemplating work on the physics and chemistry of coal would be well advised to read the parts that are applicable to their work. The book reviews the literature and critically evaluates the results reported. The approach to most subjects is historical, covering essentially all work from the last two centuries. Descriptions of outdated methods, hypotheses, and data are given, but vanKrevelen takes the time and space to explain why these have been superseded or why they were wrong. Such an approach makes the book longer than would be necessary for a description of the current state of coal science but adds value by providing a perspective not available in shorter works. Review of current work is as up-to-date as can be expected for a large book.

Shortcomings of the book are mostly problems with editing and writing style. An occasional statement is unclear because of incorrect, poor, or odd use of English. The common occurrence of one-sentence paragraphs detracts from the presentation. Understanding often requires carefully rereading the sentence to determine whether it was intended to stand alone or should have been part of a paragraph together with neighboring sentences. Typographical errors are common in some parts of the book, suggesting that structures, numerical data, and references should be checked against original sources before being cited or used in critical work. Overstatement (e.g. great, wonderful, or perfect) occasionally detracts from the scientific quality of the presentation.

Lee D. Hansen, *Brigham Young University*

Inorganic Biochemistry: An Introduction. By J. A. Cowan (The Ohio State University). VCH: New York. 1993. xii + 350 pp. $39.00. ISBN 1-56081-537-x.

This book is designed as an introductory text on the concepts and

underlying principles of modern metallobiochemistry using background materials in physical methods and biochemistry.

The first two chapters are backgrounds in inorganic solution chemistry, structural and mechanistic biochemistry, and physical inorganic methods that form a necessary foundation for the rest of the book. Chapter 1, Fundamentals of Inorganic Biochemistry, is divided into two parts: Fundamentals of Inorganic Solution Chemistry and Fundamental Principles of Biochemistry. Part I is a good introduction to general inorganic chemistry with emphasis on biological systems, and the discussions on coordination chemistry (HSAB and Stability Constants) are especially useful. Part II of this chapter develops the biological aspects of this subject, covering such topics as biological ligands and polypeptide and polynucleotide structure and conformation. The chapter finishes with a discussion of cell physiology and molecular biology, including clear and concise discussions of polynucleotide transcription, cloning, and site-directed mutagenesis. Chapter 2, Experimental Methods, is also composed of two parts: Physicochemical Methods, a good introduction to the spectroscopy of inorganic systems, and Biochemical Methods, which is equally useful, covering the areas of enzyme kinetics, protein purification, and mass measurement of proteins and polynucleotides. All of the aforementioned techniques of the first two chapters are clear and well written; however, they are very brief and by no means complete. To compensate for this, the author has carefully chosen specific examples to illustrate important principles and provides a complete listing of books for further reading.

In the following six chapters, the author discusses various bioinorganic systems: Transport and Storage; Metalloproteins and Metalloenzymes—Oxygen Carriers and Hydrolases; Metalloproteins and Metalloenzymes—(II) Redox Chemistry; Alkali and Alkaline Earth Metals; Metals in the Regulation of Biochemical Events; and Cell Toxicity and Chemotherapeutics. Chapter 9, Metal Complexes as Probes of Structure and Reactivity, describes the use of metals as structural probes for nucleotide structure and the substitution of metals as a probe of the active site of metalloproteins. Chapter 10 is a discussion of two case studies where the techniques elucidated in the first two chapters are applied to cytochrome c oxidase and mercuric reductase.

Overall, the book is well written and gives a good introduction to a rich and growing area of research.

Advances in Electron Transfer Chemistry. Volume 3. Edited by Patrick S. Mariano (University of Maryland, College Park). JAI Press: Greenwich, CT. 1993. x + 256 pp. ISBN 1-55938-320-8.

According to Professor Mariano, the editor of the Advances in Electron Transfer Chemistry Series, the reviews encompassed within the pages are to a large extent focused on the research efforts of the individual contributors. Dr. Mariano's stated design is to provide a platform for those who are developing new knowledge in electron transfer chemistry to present their latest findings and to inform the reader about current breakthroughs in the area. Thus one opens this third volume of the series with expectations that the authors are going to treat us to up-to-the-minute accounts of their chosen material. Unfortunately, it does not turn out this way; much of what appears in this volume could have, and probably has, appeared in reviews published five years ago.

Nevertheless, in spite of this nagging disappointment, this reviewer found the four reviews in this volume to be very valuable. One major success is that the editor has orchestrated the four contributions to be in areas that are widely separated, one from the other. Thus, Jones and Farahat write about Photoinduced Electron Transfer in Flexible Biaryl Donor-Acceptor Molecules and focus attention to TICT and related phenomena and how solvents influence the behavior. Serpone, Terzian, Lawless, and Herrmann review Light-Induced Electron Transfer in Inorganic Systems in Homogeneous and Heterogeneous Phases, in which they pay much attention to interfacial electron transfer involving semiconductors. These two photoactivated chapters are succeeded by a pair of non-photoactivated reviews. Thus, Nelsen discusses Internal Geometry Relaxation Effects on Electron Transfer Rates of Amino Centered Systems. He focuses on "self"-ET, which he defines as transfer of an electron between a neutral molecule and its own radical cation, and examples that he considers are the Wurster's blue cation, trialkylamine cations, and hydrazines. The second non-photoactivated area is Sequential Electron Transfer Reactions Catalyzed by Cytochrome P-450 Enzymes by Guengerich and Macdonald, which gives the nonexpert (such as this reviewer) a fascinating glimpse of the rich diversity of oxidations that P-450 enzymes can carry out.

My personal favorite among the four is the review by Serpone, Terzian, Lawless, and Herrmann. It is a mammoth effort, covering 133 pages out of a total of 240 pages in the volume. There are 322 references. The authors have taken a welcome didactic stance in their introductory material, devoting some 30 pages to a basic exposition of inorganic photophysics, semiconductor theory, and electron transfer theory. From this base, they develop accounts, largely mechanistic, of the intriguing interactions between electronically excited states and semiconductors. This chapter has something for everyone who is interested in the interfacial aspects of photochemistry.

The only noticeable duplication across the four reviews is that all have, to some extent, devoted space to electron transfer theories, mainly Marcus' approach. This is probably unavoidable since all reviews must have internal balance and, to be fair, the individuals have developed the basic material toward their own area such that different aspects become exposed.

In summary, this volume proves to contain four reviews that those wishing to acquaint themselves with the subject matter will find very useful as accounts *per se* and as good guides to the literature.

Michael A. J. Rodgers, *Bowling Green State University*