

Book Reviews *

An Introduction to Free Radicals. By John E. Leffler (Florida State University). J. Wiley and Sons: New York. 1993. vi + 288 pp. \$64.95. ISBN 0-471-59406-7.

In the book's preface the author states, "My object in this book is to extract from the vast literature on free radicals a relatively modest selection of the most fundamental and generally useful material. Hence it is an *introduction* to free radicals, a foundation on which readers may build to meet their more specialized need." The author succeeds in attaining this goal, producing a manuscript which is thoroughly enjoyable to read and which will leave the reader with a solid foundation in free radical chemistry.

Chapters 1–5 present the theoretical and experimental concepts necessary to understand the chemistry of free radicals. Chapter 1 introduces the concepts of electronic and nuclear spin angular momentum as a necessary prerequisite to the following chapters which introduce electron spin resonance spectroscopy (Chapter 2), diradicals and triplet states (Chapter 3), and chemically induced dynamic nuclear spin polarization (Chapter 5). In addition to a discussion of the ESR transition, Chapter 2 also provides a detailed look at empirical correlations of the hyperfine constant and conformational effects on both the magnitude of the hyperfine splitting and on the dynamic appearance of the ESR spectrum. Chapter 3 provides a very brief introduction to the ESR of triplets and to an analysis of the zero-field parameters, *D* and *E*. The kinetic treatments of radical reactions by the radical clock method, by kinetic ESR spectroscopy, and by nanosecond laser flash photolysis are dealt with in Chapter 4. The thermochemistry of radicals is appropriately delayed until the chemistry of alkyl radicals is presented in Chapter 9.

Chapters 6–11 present the chemistry of free radicals, including methods for their formation, and their use in organic synthesis. The thermolysis and photolysis of peroxides and azo compounds as sources of radicals are discussed in Chapters 7 and 8, respectively. The use of tri-*n*-butyl tin hydride in radical reactions is discussed in conjunction with synthetic aspects of free radical chemistry in Chapter 11. The chemistry, properties, and structures of selected radicals are presented in Chapters 6, 9, and 10. Several synthetically useful radical reactions including deoxygenation, halogenation, deamination, decarboxylation, and additions to alkenes along with a discussion of the regio- and stereochemistries of radical reactions are presented in Chapter 11.

The final chapter of the book presents an introduction to electron transfer processes. The first part of the chapter introduces the concepts of inner- and outer-sphere electron transfer and of rate–equilibrium relationships such as the Marcus treatment. Topics covered in the remaining part of the chapter include the S_{RN} mechanisms, radical pairs versus ion pairs, and zwitterions versus diradicals.

This book would provide an excellent template for an advanced undergraduate or graduate level course in free radical chemistry. A sufficient number of up-to-date and key references are provided for those who are new to the field.

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JA934692L

Heterocyclic Compounds. Volume 52. Pyrimidines. By D. J. Brown (Australian National University, Canberra). J. Wiley and Sons: New York. 1994. xxx + 1510 pp. \$595.00. ISBN 0-471-50656-7.

For all heterocyclic chemists interested in pyrimidine ring systems, the latest contribution by D. J. Brown is most welcome. Those who are active in this field are quite familiar with the predecessor, Volume 16 (Heterocyclic Compounds. The Pyrimidines and Its Two Supplements). Although the present volume is given a new number, it is considered to be a second edition. As such, it brings up to date in one volume most of the valuable components of the earlier volumes, and the chemical community will find it beneficial to have this information in one volume.

This 1510 page treatise consists of 870 pages of text assigned to 12 chapters, 310 pages of data tables, 180 pages of references, and 140 pages devoted to the index. The author has done an admirable job

condensing the more than 2500 pages contained in the three previous volumes into a manageable form. The chapter format that existed in the earlier works has been largely retained. The major change has been to eliminate the chapter on *N*-Alkylated Pyrimidines and Pyrimidine-*N*-Oxides and disperse some of this material into other chapters. The text has received a face-lift with a new, numerical system to identify the chapters and their subsections. Chapter 2, Primary Syntheses, utilizes the synthon approach rather than identifying compounds as precursors.

The extraordinary size of this book dictates some minor problems in presentation and production. In contrast to thinner volumes, the quality of the paper appears to be compromised so that the reader is occasionally presented with print showing through from the opposite side of the page, especially where text and structures are opposing. The manner of listing more than 7000 references is not systematic, probably for reasons of time. Yet, this approach makes it difficult to assess the work of any one author or laboratory. The references appear, however, to encompass the full range of the period of pyrimidine chemistry.

While the cost of this volume is quite high for individual purchase, those who are active in the field would be well served to have this book on their shelf.

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JA945025A

Photochemical Key Steps in Organic Synthesis: An Experimental Course Book. Edited by Jochen Mattay (Universitat Munster) and Axel G. Griesbeck (Universitat Koln). VCH: Weinheim. 1994. 350 pp. \$40.00. ISBN 3-527-29214-4.

Over 40 researchers contributed to this collection of multistep experiments featuring one or two photochemical key steps. A general section discusses reaction control, interpretation of UV spectra, quantum yields and chemical yields, and information on solvents, lamps, filters, and vessels. The experiments were chosen because the starting materials were cheap and readily available, the necessary photochemical equipment was available in most institutes, the products were useful for further syntheses, and the light reaction was efficient. Chapter headings include (1) Carbonyl Compounds, Aldehydes and Ketones, Enones and Dienones; (2) Nitrogen-containing Chromophores; (3) Aromatic Compounds; (4) Alkenes, Arylalkenes and Cycloalkenes; (5) Organometallic Compounds; (6) Photo oxygenation and Photo reduction; (7) Photochemistry in Organized Media; and (8) Photochromic Compounds. Graphical, photochemical key step, and subject indexes are included.

JA945134P

Biodegradable Plastics and Polymers. Edited by Y. Doi (The Institute of Physical and Chemical Research) and K. Fukuda (Biodegradable Plastics Society). Elsevier: Amsterdam, The Netherlands. 1994. xvii + 627 pp. \$283.00. ISBN 0-444-81708-5.

A total of 300 researchers, scientists, and engineers from around the globe contributed to the proceedings of the Third International Scientific Workshop on Biodegradable Plastics and Polymers held at Osaka, Japan, in 1993. Chapter headings include (1) Biodegradation of polymers and plastics; (2) Environmental degradation of plastics; (3) Synthesis and properties of new biodegradable plastic materials; (4) Biodegradation and morphologies of polymer blends; (5) Development of biodegradation test method; and (6) Governmental policy, regulation and standards. A list of contributors and a subject index conclude.

JA9450667

Infrared Characteristic Group Frequencies, Second Edition. Tables and Charts. By George Socrates (The University of West London). John Wiley & Sons: New York. 1994. viii + 249 pp. \$74.95. ISBN 0-471-94230-8.

*Unsigned book reviews are by the Book Review Editor.

This handbook of infrared characteristic group frequencies contains numerous charts, figures, and tables. Each chapter begins with a discussion of the steric, electronic, and solvent-solute interactions which affect group frequencies; related tables follow. Organic and inorganic compounds are covered, and there is an appendix and an index.

JA9450770

Separations for Biotechnology 3. Edited by D. L. Pyle (University of Reading, U.K.). Royal Society of Chemistry: Cambridge. 1994. xiv + 604 pp. £92.50. ISBN 0-85186-724-3.

Bioseparations technology is an area where multidisciplinary efforts are needed and molecular biology and process engineering go hand in hand. These proceedings of the Third International Conference on Separations for Biotechnology include papers on the wide range of approaches and areas of biotechnology and reflect the multidisciplinary nature of the technical problems posed in bioprocessing. Topics covered include the use of molecular biology and protein engineering to facilitate product recovery, new techniques for affinity separations, mathematical modeling of individual processes and separation systems, and the validation of processes for safe use. Author and subject indexes conclude.

JA945135H

Medicinal Chemistry: Principles and Practice. Edited by Frank D. King (SmithKline Beecham Pharmaceuticals). Royal Society of Chemistry: Cambridge. 1994. xxiv + 314 pp. £39.50. ISBN 0-85186-494-5.

Essentially a collation of lectures presented at the 7th RSC Medicinal Chemistry School held in 1993 at the University of Kent, U.K., this text provides an introduction to medicinal chemistry, primarily for synthetic chemists new to the industry. Chapter headings include (1) An introduction to drug-receptor interactions; (2) Signal transduction and second messengers; (3) Enzyme inhibitors; (4) The biological evaluation of new compounds; (5) Pharmacokinetics; (6) Drug metabolism; (7) Physicochemical properties and drug design; (8) Quantitative structure-activity relationships; (9) Computational chemistry techniques; (10) Patent Medicine; (11) Molecular Biology; (12) Devising a research strategy; (13) Past approaches to discovering new drugs; (14) Bioisosteres, conformational restriction and Pro-drugs; (15) Design and synthesis of selective protein kinase C inhibitors; (16) Discovery of 1069C; (17) "Dipeptoid" antagonists; and (18) Migraine therapy. Appendixes and a subject index conclude.

JA945136+

Biofluid and Tissue Analysis for Drugs, including Hypolipidaemics. Edited by Eric Reid (Guildford Academic Associates), Howard M. Hill (Hazleton Europe), and Ian D. Wilson (Zeneca Pharmaceuticals). Royal Society of Chemistry: Cambridge. 1994. xiv + 420 pp. £95.00. ISBN 0-85186-644-1.

Based on the proceedings of the 10th International Forum held in 1993 in Guildford, U.K., these edited papers review drug development methodology and associated problems with particular reference to the analysis of biofluids and tissues. Topics covered include training in bioanalysis, metabolite investigation, drug-protein binding, biochemistry of hyperlipidaemia, fibrates, ACAT inhibitor 447C88, HPLC, polar antiviral drugs, unstable analytes, and analyte and general indexes.

JA9451372

Chemistry of Nonaqueous Solutions: Current Progress. Edited by Gleb Mamantov (University of Tennessee) and Alexander I. Popov (Michigan State University). VCH Publishers, Inc.: New York. 1994. xi + 377 pp. \$125.00. ISBN 1-56081-546-9.

Chemistry of Nonaqueous Solutions provides up-to-date coverage of ion-ion and ion-solvent interactions in a wide range of nonaqueous solvents, as well as descriptions of instrumentation, theoretical and computational methods used in determination and interpretation of

electrochemical, thermodynamic, and spectroscopic data. The book's six chapters, written by leading experts in their respective fields, are for the most part devoted to nonaqueous electrolyte solutions. Non-electrolyte solutions are discussed only in the last chapter dealing with computer simulations.

The first chapter, *Solution Chemistry: Cutting Edge in Modern Electrochemical Technology*, comprises approximately 40% of the entire book and is divided into two parts. The first part provides tabulation and discussion of bulk solvent properties (viscosity, relative permittivity, density, and melting and boiling point temperatures), solvent classification schemes and empirical solvent parameters (Gutmann's donor number, Kamlet and Taft's α - and β -scales, Dimroth and Reichardt's $E_T(30)$ scale, and the π^* solvatochromic parameter), solvent electrochemical stability ranges, surveys of electrolyte conductivities from infinite dilute solution to saturation, and ionic equilibrium in and structure of electrolyte solutions. The second part of the chapter is devoted to the more practical applications of nonaqueous solutions in batteries and electroplating and electrodeposition processes involving semiconducting materials and compounds, refractory materials, and conducting organic polymers.

The book's second chapter focuses on the application of Raman and infrared vibrational spectroscopy to identify and characterize ionic structures in nonaqueous solvent media. Specific types of ion associates considered include contact ion pairs, solvent-separated ion pairs, solvent-shared ion pairs, groups of ions into triplets, uncharged ion aggregates with even stoichiometry in which the cations and anions are in direct contact, associates in which there is a mixture of contact and solvent-separated ion pairing, and ion pairs involving a transition metal complex and a cation situated outside of the inner sphere ligands. Complexation in nonaqueous solvents is discussed in detail in the third chapter from a thermodynamic standpoint, with particular emphasis on halogeno and thiocyanato transition metal complexes.

Chapters 4 and 5 deal with electrochemistry and chemical speciation in room-temperature chloroaluminate molten salts, respectively. Included in the chapters are preparations and purifications of the various molten salts, electrode systems utilized, electrochemical potential ranges of common haloaluminate molten salts, formal potentials of selected main group couples, solid-liquid phase boundaries of several binary molten salts, and spectral properties of various transition element complexes identified as being present in the molten salts. The last chapter discusses molecular dynamics and Monte Carlo computer simulations on both pure liquids and binary liquid mixtures. Each chapter is heavily referenced, with the majority of the references being recent and spanning the years 1975-1992. I found the book to be extremely informative and very well-written and recommend it highly to individuals interested in the properties of nonaqueous electrolyte solutions and in nonaqueous electrochemistry.

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JA945050G

Handbook of Electron Spin Resonance: Data Sources, Computer Technology, Relaxation, and ENDOR. Edited by Charles P. Poole and Horacio A. Farach (University of South Carolina). AIP Press: Woodbury, NY. 1994. x + 660 pp. \$115.00. ISBN 1-56396-044-3.

This book is the first of a planned multivolume entitled *Handbook of Electron Spin Resonance*, and the subtitle accurately reflects its contents. Future volumes will cover topics such as transition metal ions, free radicals, ESR imaging, FT-ESR, 2D-ESR, high-field ESR, etc. Apparently, the editor's idea is to provide a place for nonspecialists and those new to a particular subfield to begin their study of that field with a review of the basic physics and important results obtained to date. C. P. Poole and H. A. Farach's chapter on Data Sources meets this objective admirably. There are lists of reviews, monographs, and textbooks, compilations of the number and types of research publications as a function of time that I have not seen conveniently collected together before, and a list of the most recent physical constants of relevance to magnetic resonance. In the chapter entitled *Computer Techniques*, B. Kirste has undertaken the almost impossible task of reviewing current computer techniques in ESR data acquisition and analysis. While written in Kirste's usual careful and complete manner, the bulk of the literature references work done before 1987 with a few references to 1989 work. As a result, this chapter is almost useless to

modern ESR spectroscopists and one wonders where it has been sitting for the last five years. I. Bertini, G. Martini, and C. Luchinat provide a Bloch equation based introduction to relaxation in their chapter *Relaxation, Background, and Theory*. This chapter is best considered as an historical introduction rather than a review of modern research in this field since half of the references are to work published before 1970 and none are more recent than 1991. Their second chapter, *Relaxation Data Tabulation*, is a 231-page tabulation of relaxation data of almost every imaginable kind: transition metal ions, nitroxides, and organic radicals are covered in various phases as are motion, chemical exchange, spin exchange, etc. This unique compilation should be of great value to researchers in the field of magnetic resonance relaxation, if only to keep them from repeating themselves. L. Piekara-Sada and L. D. Kispert provide a routine introduction in their chapter entitled *ENDOR Spectroscopy*, which will help nonspecialists deal with the literature but will be of little interest to experienced workers in the field. Then follows a 293-page chapter by the same authors entitled *ENDOR Data Tabulation*. The authors have reviewed the ENDOR literature between 1978 and 1989. This restricted time period provides a distorted picture of some aspects of ENDOR spectroscopy. For example, there are only 16 references to proton ENDOR in solution, which is only the tip of the iceberg, presumably because the bulk of the work in this field was done before 1978. Subsequent sections cover liquid phase ENDOR on other nuclei, ENDOR in liquid crystals, ENDOR of triplet state radicals, small inorganic radicals, paramagnetic ions, defects in solids, etc. My impression is that these sections are much more representative of their fields and should provide a good literature review for future workers.

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JA945032Z

Natural Products. Their Chemistry and Biological Significance.

By J. Mann, R. S. Davidson, J. B. Hobbs, D. V. Banthorpe, and J. B. Harborne. Longman Scientific and Technical/J. Wiley and Sons: New York. 1994. xiv + 456 pp. \$44.95. ISBN 0-470-20002-2.

This book is a general survey of natural products chemistry which covers both primary and secondary metabolites, with emphasis on the former. It is not intended as a research text, and specific references have not been provided, though a reading list of one or two pages is given at the end of each chapter. Each chapter treats the general areas of structure, biosynthesis, and synthesis. The relative emphasis of these areas, as well as chapter size, has been left up to the individual authors. The largest and smallest chapters involve three authors and 108 pages and a single author and 28 pages, respectively.

With such a vast area to be covered, selection of topics and style of treatment are equally crucial. With a view toward informing the potential reader, some specific impressions of the individual chapters are perhaps in order. The carbohydrates chapter presented chiral synthesis of several metabolic types, including shikimic acid, showdomycin, muscarine, and even an artificial antigen. The nucleoside-related chapter provided a clear description of some aspects of nucleoside conformation, a concise account of nucleoside and polynucleotide biosynthesis, and a section on oligonucleotide synthesis which stressed protecting group chemistry and four principal methods of assembly. Brief treatments of the Maxam-Gilbert method and recombinant DNA were also given. The largest chapter, on amino acids and peptides, emphasized chemical synthesis of peptides and methods used for their sequencing. The fatty acids chapter covered several aspects of leukotrienes and prostaglandins. Biosynthetic relationships were stressed in the terpenoids chapter, and treatments of some aspects of the Woodward and Velluz routes to steroids were provided. The smallest chapter, Phenolics, included biosyntheses of usnic acid, lignin, and cyanidin-3-glucoside and a few pages of synthetic work emphasizing flavonoids. The final chapter, Alkaloids, had biosynthetic sections on cocaine, coniine, nicotine, the morphine alkaloids, and lysergic acid and a synthetic section emphasizing the intramolecular Diels-Alder reaction. Asymmetric syntheses of chemotherapeutic agents deoxyjirimycin and indolactam V were also given.

The stated purpose of the book was to provide a comprehensive and readable introduction to natural products chemistry. In this it succeeded. The level of material and selection of topics was appropriate to the intended audience of undergraduate and "postgraduate" students. Explanations were generally clear, and errors for the most part were

of a minor nature. This book provides much enjoyable reading and should prove to be a popular addition to chemistry libraries, though the extent to which individual students will actually purchase it is far less certain.

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JA945033R

Iron-Carbene Complexes. Scripts in Inorganic and Organometallic Chemistry. Edited by Wolfgang Petz (Gmelin Institute for Inorganic Chemistry, Germany). Springer-Verlag: New York. 1993. vii + 202 pp. Paperback \$49.00. ISBN 0-387-56258-3.

This book is comprised of two chapters which review the chemistry of iron-carbene complexes containing a cyclopentadienyl group. The first chapter discusses the preparation and reactions of iron-carbene complexes with a diphos or two phosphine ligands with no or one heteroatom at the carbene carbon. The authors also include a section on iron-carbene complexes containing one phosphine ligand with no, one, or two heteroatom(s) at the carbene carbon. In this chapter, the preparations and reactions of non-heteroatom- or heteroatom-stabilized dicarbonyl iron-carbene complexes are also described, along with examples of iron carbene with isocyanide ligand(s) and neutral and anionic iron-carbene complexes. The focus of the short second chapter is mainly on the preparation of vinylidene-iron complexes.

The book presents an in-depth collection of the cyclopentadienyl group containing iron-carbene complexes with spectroscopic data and X-ray structures, where applicable, and documentation on the cyclopropanation reactions involving iron carbenes. However, it lacks a general introduction on iron carbenes, which would have facilitated students' understanding of its contents. The authors also left out the detailed information concerning the synthesis of carbenes and references to original publications in order to limit the size of the book; this exclusion of references makes the book less attractive. The authors could have served their readers better by simply including all the references at the end of the book. Moreover, if the authors had included iron-carbene complexes such as $(CO)_4Fe=CRR$ and other related carbenes, it would have made this publication a more complete work on iron-carbene complexes. There are also several printing errors, which could be avoided.

Overall, the book is a concise, well-documented collection of data on the cyclopentadienyl group containing iron-carbene complexes. The book will be of great help to chemists who are working or planning to work with iron carbenes because it provides a quick reference source for spectroscopic data for iron-carbene complexes.

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JA934696Q

Peptide and Protein Hormones: Structure, Regulation, Activity. A Reference Manual. Edited by Wolfgang König. VCH: New York. 1993. xii + 284 pp. \$135.00. ISBN 3-527-28417-6.

Enkephalins, endorphins, and related peptide hormone segments of the opiomelanocortins were discovered beginning in 1976 although ACTH, another fragment of the precursor molecule, was known for a much longer time. With the discovery of the atrial natriuretic peptides in the 1980s and the endothelins in the past few years, it is clear that the field of peptide hormones is in constant flux with both practitioners and casual observers in need of updated resource material.

This volume by Dr. König is a partial answer. As noted in the preface, not since the 1966 publication of *The Peptides* by Schröder and Lübke has there been a comprehensive monograph on peptide hormones. Not only have a great many such structures been discovered since then but their myriad and often conflicting biological activities, also dependent on species, organs, modes of administration, and dosage, provide an even more bewildering array of "facts". For this reason, prospective readers owe Dr. König a great debt of gratitude for attempting to assemble this reference manual.

Divided into 11 chapters (including a short introduction and 58 pages of references, 3215 in all), the subdivisions chosen represent one area of possible contention. Among the chapter headings are (2) Gonadoliberin, Thyroliberin, Gonadotropins, Thyrotropin, (3) Parathyroid Hormone and the Calcitonin Family, (4) Corticoliberin-Proopiomel-

anocortin Cascade, and (5) Blood Pressure Regulating Peptides. Others include (6) Cholecystokinin and Gastrin, (7) Secretin Family, and three short chapters on neurotensin, motilin, and pancreatic spasmolytic peptide. This organization creates strange bedfellows in terms of function and divided function. Thus, the secretin family includes somatostatin (usually grouped with other hypothalamic releasing factors GnRH, GRF, and TRH) while various gastrointestinal peptides, growth factors, and bone peptides are scattered among various segments of the volume. But each peptide is usually accompanied by subsections entitled occurrence, release, biological effects, and structure-activity relationships, thereby affording a more organized presentation of data. And organization is the forte of this volume. For those familiar with the variations seen in measuring bioactivities (the periodic compilation of peptide hormone effects assembled by Abba Kastin and co-workers in the journal *Peptides* comes readily to mind), deciding on even the nature of an effect, much less its magnitude, is often a real challenge. König has been able to consolidate an incredible amount of data into a volume of quite modest size precisely through good organization and brevity.

Sometimes the brevity is off-putting. Thus, gonadoliberein is termed GnRH (but never LH-RH) and is part of a constant stream of abbreviations which, together with chapter-based references (e.g., [5.134]), can make a printed page a visual cacophony of letters and numbers. Even more surprising is the selective nature of the references (even with 3215 of them), which tends to omit key references such as the individuals responsible for isolation and synthesis; in virtually all cases, "et al." is used to save space. Although it can be argued that Noble laureates such as duVigneaud, Schally, and Guillemin, among others, need no further exposure, it is strange to see them and even Hughes and Kosterlitz, co-discoverers of leucine enkephalin, virtually absent from the references. There are essentially no individuals cited anywhere within the body of the text. The result is a volume that will prove useful for the libraries of any scientists interested in this field, either directly or peripherally. But the emphasis is on content, condensed and recent, so that most citations included are from the mid to late 1980s.

In summary, this is an ambitious and worthwhile manual which spans the chemistry and biology of peptide hormones in a concise and non-nonsense fashion. As a delightful epilogue to this volume suggests, it was produced with concern for the monumental challenge of the task but with hopes for modest enlightenment. It largely succeeds.

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JA944854T

Methods in Enzymology. Volumes 226 and 227. Edited by James F. Riordan and Bert L. Vallee (Harvard Medical School). Academic Press: San Diego, CA. 1993. Volume 226: xxiv + 674 pp. \$95.00. ISBN 0-121-82127-7. Volume 227: xxiv + 634 pp. \$99.00. ISBN 0-121-82128-5.

In the field of metallobiochemistry, characterization of structure/function relationships requires the application of a wide array of physical methodology. The best research in the field is accomplished by

understanding which techniques can be employed for the system under study and what specific questions they can answer. There are few comprehensive sources summarizing the methodologies used in this field. Textbooks for graduate-level courses covering physical methods in metallobiochemistry are either out-of-date or incomplete. Thus, these two volumes are a timely and welcome addition to the literature. Although the books are not designed to be texts per se, the coverage is extensive and most of the contributors have made an attempt to include the background information necessary to allow nonpractitioners to extract the applicability of the technique to their own problems.

The first volume (226) emphasizes techniques that make use of photons near the visible and infrared regions of the spectrum. The expected techniques are covered, electronic, (magnetic) circular dichroism, (resonance) Raman (and surface-enhanced resonance Raman), and FT-infrared spectroscopies, but to the credit of the editors, an emphasis is placed on time-dependent and low-temperature applications and less commonly used techniques like linear dichroism, luminescence, and cryokinetics are explained. For good measure, chapters are included on the interaction of metal complexes with proteins (as covalent labels or cross-links) and nucleic acids (as chiral luminescent reporters) and on a wide array of methods useful for detecting metal-metal interactions in proteins.

The coverage in Volume 227 emphasizes the magnetic properties of metals in biological systems. A thorough discussion of nuclear magnetic resonance (NMR) includes the use of Ca, Cd, and the alkali metals as NMR nuclei, as well as multidimensional NMR of both diamagnetic and paramagnetic metalloproteins, and the use of lanthanide shift reagents. As would be expected, about twice as much space is used to discuss *electronic* magnetic properties, with chapters on electron paramagnetic resonance spectroscopy (including integer-spin EPR), optically-detected magnetic resonance, continuous-wave and pulsed electron nuclear double (and multiple) resonance, electron spin echo envelope modulation, magnetic susceptibility, and multfield saturation magnetization. Mössbauer spectroscopy is covered in combination with integer-spin EPR, and the editors have included some useful chapters on electrochemical studies, pulse radiolysis, and techniques for locating metal atoms in biological samples.

These two volumes do a good job of updating the review literature on the important techniques for studying metallobiochemical systems and are particularly helpful by incorporating some of the newest or lesser-known techniques that have not received the attention they deserve. Although the editors state in the preface that they have not attempted to be comprehensive, the absence of a general discussion of X-ray absorption spectroscopy is unfortunate, especially in light of its unique utility for examining Zn sites in proteins, which represent a large proportion of metallobiochemical systems of interest. Even so, these volumes are an extremely useful addition to the field and should be a part of the library of any practicing metallobiochemist. I certainly plan to incorporate some of the chapters into my next course on physical methods.

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JA9347548