

biscoordination proposed for Cd(II) flavin complexes by Hemmerich et al.<sup>8</sup>

The quadrupolar splittings needed to simulate the FH<sub>2</sub>ase modulation curve do not correspond well to the pure nuclear quadrupolar resonance splitting for histidine or imidazole or backbone nitrogens; however, Ashby et al.<sup>9</sup> have shown that these energy levels are sensitive to changes in environment. Table I shows some of the quadrupolar transitions obtained in other

systems. Recent EXAFS data<sup>11</sup> suggest multiple sulfur coordination to nickel in this enzyme.

The ESEEM study described here thus suggests a nitrogen nucleus from the protein or possibly the FAD coenzyme in the FH<sub>2</sub>ase is close to the nickel paramagnet. Taken with the EXAFS data, these results begin to define the likely ligands to the nickel. The striking distinction between the FH<sub>2</sub>ase and MVH<sub>2</sub>ase data indicates the discriminating power of the ESEEM approach.

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(9) (a) Ashby, C. I. H.; Paton, W. F.; Brown, T. L. *J. Am. Chem. Soc.* **1980**, *102*, 2990-2998. (b) Ashby, C. I. H.; Cheng, C. P.; Brown, T. L. *J. Am. Chem. Soc.* **1978**, *100*, 6057-6062.

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## Additions and Corrections

**Electrocatalytic Oxidation of Carbon Monoxide in a CO/O<sub>2</sub> Fuel Cell** [*J. Am. Chem. Soc.* **1983**, *105*, 7456]. JIANXIN WU and CLIFFORD P. KUBIAK\*

Page 7457, second paragraph: The rate constant  $k^h = 1.86 \times 10^2 \text{ cm s}^{-1}$  should be  $k^h = 1.86 \times 10^{-2} \text{ cm s}^{-1}$ .

**Self-Diffusion of Water at the Protein Surface: A Measurement** [*J. Am. Chem. Soc.* **1984**, *106*, 428-9]. C. F. POLNASZEK and R. G. BRYANT\*

Page 429, lines 24-28: The sentence should read as follows—The neglect of these effects can be shown to result in a calculated diffusion constant that is somewhat *larger* than the correct value and a calculated distance between the centers of the interacting particles that is *smaller* than the correct value.<sup>8</sup>

## Book Reviews \*

**Atmospheric Pollution, Its History, Origins and Prevention. 4th Edition.** By A. R. Meetham, D. W. Bottom, S. Cayton, A. Henderson-Sellers, and D. Chambers. Pergamon Press, Oxford and New York. 1981. xi + 232 pp. \$15.00.

This book covers a wide range of topics on air pollution, including the sources, measurement, effects, and control of pollution. It also provides a brief discussion on the air pollution laws administered in the Western European countries and the United States of America. While the initial chapters of the book appear remotely related to the atmospheric pollution, it is not until one reads past Chapter 10 that the usefulness of the book can be realized. While I trust the authors had some good purpose to scope the book which includes a lengthy discussion on the sources of pollution such as fuels, furnaces, and other industrial equipment, this discussion could have been brief without losing the purpose served. For example, the engineering drawings of the archaic boilers, such as Cochran and Lankashire types, occupy so many pages; the book could have been just as useful without them.

The chapter of measurement of air pollution is succinct, clear, and reflects the start-of-the-art, though it is limited to two pollutants, namely the particulates (smoke) and sulfur dioxide which are of major concern in England. In fact, the whole book places much emphasis on these two pollutants, only having a brief reference to others. The discussion on atmospheric dilution processes and their effect on spacial variability of pollution is given in simple terms requiring little special training for the

reader to understand the subject. The discussion on the British approach of using tall chimneys as effective means of reducing ground-level concentrations of pollution is skillfully handled which leaves a novice to air pollution with the impression that the solution to pollution could be just as simple. The effect of using tall chimneys at large distances away from the sources is not explained well. The long-range transport of pollutants and their effect in acid participation is a major concern in North America and Scandinavian Countries where dilution with the use of tall chimneys is not considered as a solution to pollution. As such, the air pollution law in the United States limits the maximum height of the chimneys that industry can use while the British regulate the minimum height of the chimneys which places no limitation on how tall they can be.

All this and the discussion on air pollution laws and their administration in several countries provides a good start for the reader in learning about air pollution, its sources, effects, and control methods.

Sury N. Putta, *New York State Department of Public Service*

**Survey of Contemporary Toxicology. Volume I.** Edited by Anthony T. Tu (Colorado State University). John Wiley and Sons, New York, NY. 1980. ix + 357 pp. \$39.50.

It is difficult to review a book that is one volume in a series designed to survey the field of contemporary toxicology when the editor does not give a list of the topics that will be covered in other volumes. The reader is forced to place Volume I in a perspective about which he is uncertain.

The real strength of this book is the comprehensive manner in which it treats the toxicology of substances in foods or that have food related origins. Indeed six of the seven chapters (Chapters 2-7) deal with this

\*Unsigned book reviews are by the Book Review Editor.

important aspect of toxicology. Chapter 3 (Food Additive Toxicology) is typical of the excellent manner in which food related toxicants are treated in the six chapters. The author discusses the concepts and "myths" that have evolved around the term "natural" as used to describe foods and gives good examples of some of the misconceptions that have developed. Unfortunately, in the core of the introduction, a good preview of the toxicology of food preservatives is interrupted by an unrelated table showing the impact of the effect of producing crops without pesticides, although pesticides (rightfully) are given no text in this excellent chapter. The reader is given a thorough and balanced discussion of the toxicology of food additives covering the legal and moral implications, reasons for use of food additives, types of food additives, and some biochemical toxicology. The reader is left with a feeling that he has had a good survey of this topic with a useful list of references. This chapter typifies the strengths of the associated chapters on related topics. In addition, some of the other chapters are endowed with excellent tables and geographical illustrations showing the specific location of certain chemical hazards associated with water and marine life. Another outstanding feature of this book is its treatment of infectious agents. This subject is usually treated very weakly in most toxicology books that are chemically oriented.

The weakness of this book is twofold. First, a good survey in toxicology should include a section on the basic principles of toxicology in its first volume. No such section was included in this book. Second, Chapter 1, Industrial Toxicology, appears isolated and condensed when compared to the next six chapters on food related toxicants. The authors of Chapter 1 do a good job of cataloguing a large number of specific industrial toxicants. A selected list of five chemicals is used to discuss systemic poisons. The discussions are adequate but the list is short and no references are given to direct the reader to this kind of information for the other chemicals that are catalogued. Chemicals as causes of cancer is discussed in about one-half page of text. Instead of a balanced discussion on the difficulties of obtaining reliable data with respect to the contributions of the workplace to the total cancer risk, the reader is presented with a series of estimates with no discussion as to why the estimates might not agree. The chapter on Industrial Toxicology is a good chapter but perhaps better suited for a different setting. The topic is much too broad to be treated in one chapter and placed parallel to six other chapters on more specific topics.

Overall the book is useful for toxicologists but is too limited to be used as a textbook for general toxicology.

Curtis Harper, *University of North Carolina School of Medicine*

**Biochemistry and Physiology of Herbicide Action.** By Carl Fedtke (Bayer A.G.). Springer-Verlag, Berlin, Heidelberg, and New York. 1982. xi + 202 pp. \$68.00.

The effect of herbicides on biochemical processes in plants is the subject of this book. The book is directed to the plant physiologist, but will also be useful to the weed scientist and biochemist. For these investigators, herbicides may serve as a research tool in the study of plants much as drugs have aided the animal physiologist. The book contains 12 chapters with 43 figures and 58 tables. Systematic chemical names are not used but chemical structures are shown. The current knowledge and views on the mode of action of herbicides are described in chapters on photosynthesis, energy conservation, nucleic acid and protein synthesis, microtubule formation, lipid metabolism, germination, auxin activity, and aromatic amino acid biosynthesis. Both the older and very new herbicides are discussed. The chapters are well referenced. Where known, the author describes the biochemical effects of herbicides on molds and bacteria.

James Fleeker, *North Dakota State University*

**Advances in Quantum Chemistry. Volume 15.** Edited by Per-olov Lowdin. Academic Press, NY. 1982. x + 277 pp. \$54.00.

This is a set of four reviews of important current topics in quantum chemistry. Basilevsky and Ryabov present a review of the Quantum Dynamics of Linear Triatomic Reactions via a systematic discussion of one-dimensional matrix theory of reactive scattering and a discussion of numerous results of both quantum and classical dynamical calculations. A very useful commentary paragraph with appropriate references ends each section. Bersuker and Polinger, Vibronic Interactions and the Jahn-Teller Effect, review the latest achievements of the theory of vibronic interactions and Jahn-Teller effects and discuss important new topics, including a rigorous deduction of the vibronic hamiltonian and reduction of the multimode adiabatic potential. The presentation is well laid out and quite readable. Kertesz considers a number of methodological problems related to the treatment of the Electronic Structure of Polymers, including boundary conditions and problems related to the sizes of polymers, difficulties regarding ab initio techniques, and the symmetry dilemma connected with the quasi-degeneracy of partially filled bands. Applications to conjugated polymers are discussed. Carbo, Domingo, and

Peris consider the relationship between Elementary Unitary MO Transformations and SCF Theory. While this is an important area, the paper is not smoothly written, and the authors are less than clear about their purpose.

Mark S. Gordon, *North Dakota State University*

**Advances in Quantum Chemistry. Volume 16.** Edited by Per-olov Lowdin. Academic Press, NY. 1982. x + 285 pp. \$56.00.

This volume contains two papers on ab initio calculations on large metal-containing molecules, one each on radiative and radioationless transitions and one on valence bond calculations. **Metals in Biology: An Attempt at Classification**, by Fischer-Hjalmars and Henriksson-Enflo, describes recent calculations on systems which model metal-amino acid interactions. The work is comprehensive but somewhat disjointed. Dediu, Rohmer, and Veillard (Ab Initio calculations of Metalloporphyrins) primarily review the calculations produced by the Veillard group in the past 7 years including geometry predictions, interpretation of photoelectron and Mössbauer spectra, and comparisons of theoretical electron-density maps with those obtained from X-ray and neutron diffraction. They present a nice overview of the current status of the field. Crain and Thirunamachandran present a very nice review of basics and representative applications of Radiation-Molecule Interactions, in particular the application of quantum electrodynamics to radiative processes. Applications discussed include 1- and 2-photon absorptions, spontaneous emission, circular dichroism, Raman scattering, and molecule-molecule interactions. In **Nonlinear Radiationless Processes in Chemistry**, Ovchinnikov and Ovchinnikova review slow processes due either to high transition energies or the requirement of large rearrangements of the molecular environment. Particular attention is paid to processes for which anharmonicity is important. In addition to a general summary of formalism, mechanisms of electronic and vibrational energy relaxation and charge-transfer reactions in polar liquids are also considered. Finally, **Practical Valence Bond Calculations** is an up-to-date review by Gallup and co-workers. Included in the presentation are the generation of spin eigenfunctions with use of the symmetric group, the use of tableau functions, and methods for handling the nonorthogonality problem. Applications to butadiene and the insertion of CH<sub>2</sub> into ethylene are included.

Mark S. Gordon, *North Dakota State University*

**Metal Ions in Biological Systems. Volume 15. Zinc and Its Role in Biology and Nutrition.** Edited by Helmut Sigel. Marcel Dekker, Inc., New York. 1983. iii + 493 pp. \$75.00.

This volume reviews zinc's role in biology and nutrition. Topics range from basic zinc chemistry in biological systems to zinc deficiency during total parenteral nutrition. Also included are the role of zinc in snake toxins, spectroscopic properties of metallotheonine, interaction of zinc with erythrocytes, and zinc absorption and excretion. This unique mix of topics is quite different from those found in most reviews. Normally one would expect a greater emphasis on metabolism in human and animal systems. This mix, however, is of interest because it complements subjects previously published.

The functions and role of zinc in biological systems are discussed. Identified are catalytic, structural, regulatory, and obscure noncatalytic functions. Examples are included. Of particular interest are metallo-enzyme amino acid structures and the molecular orientation of the zinc atom for specific enzymes. Models for zinc(II) binding sites are presented. This basic zinc chemistry is a useful resource for health professionals researching biological systems.

This book is well referenced after each chapter. Both an author and subject index are included.

Dorothy W. Hagan, *Children's Hospital of Michigan, Detroit*

**Chemistry and Biology of  $\beta$ -Lactam Antibiotics. Volume 1. Penicillins and Cephalosporins. Volume 2. Nontraditional  $\beta$ -Lactam Antibiotics. Volume 3. Biochemistry.** Edited by Robert B. Morin and Marvin Gorman. Academic Press, New York. 1982. Volume 1: xi + 553 pp. \$73.00. Volume 2: xiv + 408 pp. \$64.00. Volume 3: xiv + 424 pp. \$64.00.

This three-volume set is the third in a series of detailed reviews to appear concerning the chemistry and biology of  $\beta$ -lactams. The contribution comes at a time of explosive expansion of new information in the field and not only outlines new data on the well-known penicillins and cephalosporins but also provides reviews on a number of new  $\beta$ -lactam structures which show significant potential as broad-spectrum antibiotics.

Volume 1 is titled "Penicillins and Cephalosporins" and contains five chapters. The text begins with a contribution by R. D. G. Cooper and G. A. Koppel titled *The Chemistry of Penicillin Sulfoxide*. This is an excellent review which updates the important utilization of penicillin sulfoxide as a precursor to a large variety of other bicyclic and monocyclic

$\beta$ -lactams. Chapter 2 is by S. Kukulja and R. R. Chauvette and is titled Cephalosporin Antibiotics Prepared by Modification at the C-3 Position. The information presented in this chapter is a logical extension of Chapter 1 since the penam-cepham rearrangement provides the foundation for the chemistry outlined. Chapter 3 is by E. M. Gordon and R. B. Sykes and is titled Cephamycin Antibiotics. This chapter is devoted to 7-substituted cephalosporins and 6-substituted penicillins with the major emphasis on 7 $\alpha$ -methoxycephalosporins. It is well-written and presents useful information, particularly to the medicinal chemist whose research interests are closely related to this subject. The next chapter is by J. A. Webber and W. J. Wheeler and is titled Antimicrobial and Pharmacokinetic Properties of Newer Penicillins and Cephalosporins. It is devoted mainly to microbiological characteristics and pharmacokinetic considerations. The last contribution is by D. B. Boyd and is titled Theoretical and Physicochemical Studies on  $\beta$ -Lactam Antibiotics. This is one of the most interesting contributions to Volume 1. It provides quantitative SAR studies and theoretical calculations in elucidating the properties of  $\beta$ -lactam. This is a most useful chapter in providing a quantitative formulation for the mode of action of the  $\beta$ -lactam antibiotics.

Volume 2 is the most useful to this reviewer. It is titled "Nontraditional  $\beta$ -Lactam Antibiotics" and provides reviews of the new  $\beta$ -lactams which are primarily responsible for the revived interest in the field. These include Nocardicins, by T. Kamiya, H. Aoki and Y. Mine, The Chemistry of Thienamycin and Other Carbapenem Antibiotics, by R. W. Ratcliffe, and G. Albers-Schönberg, The Penems, by I. Ernest, and Clavulanic Acid, by P. C. Cherry and C. E. Newall. A discussion of the very important monobactams is missing from Volume 2, but appears in Volume 3. This unfortunately requires the purchase of two volumes of this expensive series in order to obtain the complete story of those new natural  $\beta$ -lactams which have influenced the field so strongly in recent years. The first two chapters of Volume 2, Partial Synthesis of Nuclear Analogs of Cephalosporin, by W. Nagata, M. Narisada and T. Yoshida, and Total Synthesis of Penicillins, Cephalosporins and Their Nuclear Analogs, by K. G. Holden, provide excellent reviews of the synthetic routes to  $\beta$ -lactams.

Volume 3 is titled "Biochemistry". Like Volume 1 and 2, this is an excellent contribution and provides its main emphasis on the biological properties of  $\beta$ -lactams. This volume includes chapters on biosynthesis, by S. W. Queener and N. Neuss, fermentation, by R. P. Elander and H. Aoki,  $\beta$ -lactamase inhibition, by R. B. Sykes and K. Bush, mechanism of action and bacterial lethality, by D. J. Waxman, and J. L. Strominger and G. D. Shockman, L. Daneo-Moore, T. D. McDowell, and W. Wong, a clinical prospective, by R. B. Kammer, and a review on monobactams, by W. H. Koster, C. M. Cimarusti, and R. B. Sykes.

In conclusion, these three volumes provide an in-depth update of the chemistry and biology of  $\beta$ -lactams as it has developed during the past 10 years. The individual chapters are uniformly of high quality. The main criticism of these books is directed toward the publisher. Unfortunately, the text often precedes the illustration by several pages, a nuisance to the reader. In spite of this shortcoming, the set is recommended to the experts as well as to those with potential research interests in the field.

H. W. Moore, *University of California, Irvine*

**Progress in Reaction Kinetics. Volume II.** Edited by K. R. Jennings (University of Warwick) and R. B. Cundall (University of Salford). Pergamon Press, New York. 1983. v + 274 pp. \$108.00.

This volume continues this series of publications at its high level. The three chapters in the present volume are Collisional Processes in Hydrogen Fluoride Lasers, by R. D. H. Brown and A. Maitland, The Role of Free Radicals in Radiation and Chemical Carcinogenesis, by C. L. Greenstock, and Theory of Ion-Neutral Interactions: Application of Transition State Theory Concepts to Both Collisional and Reactive Properties of Simple Systems, by W. J. Chesnavich and M. T. Bowers. The book is done camera-ready but is attractively printed and in a uniform typescript. A subject index is provided.

William A. Pryor, *Louisiana State University (Baton Rouge)*

**Comprehensive Analytical Chemistry. Volume XVIII. Kinetic Methods in Chemical Analysis. Application of Computers in Analytical Chemistry.** Edited by G. Svehla (The Queen's University of Belfast). Elsevier Scientific Publishing Co., Amsterdam. 1983. 440 pp.

It is the stated purpose of the "Comprehensive Analytical Chemistry" series to "... give material in sufficient detail to allow it to be used directly ..." and, failing that, to make "... full reference to the pertinent original literature ...". The present volume, dealing with two important analytical chemistry topics, viz. kinetic methods and computer applications, falls short of attaining either of these goals. For example, the kinetics section, co-authored by M. Kopanica and V. Stará, consists of ten chapters and 845 references which appear to be a fairly thorough coverage of the European literature from the 1960's through the middle-to-late 1970's. However, only five of these references are later than 1978. The first five chapters cover elementary kinetics at an undergraduate textbook level. The remaining chapters are somewhat more specialized and cover reactions of complexes (Chapter 6, primarily dealing with EDTA complexes), reactions affecting electrode processes (Chapter 7, four and a quarter pages!), kinetic methods (Chapter 8, treatment at an undergraduate textbook level), instrumentation (Chapter 9), and a survey of some selected inorganic and organic substances (Chapter 10). None of these chapters deals with the topics in more than a superficial manner and the literature coverage (apparently due to publication delay) is inadequate.

The remainder of the book, co-authored by K. Eckschlager and six additional Czechoslovakian authors, purports to cover application of computers in analytical chemistry. Interestingly, this explosively growing field required the authors to reference only 85 articles, most of which were published between 1965 and 1979. Only two references, a 1980 and a 1982 review article, are more recent. Chapters 1 (information characteristics of analytical results) and 3 (numerical techniques used in data analysis) are somewhat better than the remaining two chapters. Chapter 2 is intended to explain general laboratory computer concepts and applications. The general concepts are handily dispatched in the most general fashion in the first dozen pages of the chapter. Following that the reader is given a series of *one paragraph descriptions* of computer uses in analytical chemistry, which include X-ray diffractometry, gas chromatography, mass spectrometry, and NMR spectrometry. All other applications are then summarized in six sentences and it is suggested that concrete examples will follow in a subsequent chapter. By all appearances that is intended to be Chapter 4 (Special Use of Computers in Analytical Chemistry). Here, however, only the most general discussion which mentions systems based on the DEC PDP-10 and the IBM 1130, among others, is found.

In summary, as should be clear at this point, I cannot conclude this volume has succeeded in producing either a timely or very useful summary of the state of the art in either of its chosen topics. It appears to have suffered from a common problem in multi-author volumes—the slowest contributor becomes the rate-determining step in production of the finished book.

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

**Solubility Data Series. Volume 14. Alkaline Earth Metal Halates.** Edited by H. Miyamoto, M. Salomon, and H. L. Clever. Pergamon Press, Oxford and New York. 1983. xx + 332 pp. \$100.00.

When this ambitious project began only a few years ago to compile and critically evaluate the vast amount of published data on solubilities, it was easy to believe that the planners had bitten off more than they could chew. Now, however, with the 14th volume to hand, and 11 more in preparation, the project is firmly established, and its products, these books, increase in usefulness as they are joined by new companions.

The information continues to be presented in the form originally adopted, with tables, references, comments on the methods used and the purity of the materials, and estimated error. Eleven compounds are surveyed in this volume: the chlorates, bromates, and iodates of magnesium, calcium, strontium, and barium (calcium bromate is missing). Ternary and multicomponent systems, usually including halate salts of other metals, but also numerous salts of organic acids, are an important part of the compilation. Most of the data are understandably for aqueous systems, but organic solvents such as acetone, small alcohols and glycols, and ethyl acetate are also treated.