Additions and Corrections

Alkane Functionalization at Nonheme Iron Centers. Stoichiometric Transfer of Metal-Bound Ligands to Alkane [*J. Am. Chem. Soc.* **1993**, *115*, 11328–11335]. TAKAHIKO KOJIMA, RANDOLPH A. LEISING, SHIPING YAN, AND LAWRENCE QUE, JR.*

Page 11329: The complex [$FeBr_2$(NTB*)]Br should be labeled **4** and the complex [$FeCl_2$(NTB*)]Cl should be labeled **5**.

Book Reviews *

Perspectives on Bioinorganic Chemistry. Volume 2. Edited by Robert W. Hay (University of St. Andrews), Jon R. Dilworth (University of Essex), and Kevin B. Nolan (Royal College of Surgeons in Ireland). JAI Press: Greenwich, CT. 1993. xii + 292 pp. $90.25. ISBN 1-55938-272-4.

After a list of contributors, an introduction to the series, a forward by the editors, a dedication to Michael Green, and the preface by Hay, thereare six chapters with the following headings: Dynamics of Iron(II) and Cobalt(II) Dioxygen Carriers by P. Richard Warburton and Daryle H. Busch; Homodinuclear Metallobiosites by David E. Fenton and Hisashi Okawa; Transferrin Complexes with Non-Physiological and Toxic Metals by David M. Taylor; Transferrins from a Structural Perspective by Edward N. Baker; Galactose Oxidase by Peter F. Knowles and Nobutoshi Ito; and Chemistry of Aqua Ions of Biological Importance by David T. Richens. There is not a subject index.

Bioanalytical Instrumentation: Methods of Biochemical Analysis. Volume 37. Edited by Clarence H. Suelter (Michigan State University). John Wiley and Sons: New York. 1994. xvi + 325 pp. $95.00. ISBN 0-471-58260-3.

This volume focuses on the application of special instrumental techniques to problems in biology. After a preface by the editor and a list of abbreviations, there are five chapters with the following headings: X-ray Crystallography of Proteins by J. P. Glusker; Transmission ElectronMicroscopy and Scanning Probe Microscopy by Karen L. Klomparens and John W. Heckman, Jr.; Quantitative Fluorescence Imaging Techniques for the Study of Organization and Signaling Mechanisms in Cells by Margaret H. Wade, Adriaan W. de Feijter, Melinda K. Frame, and Melvin Schindler; Automated Enzymes Assays by John A. Lott and Daniel A. Nealon; and Rapid-Scanning Stopped-Flow Spectroscopy by Peter S. Brzovic and Michael F. Dunn. There are author and subject indexes and cumulative author and subject indexes for Volumes 1–37 and the supplemental volume.

Annual Review of Physical Chemistry. Volume 44. Edited by Herbert L. Strauss (University of California), Gerald T. Babcock (Michigan State University), and Stephen R. Leone (University of Colorado). Annual Reviews: Palo Alto, CA. 1993. xii + 530 pp. $48.00. ISBN 0-8243-1044-6.

This is a volume of the continuing series published by Annual Reviews Inc., a nonprofit scientific publisher established to promote the advancement of sciences. The volumes are organized by Editors and Editorial Committees who invite qualified authors to contribute critical articles. After a preface by the editorial board, there are 17 chapters with the following headings: Almost 50 Years of Physical Chemistry at the University of Texas by N. Hackerman and A. Campion; Scattering-State Spectroscopy as a Probe of Molecular Dynamics by P. D. Kleiber, W. C. Stwalley, and K. M. Sando; Aspects of Structure and Energy Transport in Artificial Molecular Assemblies by Paul W. Bohn; Theory of the Equation of State at High Pressure by Marvin Ross and David A. Young; Pressure Stability of Proteins by Jerson L. Silva and GreogorioWeber; Anderson Localization and the Exceptions by Philip Phillips; The Adiabatic Theory of Heavy-Light-Heavy Chemical Reactions by Rex T. Skodje; Ordering in Metal Halide Melts by Mario P. Tosi, David Long Price, and Marie-Louise Saboungi; Local Treatment of Electron Correlation by Svein Saebo and Peter Pulay; Scanning Tunneling Microscopy Studies of Low-Dimensional Materials: Charge Density Wave Pinning and Melting in Two Dimensions by Hongjie Dai and Charles M. Lieber; Reaction of Small Molecules at Well-Characterized Iron Surfaces by Steven L. Bernasek; High-Resolution Spectroscopy of Solid Hydrogen by Takeshi Oka; Computer Simulation of Hydrogen-Bonding Liquids by Branka M. Ladanyi and Munir S. Skaf; Hydration Forces by S. Leikin, V. A. Parsegian, D. C. Rau, and R. P. Rand; Vibrationally Mediated Photodissociation: Exploring Excited-State Surfaces and Controlling Decomposition Pathways by F. F. Crim; Shock Tube Techniques in Chemical Kinetics by J. V. Michael and K. P. Lim; and In-Situ Electrochemical Surface Science by Michael J. Weaver and Xiaoping Gao. There are also author and subject indexes and cumulative author and cumulative chapter title indexes for Volumes 40–44.

Application of Graph Theory and Topology in Inorganic Cluster and Coordination Chemistry. By R. B. King. CRC Press: Boca Raton, FL. 1993. 230 pp. $69.95. ISBN 0-8493-4298-8.

Professor King is responsible for many applications of topology and graph theory in inorganic chemistry. The present book is a comprehensive review of such applications due to him and to other authors.

The first two chapters are entitled Topology, graph theory, and polyhedra and Symmetry and group theory. They provide the mathematical background expressed in simple language with many illustrations.

Chapter 3 describes briefly the atomic orbitals involved in coordination polyhedra with four to nine ligands, explaining why 8-vertex polyhedra of relatively high symmetry, namely the cube, the hexagonal bipyramid, and the D_{3h} 3,3-bicapped trigonal prism, are spd-forbidden coordination polyhedra.

Chapters 4 and 5 provide a unified treatment of planar hydrocarbons, boranes, and carboranes using graph theory and Hückel theory. In planar hydrocarbons delocalization in the plane of the molecule leads to the aromaticity that is familiar to organic chemists, whereas in boranes and carboranes delocalization in three dimensions in the deltahedra leads to a similar stabilization (3D-aromaticity). This applies to the icosahedral carboranes as well as octahedral $B_6H_6^{2-}$. Thus in simple terms the HMO picture of the molecular orbitals in benzene corresponds to the graph spectrum of a hexagon while the orbitals in polyhedral systems are described by the spectrum of the complete graph with as many vertices as atoms of the deltahedron. Related treatments apply to *nido* or *arachno* electron-richer compounds which contain more than the $2n + 2$ skeletal electrons necessary for globally delocalized n-vertex deltahedra without vertices of degree 3.

Chapters 6–11 continue the aforementioned approach by reviewing systematically the structure and bonding in other classes of inorganic compounds, namely molecular and ionic metal clusters as well as some metal oxide structures. Thus Chapter 6 shows octahedral $Rh_6(CO)_{16}$ as an analogue of benzene. In a similar way biphenyl analogues can be constructed by joining $Rh_6(CO)_{16}$ octahedra through a Rh–Rh bond, yielding $Rh_{12}(CO)_{30}^{2-}$, or naphthalene analogues by fusing two such octahedra either on an edge, yielding $Rh_{10}C_2(CO)_{24}^{2-}$, or on a face, giving $Rh_9(CO)_{19}^{3-}$. The last type of fusion can be extended to an anthracene analogue by fusing two octahedra on opposite faces of a third octahedron.

Chapter 7 refers to early transition metal clusters, Chapter 8 to post-transition metal clusters, and Chapter 9 to infinite solid state structures with metal–metal interactions. In Chapter 9 the analogy with condensed polycyclic aromatics is extended to ternary molybdenum sulfides formed by fusion of molybdenum octahedra; such ternary chalcogenides of molybdenum, called Chevrel phases, have superconducting properties. Chapter 10 deals with metal oxides with metal–metal interactions and

*Unsigned book reviews are by the Book Review Editor.

discusses briefly the high T_c copper oxide superconductors. In Chapter 11 the author reviews icosahedral boron allotropes and metal borides using the same theoretical approach. Icosahedral quasicrystals and carbon cages (fullerenes) are also briefly discussed.

The 12th and the last chapter describes polyhedral dynamics (isomerizations of polyhedral structures), which can be conveniently represented by reaction graphs. Gale diagrams can also be used to treat polyhedral isomerizations in five- and six-vertex structures.

The book is concise yet comprehensive and offers a unified view on a rapidly developing field. All illustrations are carefully drawn, and misprints are very few. In conclusion, for all those interested in easily obtaining background information on graph theory and topology to be applied in many areas of inorganic chemistry, this is a highly recommended reference text.

Alexandru T. Balaban, *Texas A & M University, GC*

The Organic Chemistry of β-Lactams. Edited by Gunda I. Georg. VCH Publishers, Inc.: New York. 1993. xi + 381 pp. $115.00. ISBN 1-56081-083-1.

Since the elucidation of the structure of penicillin, β-lactams have become the center of attention for many synthetic and medicinal chemists. Prof. John Sheehan coined the apt title of the "enchanted ring" for this four-membered heterocycle that has captivated generations of students, academic scientists, and industrial research workers.

The discovery every few years of new types of β-lactam antibiotics in nature has sustained a high level of interest in synthesizing variously substituted monocyclic and bicyclic β-lactams. In recent years the synthetic potential of this family of compounds has been greatly increased by their use as synthons for diverse types of natural products and analogs.

The veterans in the field of β-lactams have to cope with a high rate of new information on synthesis and transformation. The new entrants to the field have to familiarize themselves with several decades of work on β-lactams since the classified Anglo-American research effort during World War II. The first synthesis of β-lactams goes back at least to Staudinger's publication in 1907. It is possible, however, that Einhorn was correct in identifying one of his reaction products in 1883 as an *N*-acetyl-β-lactam.

A few books and several comprehensive reviews have appeared from time to time covering various aspects of β-lactam chemistry. But the rapid growth of the field has outdated many of them. This 1992 book on synthetic aspects of β-lactams edited by Dr. Gunda Georg is a valuable addition to the β-lactam literature.

Six interesting and important areas of β-lactam synthesis are covered in more than 350 pages of text. This monograph is notable for the care for details, exhaustive and critical coverage of the literature, and an abundance of structural diagrams and tables.

The first two chapters by Hanno Wild deal with protective groups and functional groups in β-lactam chemistry. More than 600 individual references have been cited—mostly from the 1980–90 period. These are valuable resource material for planning new multiple-step syntheses.

Methods for the β-lactam ring formation developed mostly during the 80s are described by Robert Ternansky and John Morin in logically arranged sections. Joydeep Kant and Donald Walker cover in detail the specialized field of the conversion of monocyclic β-lactams to the bicyclic structures that duplicate or mimic β-lactam antibiotics found in nature.

The current interest in the synthesis of optically active compounds is reflected in the chapters on β-lactam synthons by Iwao Ojima and ketene–imine cycloaddition by Gunda Georg and Vasulinga Ravikumar. The development of a new approach to amino acids and peptides via enantiomerically pure β-lactams is fully documented by Ojima on the basis of the work of his own group. The chapter on the Staudinger type cycloaddition not only provides an authoritative review of the field but also includes predictive rules suggested by Georg and Ravikumar for the steric course of β-lactam formation.

A shortcoming of this monograph is the lack of a chapter on the ester enolate–imine cycloaddition method for β-lactam synthesis. There are other topics too that would have interested many of the readers. Nevertheless, this monograph will find extensive use by specialists in the field and also serve as a ready source of information for parts of graduate courses on heterocycles and synthetic methods.

The flow of new literature on the synthesis and transformation of β-lactams shows no sign of abating. It is hoped that Georg will undertake in the near future another successful venture on documenting the continuing saga of the "enchanted ring".

Ajay K. Bose, *Stevens Institute of Technology*

Metal Ions in Biological Systems. Volume 29. Biological Properties of Metal Alkyl Derivatives. Edited by H. Sigel and A. Sigel. Marcel Dekker, Inc.: New York. 1993. xxxiv + 448 pp. $165.00. ISBN 0-8247-9022-7.

The preface to the first volume of this series was written in 1973. It is now some twenty years later, and the interdisciplinary approach established by the authors is well accepted and the series has done much to advance the cause of bioinorganic chemistry. However, the production and editorial process requires care and attention, and some cracks are showing in the present volume.

The 11 chapters in Volume 29 are titled as follows: 1, Global bioalkylation of the heavy elements, by J. S. Thayer; 2, Analysis of organometallic compounds in the environment, by D. Mennie and P. J. Craig; 3, Biogeochemistry of methylgermanium species in natural waters, by B. L. Lewis and H. P. Mayer; 4, Biological properties of alkyltin compounds, by Y. Arakawa and O. Wada; 5, Biological properties of alkyl derivatives of lead, by Y. Yamamura and F. Arai; 6, Metabolism of alkyl arsenic and antimony compounds, by M. Vahter and E. Marafante; 7, Biological alkylation of selenium and tellurium, by U. Karlson and W. T. Frankenberger, Jr.; 8, Making and breaking the Co–alkyl bond in B_{12} derivatives, by J. M. Pratt; 9, Methane formation by methanogenic bacteria: Redox chemistry of coenzyme F430, by B. Jaun; 10, Synthesis and degradation of organomercurials by bacteria: A comment by the editors, by H. Sigel and A. Sigel; 11, Biogenesis and metabolic role of halomethanes in fungi and plants, by D. B. Harper.

I particularly enjoyed reading the chapter (9) by Jaun on methanogens and the role of nickel in coenzyme F430. The material is presented in a timely, concise, yet understandable way. However, the bonds are missing from the structural diagrams. There is a chapter on halomethanes (11) in which Harper makes the important point that nature is a major producer of CH_3Cl and related molecules; however, not much of this material concerns the biological properties of metal alkyl derivatives. This chapter gives a fairly detailed and critical account of the ability of various microorganisms and plants not only to synthesize halomethanes but also to use them in transmethylation reactions.

The most surprising chapter is actually a comment and a reading list compiled by the editors. They explain that the designated author for the chapter on Organomercurials (10) was unable to deliver a manuscript on time. The editors have reproduced some of the comments by the tardy author to illustrate the problem, and some of these are worth repeating here: "Yet, how methylmercury is synthesized is still unclear... This clearly requires understanding that takes time and energy on a large scale..." In spite of this *cri de coeur*, other authors in the volume don't seem to have difficulty with the "old" view that methyl-B_{12} is the methyl donor. I can only hope that the whole story will be told soon; this volume is a lot poorer for its absence, because, apart from the methylarsenicals, methylmercury is the cornerstone on which much of the work in this book is based.

The chapter by Mennie and Craig is disappointing in that it has been carelessly put together. For example, there are three obvious errors in the formula in Table 5 (50% of the contents) and better toxicity data are available than those listed; arrowheads are missing in Figure 3, and Figure 4 does not describe the *known* biogeochemical cycle for arsenic, proposed, perhaps. It would have been appropriate to have noted that severe matrix effects can be overcome by using GC/AA for analysis, although it is often necessary to derivatize the organometallic species to take advantage of this technique.

Chapters 1 and 6 are useful contributions but are plagued by errors, omissions, and misconceptions. For example, the alga *Hizikia fusiforme* is known to contain more complicated arsenicals (arsenosugars) than those described in the text (p 163), the structural diagram on p 166 is incomplete, and one author seems to believe that it is unusual for an enzymatic reaction to be reversible (p 21).

The chapter on B_{12} chemistry is largely concerned with *in vitro* Co–C bond formation and cleavage in the corrinoids, but this reviewer would have liked to see a little more "bio" in the coverage. The remaining chapters are focused on their topics and appear to provide up-to-date but somewhat restricted coverage: some chemical equations would be useful in the selenium alkylation section.

Overall I do not feel that this volume gives value for money ($165.00). Alternative sources are available for much of the material, and I would not rush out to purchase a personal copy.

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