Importing data is accomplished by reading data from a JMP export file, SAS transport file, or standard text file. The format of the incoming file can be accommodated by specifying the approprite end-of-field and end-of-line delimiters. Once the data have been imported into JMP's spread sheet, data columns and rows can be altered or created. Standard file operations are available as well as several other options (i.e., calculator, subset, sort, join, concatenate, stack, and transpose).

Even though JMP is not primarily a graphics program, the software package provides many plotting features. The more notable of these features are color plots, overlay plots, confidence curves, and pareto charts. JMP has commands that represent eight statistical platforms: distribution of Y's, fit Y by X, fit Y by X's, specify model, nonlinear fit, spin, Y's, by Y's, and special graphs. The various statistical parameters associated with these platforms are too numerous to list here, but include multiple regressions, nonparametric tests, factor analyses, and distributions. Each of the statistical methodologies ranges from simple to complex and has a wide variety of applications. The statistical approach of each platform is well documented and referenced, presented in the user guide and through the help menus. Because interpretation of the results is necessary, it is recommended that the user have a minimal background in statistics in order to get full use of the programs statistical package.

JMP provides a powerful statistical tool with capabilities that typically exceed what the average scientist or student would need. The program is versatile and user friendly, allowing both the trained professional and the novice to design specific statistical analyses. JMP is a solid program and worthy of consideration by the scientific community.

Kraig A. Wheeler, *The University of Texas at Austin*

*Book Reviews**

Chemical Industries Series. Volume 47. Catalysis of Organic Reactions. Edited by William E. Pascoe (Eastman Kodak Company). Marcel Dekker: New York. 1992. xvi + 386 pp. $150.00. ISBN 0-8247-8573-8.

This volume is a collection of the papers and posters presented at the Thirteenth Conference on Catalysis of Organic Reactions in Boca Raton, Florida, in May 1990. The book is in two sections "Reactions with Hydrogen" and "Other Catalytic Reactions in Organic Synthesis", which contains subsections on "Acid-Catalysis", "Dehydrogenations", "Oxidations", and "Special Topics in Catalysis".

The subject matter in this book covers a broad range of research that is of interest to the chemical community. The sizable contribution from academia (approximately 40%) to this book demonstrates this overlap in research interests. However, there is a large imbalance in the coverage given each subject. The area of research with by far the largest influence in this book is the use of supported metal catalysts for heterogeneous hydrogenation and dehydrogenation reactions (15 chapters out of 33). Throughout the book many examples illustrate the variety of the research industrial chemists perform on all aspects of heterogeneous catalysis, such as catalyst structure, selectivity, by-product formation, reaction modeling, reaction vessel design, catalyst poisoning, and reactivation. Several important areas of industrial research only receive scant attention in this book, including such topics as enzymes in industrial processes (1 chapter), zeolites (2 chapters), phase transfer catalysis (1 chapter), and chiral synthesis (1 chapter); this imbalance in subject material is the major failing of this current publication.

This volume contains over 500 references, with a sizable number of recent citations. However, over half of the citations appear in only six chapters, and there are no fewer than sixteen chapters that contain ten or fewer references (three of the chapters contain no citations at all). No doubt, this is partially due to the inclusion of chapters based on the poster sessions from the conference.

In summary, this book provides an insight into industrial research problems, although the price and variety of subject material mean that purchasing of this volume will only be of interest to libraries and specialists in the field.

Andrew Bennet, *Simon Fraser University*

The Total Synthesis of Natural Products. Volume 9. The Synthesis of Insect Pheromones, 1979–1989. By Kenji Mori. Edited by John ApSimon. John Wiley & Sons: New York. 1992. ix + 533 pp. $125.00. ISBN 0-471-55189-9.

John ApSimon has been the editor of this most valuable series of compilations of organic syntheses since its inception in 1973. After 18 years of exceptional service to the organic community, he has now decided to pass the responsibility to another editor. Volume 9 of this series maintains the standard which has typified successive volumes down the years and should stand as a final tribute to his endeavors. The current volume is the work of a single author, Professor Kenji Mori, and documents, in a comprehensive way, the extensive synthetic effort associated with insect pheromones through its most productive time from 1979 to 1990. The book is a tour de force from Professor Mori, but its painstaking and lucid description of the field will come as no surprise to those familiar with the dedication which the author brings to all of his projects. The syntheses of no fewer than 260 pheromones have been reviewed in the book, which contains 987 schemes and delineates 1229 references. It will surely be unnecessary to review the field again the foreseeable future.

Of the possible approaches available, the author has chosen to classify the pheromones according to structural type and enantioselective synthesis has been included in each section rather than in a separate chapter. The main body of the work is preceded by a short, but valuable, review of a number of general methods for the synthesis of pheromones. Thus the alkylation of acetylenes, Wittig reactions in a heterogeneous medium, olefin inversion, and other procedures are delineated. The treatise then deals successively with alkanes, olefins, unsaturated alcohols and acetates, conjugated dienes and enynes, trienes and tetraenes, epoxides, chiral alcohols, aldehydes, ketones, lactones, isoprenoid derivatives, oxygen heterocycles, acetals, and spiroacetals. The descriptions, whilst precise, give a wealth of information which can be readily assimilated by either the casual or more serious reader. Reagents and conditions for individual procedures are clearly listed together with yields of reactions to allow judgement to be made on the attractiveness of the approach. In enantioselective syntheses, the optical rotation of the final pheromone is included in the schemes and care has been taken to discuss information on the enantiomeric excess of the products in a critical fashion.

To those of us who took part in the development of this chemistry, the book is a timely reminder of some of the excitements of the period. Expectations that pheromones might play a major role in insect control systems have not been fulfilled, but the chemistry engendered in the period has added a significant number of processes to our synthetic libraries, many of them capable of being transferred to large scale operations. The sections on enantiomeric syntheses are also of real value and allow direct comparison to be made of alternative procedures. For example, seven asymmetric syntheses of frontalin are described, three of which employed asymmetric carbon-carbon bond forming reactions. The intricacies of enantiomeric specific syntheses of spiroacetals are also noteworthy.

The most impressive aspect of the book is the clarity in which the synthetic schemes have been described. Professor Mori has been meticulous in the detail provided, and the important aspects of the schemes are readily appreciated by the reader. It is a book that can be enjoyed by those who wish to dip quickly into the various sections or by the more serious reader to garner information for his purposes. It will rapidly attain the status of the reference text for nearly two decades of chemistry, and deservedly so. The author has, indeed, transferred his immense knowledge and expertise from the laboratory to an outstanding piece of scholarship to the benefit of all involved in the art of organic synthesis. The book can be recommended, wholeheartedly, to those who will make regular reference and also to libraries where the book will soon be regarded as the masterpiece which it is.

Raymond Baker, *Merck Sharp & Dohme Research Laboratories*

Chemical Analysis. Volume 115. Trace and Ultratrace Analysis by HPLC. By Satinder Ahuja (Ciba Geigy Corporation). Wiley-Interscience: New York. 1992. xi + 419 pp. $75.00. ISBN 0-471-51419-5.

This book on trace analysis using HPLC is the latest addition to the excellent *Chemical Analysis* series. The author indicates that his goal is to provide solutions to real problems and to open new doors to knowledge. To accomplish these goals, the book presents basic theory, discusses instrumental considerations in trace analysis, provides an overview of sample preparation and method development, and reviews many applications. The latter comprise nearly 25% of the book. The index is relatively good in directing the reader to the specifics of a method, an absolute necessity for this type of book.

The presentation of theory is accurate and understandable, but not novel. The nearly word for word repetition of the equations and discussion from pages 56–57 on page 165 leads this reviewer to conclude

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*Unsigned book reviews are by the Book Review Editor.

that the book is unnecessarily padded. The discussion of instrumentation reveals an annoying inconsistency in depth and degree of coverage which plagues the remainder of the book. For example, one and a half pages are devoted to listing the specifications of one commercial pump. There is no clear indication of the characteristics of an ideal pump for trace and ultratrace analysis. There are a number of other marginally useful tables included in the book. A second frustration is the author's wandering from the topic of trace analysis. For example, discussions of refractive index and nuclear magnetic resonance detectors do not belong in a book on ultratrace analysis. Although most references are from the 1984–89 era, the book is somewhat dated already in the area of the latest advances in detector technology, particularly HPLC/MS.

The discussion of sample preparation is one of the best sections of the book. The author covers most of the currently available technology for sample preparation and manages to include numerous citations to allow the reader to further investigate the specifics of the methods discussed. The chapter on optimizing detection is also a good summary of theory and practice that facilitate trace analytical method development.

The real strength of this book is the kernels of helpful information distributed throughout. For example, the author points out some of the problems with absorbance matching of solvents in gradient elution and their solution. There are many other specific hints that can help the novice to intermediate chromatographer. Unfortunately, these hints are not noted in the index, so the reader is left to his or her own devices to locate them when needed.

This book should be useful to the novice to intermediate level chromatographer given the responsibility of developing trace analytical procedures. Although much of the material in the book has been covered elsewhere, and in some cases better, the unique combination of theory, practical hints, and specific methods should make it a useful addition to the chromatographic practitioner.

Larry D. Bowers, *Indiana University Medical Center*

Methods in Enzymology. Volume 205. Metallobiochemistry. Part B. Metallothionein and Related Molecules. Edited by James F. Riordan and Bert L. Vallee (Harvard University). Academic Press: New York. 1991. xxxiii + 681 pp. $90.00. ISBN 0-12-182106-4.

A complete volume of *Methods in Enzymology* devoted to one protein, metallothionein, and a few other closely related molecules may at first seem unusual. Over the past 35 years, however, an increasing number of biochemists, bioinorganic chemists, and biologists from a variety of fields have been encountering this unusual protein molecule, and the collection in one volume of the methodologies and their results as applied to this unique molecule is an appropriate and timely undertaking.

Metallothionein was discovered in 1957 by Margoshes and Vallee,[1] who isolated the protein from horse kidney as a native protein containing cadmium. While metallothionein remains the only naturally occurring cadmium protein, it was appreciated from the very beginning that it also contained zinc and some copper. The protein was discovered to be induced by cadmium injection, and much of the early focus on possible function concerned its role in the detoxification of heavy metals by sequestering them in a relatively inert protein structure. The occurrence of 20 cysteine residues in a sixty-one residue mammalian protein already established this as an unusual protein. The demonstration by ^{113}Cd NMR techniques that the seven metal ions contained in metallothionein formed the first Zn and Cd cluster compound to be found among biomolecules made it even more noteworthy. Mammalian metallothionein contains two metal clusters, a three-metal cluster in an N-terminal domain and a four-metal cluster in a C-terminal domain. Although mammalian metallothionein as isolated from Cd-treated animals usually contains 5 Cd and 2 Zn, the latter exclusively in the three-metal cluster, the protein can be prepared as a pure Zn_7-protein which has the same cluster structure. Thus much recent attention has shifted to the possible role this protein may play in the important zinc economy of the body, perhaps as a storage protein or a zinc-donor for other proteins, which range from enzymes to transcription factors. Metallothioneins or closely related proteins have now been isolated from many species of animals, yeast as well as other fungi and bacteria. In yeast, metallothionein is primarily a copper protein and its induction has been shown to involve a transcription factor which itself contains a copper cluster. Copper binding is required in order for this transcription factor to recognize the specific DNA sequence from which it activates transcription of the metallothionein gene.

Thus metallothionein has become of interest to a broad group of scientist including protein chemists, bioinorganic chemists, toxicologists, and molecular geneticists. The collection of all aspects of the various methodologies for studying this protein, previously scattered over a large spectrum of specialist literature, is welcome indeed. The book introduces the subject broadly followed by three detailed sections on its detection, isolation, and quantification in biological materials, as well as its purification from a variety of species. There follow two sections on the detailed chemical and physical characterization of metallothionein including the usual detailed description of the methods applied as is standard with *Methods in Enzymology*. The physical section, in addition to the presentation of a broad range of solution studies, includes the solid-state structure as determined by protein crystallography and the solution structure as determined by 2D NMR methods. While these chapters are not meant to detail the methodologies for applying these two structural techniques, the short summary of the results of the structure determinations by the investigators responsible along with comments on the special aspects encountered with metallothionein is particularly useful to biochemists and molecular biologists involved in other aspects of metallothionein. The book concludes with two special sections, one on the induction of metallothionein in animals and cultured cells and finally a brief overview of the entire subject by J. H. R. Kägi (Zurich). Each individual contribution is very adequately referenced to original articles, and most include references with 1989 and 1990 dates. Thus the references provide comprehensive as well as up to date access to the literature. This book fills an important need for those investigating the many facets of metallothionein structure and function and would also appear to be of considerable interest to those studying sulfur-containing metalloproteins in general.

Joseph E. Coleman, *Yale University*

Inclusion Compounds. Volume 5. Inorganic and Physical Aspects of Inclusion. Edited by J. L. Atwood, J. E. D. Davies, and D. D. McNicol. Oxford University Press: New York. 1991. xv + 385 pp. $98.00. ISBN 0-19-855293-9.

Volume 5 of *Inclusion* Compounds, edited by Atwood, Davies, and McNicol, continues the trends and standards established by the previous volumes in this series. Ten contributed articles in this volume cover a range of aspects of synthesis, characterization, and physico-chemico-bio-properties of largely inorganic inclusion compounds. The volume is uniformly presented, in a style consistent with the previous volumes. A modest subject index and a comprehensive author index are provided. The first three volumes of this series, which all appeared in 1984, were published by Academic Press. The current publisher of Volumes 3 and 4 is Oxford University Press. The transition has been seamless. Volumes 1 and 2 dealt with structural aspects of inclusion compounds; Volume 3 presented the first collection of physical studies and applications of inclusion compounds. The present volume and Volume 4 update the status of these areas: Volume 4 concentrates on organic materials, Volume 5 on inorganic (with some minor overlap). Workers in the area of supramolecular chemistry will wish to have this new volume on their shelf.

The contents of Volume 5 consist of the following chapters by experts in their fields. H. Gies discusses structural aspects of silica hosts in Clathrasils and Zeolsils: Inclusion Compounds with Silica Host Frameworks. J. Ripmeester and C. Ratcliffe update the use of nuclear magnetic resonance techniques in this field in Solid State NMR Studies of Inclusion Compounds. N. Herron reviews unusual catalytic properties of tailor-made inclusion compounds in zeolites. Layered clays are described by J. M. Thomas and C. R. Theocharis (The Structural Chemistry and Reactivity of Organic Guests in Layered Aluminosilicate Hosts), and the related inclusion compounds of non-aluminosilicate layered materials are reviewed by G. Alberti and U. Constantino in Intercalates of Zirconium Phosphates and Phosphonates. T. Iwamoto updates the status of Hofmann-type systems in Inclusion Compounds of Multi-Dimensional Cyanometal Complex Hosts. In a remarkable chapter, translated from Russian, Y. A. Dyandin, I. V. Bondaryuk, and F. V. Zhurko provide an extremely detailed view of phase diagrams of clathrate hydrates (Clathrate Hydrates at High Pressures). This chapter contains nearly 50 figures, most presenting phase diagrams previously published only in the Russian-language literature. Chapter 8, by D. H. Busch and N. A. Stephenson, describes inclusion complexes of a family of metallotetrammine macrocyclic systems based on the cyclidene ring (The Transition Metal Cyclidenes). K. Harata discusses recent X-ray structural studies in cyclodextrin complexes, the only stark departure in this volume from the inorganic theme. The final chapter discusses biological applications of inclusion complexes as J. C. Lockhart describes chemical sensor studies using various inclusion schemes.

David F. Eaton, *Du Pont Central Research and Development*

Isotope Effects in Gas-Phase Chemistry. ACS Symposium Series 502. Edited by Jack A. Kaye (National Aeronautics and Space Administration). ACS: Washington, DC. 1992. x + 438 pp. $97.95. ISBN 0-8412-2471-4.

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(1) Margoshes, M.; Vallee, B. L. *J. Am. Chem. Soc.* **1957**, *79*, 4813.

This book was developed from a symposium sponsored by the Division of Physical Chemistry at the 201st National Meeting of the American Chemical Society at Atlanta on April 14–19, 1991. It is introduced in a chapter written by the editor entitled Isotope Effects in Gas-Phase Chemical Reactions and Photodissociation Processes: Overview. It is organized by sections entitled as follows: Theoretical Studies of Isotope Effects in Chemical Reactions; Experimental Studies of Isotope Effects in Reactions of Neutral Systems; Experimental Studies of Isotope Effects in Reactions of Ionic Systems; Isotope Effects in Photodissociation Processes; and Applications of Isotope Effects. Also included are an Author Index, Affiliation Index, and Subject Index.

Modern Aspects of Electrochemistry. Volume 22. Edited by J. O'M. Bockris (Texas A&M University), B. E. Conway (University of Ottawa), and R. E. White (Texas A&M University). Plenum: New York and London. 1992. xi + 551 pp. $95.00. ISBN 0-306-44061-X.

This is the latest in a highly respected and influential series of chapters on particular topics by experts in their areas. The topics are of considerable current interest, and a review of chapter titles in this and previous volumes reads like an encyclopedia of modern electrochemistry. The title of the series is somewhat misleading, however. The series is strongly oriented toward physical electrochemistry; those interested in learning about recent advances in synthetic organic, inorganic, or organometallic electrochemistry will have to satisfy their curiosity elsewhere. The chapters in this volume include reviews of recent progress in the theory of the electrical double layer, specifically, the role of the metal and its interaction with the solvent (Amokrane and Badiali); studies on the electrocatalytic oxidation of oxygenated organic compounds at noble metal surfaces, including methods for identifying adsorbed intermediates (Beden, Léger, and Lamy); experimental and theoretical problems involved in studies of metal/semiconductor interfaces and surface states on semiconductors (Batchelor and Hamnett); the commercially important nickel-iron process for deposition of nickel-iron alloy films (Djokic and Maksimovic); and the use of microelectrode techniques in electrochemistry (Scharifker). The articles are generally authoritative and up to date. Scharifker's chapter is not as comprehensive as that by Wightman in a recent volume of the Bard series, but contains a good description of recent developments, such as microelectrode arrays. This volume should be in the library at any institution where extensive electrochemical research is carried out.

Albert J. Fry, *Wesleyan University*

Studies in Physical and Theoretical Chemistry. Volume 77. Computational Chemistry. Structure, Interactions and Reactivity. Parts A and B. Edited by S. Fraga (University of Alberta). Elsevier: New York. 1992. lii + 1406 pp. $568.50. ISBN 0-444-88512-9.

These two volumes constitute fifty-two contributions on largely computational/theoretical issues under the headings of Atomic and Molecular Structure, Beyond Hartree-Fock, Atomic and Molecular Interactions, Interactions Radiation-Matter, Condensed Matter, Solids, Surfaces, and Reactivity. The references in the volumes appear to be complete through late 1990. The majority of the writers are from Spanish institutions. Many of the contributions develop fundamental theory while several of the papers take on a reference flavor. The topic development logically builds from the theoretical foundations of atoms and molecules to the concluding papers on surfaces and reactivity. Missing from the volume are contributions on molecular dynamics based on density functional theory, molecular dynamics of macromolecules, and the recent combination of spectroscopy and quantum mechanics to probe potential energy surfaces of hydrogen bonded complexes. It is unfortunate that an index was not prepared, as this would have facilitated locating discussions of essential topics and would have enhanced the reference value considerably. There is an unevenness that might be expected in such a collection of papers published in a photo-offset format, along with some organizational difficulty (papers 4 and 5 in volume A are not correctly ordered). The books are very expensive ($568.50!), and so it is difficult to imagine anyone other than perhaps well-heeled libraries purchasing them. None the less, these volumes will prove valuable for students and researchers in computational chemistry.

L. G. Pedersen, *University of North Carolina*

Chemistry of the Solid–Water Interface. Processes at the Mineral–Water and Particle–Water Interface in Natural Systems. By Werner Stumm (Swiss Federal Institute of Technology). Wiley Interscience, John Wiley and Sons: New York. 1992. x + 428 pp. $39.95. ISBN 0-471-57672-7.

The author states that his aim is to provide an introduction to the solid-water interface addressed to students and researchers in chemistry, geochemistry, oceanography, limnology, soil science, and environmental engineering. He stresses the principles of interface and colloid science with emphasis on adsorption/desorption at solid/solute interfaces. The two basic processes of surface complexation and hydrophobic adsorption are considered from both the theoretical and observational viewpoints, the latter including the new techniques of synchrotron X-ray spectroscopy and surface microscopy. Applications to the Earth's surface are covered in considerable detail with several field examples, including Swiss lakes and watersheds. These applications fit together nicely to give a good sense of the overall nature of the major geochemical cycles. All told, the book covers a tremendous range from the submicroscopic scale of the electronic bonding of atoms and ions to the global scale of the soils, lakes, and oceans. Although the author disclaims any attempt to be comprehensive, some 400 references are listed which cover the major monographs and most of the key journal articles: the latest ones are for 1991 and 1992 (in press). It is perhaps rather unkind to point to the total omission of the highly developed literature on zeolites. This is unfortunate, since much of the volcanic glass at the Earth's surface turns into zeolite (for example, much of the building stone in southern Italy is zeolite). In addition, the abundant literature on the surface reactions of the ubiquitous Ca-Na-K-feldspar minerals might have been given more attention. The chapter headings give a good sense of the wide scope: The Coordination Chemistry of the Hydrous Oxide-Water Interface, Surface Charge and the Electric Double Layer, Adsorption, The Kinetics of Surface Controlled Dissolution of Oxide Minerals; an Introduction to Weathering, Precipitation and Nucleation, Particle-Particle Interaction, Carbonates and their Reactivities, Redox Processes Mediated by Surfaces, Heterogeneous Photochemistry, Regulation of Trace Elements by the Solid-Water Interface in Surface Waters. All chapters have Reading Suggestions, seven have Appendices, and three have Problems, but surprisingly not any of the other chapters. This primer is based on much of the material in the second edition (1981) of *Aquatic Chemistry* by Stumm and J. J. Morgan and Stumm's edited volume (1990) *Aquatic Chemical Kinetics, Reaction Rates of Processes in Natural Waters.* In spite of the minor criticisms listed above, it is highly recommended to all chemists wishing to explore the chemistry of water-solid interfaces and its geochemical consequences. It should be considered by instructors of courses on surface geochemistry at the graduate level.

Joseph V. Smith, *University of Chicago*

The Total Synthesis of Natural Products. Volume 8. Edited By John ApSimon (Ottawa-Carleton Chemistry Institute). Wiley Interscience: New York. 1992. $150.00. 704 pp. ISBN 0-471-54507-4.

A historic perspective on the currently oft-asked question "Whither Organic Synthesis?" can be gleaned by perusal of this outstanding series edited by John ApSimon since 1973. Volume 8 is no exception, presenting comprehensive reviews in four areas of total synthesis: tri- and tetracyclic diterpenes (D. Goldsmith, 243 pp); polysaccharides — work until 1986 (N. K. Kochetkov, 64 pp); naturally occurring quinones (R. H. Thomson, 221 pp); and spiroketal-containing natural products (V. Vaillancourt, N. E. Pratt, F. Perron, and K. F. Albizati, 159 pp).

Goldsmith succeeds admirably in presenting a large body of synthetic work in the diterpene area from the late 1930s to 1987–89 in concise, visually accessible, all inclusive schemes. Kochetkov provides a timely background review on the construction of polysaccharides, ubiquitous and industrially important (e.g. cellulose, starch) substances in which there is great current interest in view of their presence in the complicated polymeric structure of the cell. In a highly readable account, Thomson, a name synonymous with quinone chemistry, clearly conveys how much of a playground (533 references) quinones have been for synthetic chemists since 1868 when Graebe and Lebermann first prepared the industrially important pigment, alizarin. In the final chapter, Albizati and his students show how the spiroketal structural moiety, present in diverse metabolites which range from insects to marine organisms, can act as the key retrosynthetic trigger. This critical and pedagogic review covers work till mid-1989 excluding the total synthesis of monensin (available in Volume 4 of this Series), the polyether antibiotic that created the original interest in this area. The volume has an adequate index; there are, however, some obscure entries, e.g., chemical degradation, enol ether, methyl.

By presenting advances in several classes of natural product synthesis, the latest ApSimon provides, as did previous volumes in their time, snapshots to be added to the collection that illustrate the state of the strategy and the art of the discipline today.

Victor Snieckus, *University of Waterloo*