Book Reviews

Time-correlated Single Photon Counting. By Desmond V. O'Connor and David Phillips (The Royal Institution, London). Academic Press: London. 1984. viii + 288 pp. $45.00. ISBN 0-12-524140-2.

This book describes the experimental details for proper setup and use of the time-correlated single photon counting technique for measurement of the time evolution of fluorescence from excited electronic states of molecular species. The technique is capable of measuring fluorescence lifetimes ranging from tens of picoseconds to hundreds of nanoseconds. In their preface, the authors defend the need for this book by pointing out the rapid development of the technique in its 12 year history and hence the need to describe the experimental details of the method in such a way that the user can avoid pitfalls inherent in a "black box" approach.

The layout of the book is quite systematic. The first chapter gives an introduction to fluorescence, including some theory regarding fluorescent decay. This chapter also gives a review of other fluorescence lifetime measurement techniques. The second chapter describes the basics of time-correlated single photon counting. Thereafter, the chapter titles are the following: Light Sources, Photomultipliers, Electronics, and Data Analysis. It is here that the book excells in thorough descriptions of each of these subjects. In fact these chapters are written complete enough to stand alone and be a valuable reference for other experimentalist not necessarily interested in the time-correlated technique. Finally, the last two chapters describe expansions on the time-correlated technique. Chapter 7 describes time resolved emission spectroscopy wherein spectral and temporal information are obtained simultaneously. Chapter 8 describes fluorescence anisotropy measurements due to orientational relaxations of molecular species.

The hallmark of this book is attention to experimental details, both in equipment and its proper use and in data analysis. Many of the chapters have appendices describing manufacturer resources, parameters of typical units, and FORTRAN analysis routines. The book pays attention to not only describing how the apparatus is put together but also why. The book is well referenced through 1983.

In summary, I believe the authors have been successful in writing an excellent "hands-on" book for the experimentalist to intelligently establish and use a time-correlated single photon counting fluorescence measurement system.

Christopher M. Sorensen, *Kansas State University*

Annual Reports on the Progress of Chemistry. Volume 80. 1983. Section B. Organic Chemistry. Edited by A. G. Davies and P. J. Garratt (University College, London). The Royal Society of Chemistry: London. 1983. xiv + 403 pp. $114.50. ISBN 0-85186-151-2.

Davies and Garratt, ably assisted by 20 reporters, have provided a very useful summary of the major advances in organic chemistry for 1983. Coverage of biological chemistry has ceased with the disappearance of its last vestige, a section on enzymes, but in its place is an interesting, new chapter on host–guest chemistry. Also making its biennial appearance is a section on mass spectroscopy. All other topics in this 14-chapter work follow the same pattern as was used during the last few years, and the length of text has again been kept below 400 pages.

The major intent is to make the reader aware of important new developments in organic chemistry rather than to provide critical evaluation of individual contributions. Notwithstanding this, some reporters (e.g., Griller on free-radical reactions and Kennedy on organometallic chemistry of main-group elements) have enlivened their presentations by not shying away from criticism. McFarlane, in an early chapter on NMR, sets a high standard for the rest of the volume by not restricting himself to organic molecules but including other species from which organic chemists can learn useful techniques. By also spelling out the meaning of the numerous acronyms which infest the field, he makes the topic understandable to the non-expert. Some other chapters would have been helped if jargon had similarly been dealt with.

If one had to identify important general themes, they are the increasing commitment to both regio- and stereospecificity in synthesis, more sophisticated efforts to understand the role of the environment (whether it be a solvent or the host in a host–guest relationship), and the increasing involvement in organic chemistry of elements other than C, H, O, and N (evident not only in the lengthy chapter on organometallics but throughout the volume).

Although certain circumscribed topics (arynes or electroorganic chemistry) lend themselves to easier presentation than others (aliphatic compounds or synthetic methods), grouping of similar reactions and some elaboration makes material easier to read and absorb than an outpouring of facts. Thus, the chapters on alicyclic chemistry by Matlin and on aromatic compounds by Heaney are considerably easier to read than Smith's discussion of aliphatic compounds.

In summary, Davies and Garratt have again done a difficult job well, and this volume is indispensible reading for the practicing organic chemist.

Edward N. Trachtenberg, *Clark University*

Genetic Takeover and the Mineral Origins of Life. By A. G. Cairns-Smith. Cambridge University Press: New York. 1982. ix + 477 pp. $29.95. ISBN 0-521-23312-7.

This book addresses the most remote and perplexing question in the theory of evolution—how could self-sustaining, reproducing organisms appear spontaneously on earth? I do not think any scientist has difficulty seeing the biological evolutinary relationships between today's life forms, but the problem of how these first appeared is much less clear. To concentrate on this problem, *chemical* evolution, the author first tries to remove the bias that earliest life forms must have had a biochemistry similar to what we presently find. The problem is then attacked by asking fundamental questions about what constitutes a self-sustaining, reproducing organism and then attempting to find answers from our broad base of knowledge in chemistry, physics, biology, and geology. In reaching the conclusion that prototypic "life" may well have been a form of clay, the author leads us through a progression of "gedanken experiments" beginning with conditions on previtral earth, through the chemical evolution of inorganic crystals, and ending with the emergence of simple organic based life forms as the result of genetic takeover. The buildup of complex systems, from geochemical-inorganic to organic to biochemical, is explained through the principles of natural selection, functional ambivalence and overlap of materials, and takeover.

Numerous examples from the literature are used to support the argument and show similarities between this chemical evolution and what we know about biological evolution. The conclusions reached are by no means absolute and final but open up a new domain of thought for future consideration and research. The presentation is logical, organized, and complete, with all sides of an argument considered including an interesting dialogue with the imaginary Dr. Kritic. The book should not be considered textbook reading but instead reads more like a novel. I would highly recommend the book to any scientist intrigued by the idea of life originating from chemicals found on previtral earth, governed by the laws of science and excluding any improbable physical or metaphysical events.

Thomas M. Zamis, *Colorado School of Mines*

Orbital Interactions in Chemistry. By T. A. Albright (University of Houston), J. K. Burdett (University of Chicago), and M.-H. Whangbo (North Carolina State University). John Wiley & Sons: New York, 1985. xv + 447 pp. $49.95. ISBN 0471-87393-4.

Molecular orbitals are a permanent fixture in chemistry. Almost all chemists now live with "orbitals", two- and three-dimensional pictures of orbitals, impressive black-box computer programs to produce orbitals, and the conceptual perspective that "orbitals" can provide a key to molecular structure, molecular response to disturbance, and molecular reactivity. Albright, Burdett, and Whangbo present in this book a well-rounded, detailed discussion of "how and why" orbitals are at the heart of the understanding of molecular structure, stability, geometry, and especially molecular interrelationships. This book is a well-written, splendid introduction to the use of qualitative molecular orbital theory to comprehend complex molecules. (Many would remove the adjective "qualitative".) I believe this book will quickly become a standard work, provide a wide appreciation of this perspective, and stimulate much useful and constructive discussion.

The first eleven chapters develop and apply in detail the familiar basic ideas, with numerous useful examples, a bare skin of quantum theory, and frequent illustrative asides. The central ideas presented in this first group of chapters involve the general nature of molecular orbitals in simple molecules, how a complex molecule can be built up (or decomposed) in terms of simpler fragment molecular orbitals, and their response to formation of a more complex entity. Simple group theory is essential to provide this linkage—their Chapter 4 only sketches group theory needed. These basic ideas provide a straightforward coherent approach to complex molecules and explain how key structural questions can be addressed on general grounds. In Chapters 15–20, the authors skillfully

build on this foundation and develop an approach to more complex (organometallic) molecules. These six chapters provide a tight, dense, detailed introduction to material presently available only in the vast, uncharted, reaches of the literature. In these compact, example-laced chapters, basic molecular orbital structure for $ML_6(O_h)$, $ML_4(D_{4h},T_d)$, $ML_5(C_{4v})$, $ML_3(C_{2v})$, $ML_4(C_{2v})$, and $ML_2(C_{2v})$ complexes/fragments are fully developed. Abundant illustrative-type cases indicate how distorted variants are reached, clarify interrelationships between fragments and, most importantly, how more complex molecules can be built up from appropriate fragments. These six chapters form probably the most attractive feature of this book and are very rich in detail; in fact, the intense detail may well inhibit the uninitiated reader and obscure the basic unity of development. I would expect these chapters are a "must" reading for all chemists interested in organometallics. These efforts culminate in the brief introduction to further generalization—(Isolobal Analogy—Chapter 21 and Cluster Compounds, Chapter 22)—but basically only the conceptual guidelines are laid down.

A promising development of this book is the devoted effort to clear away artificial boundaries between organic vs. inorganic theories of molecules and to offer a "Grand Unified Theory"—a rather useful common sense approach. In this respect, the authors have generally succeeded and the book is more than simply the juxtaposition of the applications to organic and then organometallic systems. It is to be hoped that this trend continues.

This book is filled with figures. The figures are chiefly "free-hand" renderings of the schematic form of the molecular orbitals and parallel conjectured orbital energy level diagrams—none of these are actual molecular orbitals. In the early days of chemistry, many arresting pictures of molecules appeared in the literature and often appeared with statements disclaiming physical reality in association with the pictures; the authors wished only to use them as nomenclatural aids, to do what words could not. In some senses, the profusion of pictures in this book (and others) may be viewed as a "hieroglypherization" of the quantum theory of molecules. Despite the suggestion that this book..."serves as a guide to understanding the molecular orbital calculations, now so easily done, on these molecules"...it seems instead dedicated to the principal that all important salient features of the molecular orbital theory of molecules can be deduced a priori, without the associated full labors. This position seems to me at once the strength and limitation of this approach.

A dedicated critic can certainly find errors, questionable calls, and patches of loose language, but within the scope defined, the authors have produced a sturdy child. Any minor blemishes do not challenge the conclusion that this book is a useful, stimulating new addition to the chemical literature. Readers will be grateful for the daring to approach research frontiers so closely in a book of general scope.

Paul E. Cade, *University of Massachusetts*

Advances in Clinical Chemistry. Volume 23. Edited by A. L. Latner and M. K. Schwartz. Academic Press: Orlando, FL. 1983. ix + 350 pp. $38.50. ISBN 0-12-010323-0.

Volume 23 of this excellent series presents seven current topics each written by outstanding scientists. Section titles include the following: Clinical Chemistry of Vitamin B_6; Aluminum; Clinical Chemistry of Thiamin; Vitamin-Responsive Inborn Errors of Metabolism; Spectrophotometry of Hemoglobin and Hemoglobin Derivatives; Clinical Chemistry of Oxalate Metabolism; and, Desirable Performance Standards for Clinical Chemistry Tests.

Each of the seven sections is well organized, clearly written, and extensively referenced. Of personal interest was an outstanding section pertaining to oxalate metabolism. Of general interest to clinical biochemists and laboratory directors is the section entitled Desirable Performance Standards for Clinical Chemistry Tests, wherein analytical goals are defined, numerical performance characteristics of a number of laboratory methods are presented, and quality assurance evaluations are considered.

This book should be of particular interest to clinical chemistry laboratory directors, clinical chemists, and select research investigators.

Karl G. Blass, *University of Regina*

Lost at the Frontier: US Science and Technology Policy Adrift. By Deborah Shapley and Rustum Roy. ISI Press: Philadelphia. x + 223 pp. $19.95 (hardcover). ISBN 0-89495-041-X. $13.95 (softcover). ISBN 0-89495-042-8.

This book by Deborah Shapley and Rustum Roy consists of an extended essay (158 pages), followed by several short responses by notable figures, including William O. Baker, James R. Killian, Jr., and Edwin H. Land. Although the book purports to be a critique of U.S. science and technology policy, it lacks the thorough, analytical approach necessary to identify, let alone critique, a national policy. Rather, it comes closer to being a commentary on the culture of U.S. science and technology—the social, economic, and political factors that have shaped the diverse institutions that together constitute the U.S. science and technology establishment.

The authors have addressed several important issues relating to the process of basic discovery and the application of new concepts to practical ends. In my view, they have attempted too much for such a short essay. The treatment is superficial, and the authors freely make assertions that are no more than unsupported opinion. Too much of what they have written is devoted to the demolition of straw men. For example, in several places the authors refer scornfully to a proposition put forth by "the scholars", that there is a 30 year incubation period "between science and innovation". They imply that this period was chosen sufficiently long to relieve university researchers of any need to account for the end uses that might eventually be made of university-based research. Whether or not this notion was advanced in some study report or other, I know of no one who thinks in such terms; many counter-examples come readily to mind. Properly managed, closer ties between universities and industry are desirable; there is in fact a continuing, steady growth in the nature and extent of such relationships. However, in their critique of the role played by the research universities in promoting the health of U.S. science and technology, the authors pay almost no heed to the University's primary role, well stated by William O. Baker in his response: "...the major role of the universities has been to identify and develop the best of human talent". They are thus led in places to consider the university research environment as a kind of annex of the corporate or federal research laboratory. There is not space in this brief review to properly analyze all of the essay and the responses to it. Despite some misgivings about the book, I think that it deserves to be read and discussed. The authors have properly called attention to the inevitability of a major restructuring of the national science and technology enterprise in the years ahead. An informed and broadly-based participation in that restructuring is essential to ensure the continuing vitality of the major constituents—the research universities, government laboratories, and industry.

Theodore L. Brown, *University of Illinois, Urbana—Champaign*

Inert Gases, Potentials, Dynamics, and Energy Transfer in Doped Crystals. Edited by M. L. Klein (Chemistry Division, National Research Council of Canada). Springer-Verlag: New York. 1984. xi + 266 pp. $29.00. ISBN 0-387-13128-0.

This book consists of four chapters chosen to present the current status of chemical physical research on interatomic potentials, dynamics, vibrational, and rotational spectroscopy of inert gas crystals. It does so admirably. A very brief initial chapter by Klein sets the scope of this book and introduces the reader to inert gas research. This is followed by R. A. Aziz's chapter on interatomic potentials for pure and mixed rare gases. There is a brief discussion of the background of this field and a description of how various properties probe the potential and review of progress in the field since the last review by Barker in 1976. Aziz provides an extensive comparison of the various potentials and of properties calculated from them with experimental results. Then, various mixture interactions are treated similarly. Combining rules and their success in calculating properties are discussed. He closes with comments on the current state of derived potentials and the need for more precise experimental data. This chapter contains a large amount of data in its 38 figures, 24 tables, and 3 appendices.

The third chapter by Cohen and Klein concerns the dynamics of impure rare-gas crystals. After an introduction to impure rare-gas crystals, the authors provide an excellent discussion of the lattice dynamics of impure crystals. A useful feature of this section is the concise discussion of physical measurements used to study the effects of impurities on lattice dynamics. The two main methods used in theoretical studies are considered next. The central force-constant model is treated in more detail than computer simulation. The experimental section first treats rare-gas crystals doped with other rare-gas atoms then doped with homonuclear molecules and finally with heteronuclear molecules. Cohen and Klein limit their discussion to dilute systems without impurity–impurity interactions and are able to explain many experimental observations using a simple theoretical model.

The fourth and last chapter occupies slightly less than half the book. This is not surprising as it discusses the spectroscopy of vibrational and rotational levels of diatomic molecules in rare-gas crystals. The dynamics of vibrational levels of matrix-isolated molecules is a rapidly growing field, and Dubost covers it thoroughly. Both conventional and laser spectroscopy with its many variations are discussed. Experimental data on a large number of systems is given along with a theoretical discussion. In the last 10 years laser spectroscopy has allowed many new effects to be observed. Dubost has provided a complete and current review of this field of spectroscopy.

This small book is exceptional in the amount of information it contains. The three major chapters are all well done and complement each other. It is clearly written, concise, current, and complete. I recommend it, even if your interests are only in a single chapter.

W. J. Fredericks, *Oregon State University*

Coffee. Botany, Biochemistry and Production of Beans and Beverage. Edited by M. M. Clifford (University of Surrey, England) and K. C. Wilson (United Kingdom Overseas Development Administration, Senegal). Croom Helm: London and Sydney; distributed by AVI Publishing Co., Inc.: Westport, CT. 1985. XVI + 457 pp. $55.00. ISBN 0-87055-491-3.

On the basis of its content, the book may be divided into the following sections: Section 1, Introduction and History; Section 2, Agricultural Aspects; Section 3, Chemical Aspects; Section 4, Technological Aspects; Section 5, Physiological-Nutritional and Metabolic Aspects; Section 6, Commercial or Marketing Aspects.

The introduction gives interesting historical notes on the coffee plant dealing mainly with its origin and the use of the bean for the preparation of the popular beverage. Humorous as well as informative, the anecdotes refer much to the establishment and popularity of coffee houses in various parts of the world. Comments on the history and sociological aspects of coffee houses in South and Central America and other Latin countries would have made this light-hearted chapter more complete.

Chapter 2 is concerned with the classification of coffee, stressing a review of advances in this area. Selection and breeding are discussed in Chapter 3. Climate and Soil with respect to cultivation (Chapter 4), Physiology (Chapter 5), Mineral Nutrition and Fertilizer Needs (Chapter 6) and Cultural Methods (Chapter 7) are all authoritatively discussed by the same author, K. C. Wilson. The organization and clear, precise manner of presentation by this author are commendable. Chapters 8 (Pest Control) and 9 (Control of Coffee Diseases) present information which is of great value to those engaged in or concerned with the cultivation of coffee. Descriptions of the pests or diseases, their control, and/or eradication are outlined in a clear and concise manner.

Classical as well as modern methods of green coffee processing are dealt with in Chapter 10. The individual steps and processes are well described but flow-sheet diagrams and pictures of processing equipment would have improved the presentation.

An excellent resumē of World Coffee Trade is presented in Chapter 11. This information "probably" would fit in more comfortably as the culminating material of the book. Chapter 12 dealing with The Microscopic Structure of the Coffee Bean is a good discussion of the steps involved in such studies of the various anatomical units of the coffee bean. If placed after Chapter I or after Chapter 13, smoother reading would "probably" be enhanced.

Chapter 13 is concerned with the Chemical and Physical Aspects of Green Coffee and Coffee Products. It covers rather adequately the important components of different types of coffee and includes useful tables and structural formulas. Sections on sensory aspects, aroma, and quality assurance should be of great interest to those engaged in the sale and distribution of coffee and coffee products.

The Technology of Converting Green Coffee into the Beverage is the topic of Chapter 14. Each step, including the packaging of roasted and soluble coffee, is discussed. Locating this chapter closer to Chapter 10 (Green Coffee Processing) would allow for more continuity of thought.

The book is profoundly agricultural in content and will be of great value to those engaged in the growing and care of coffee plants. It should serve as an important reference in all libraries of agricultural institutions, especially those in coffee-producing countries, libraries of companies processing coffee and of their technical staff. It will be a good reference for teachers and students of Food Science and Food Technology, hoteliers, restaurant workers, and administrators. Each chapter is highly referenced, but a lack of illustrative material, particularly in the botanical section where this is possible, is quite noticeable. The contributors have presented their material with clarity and reasonable brevity. The contents are acceptably up to date and, within the constraints of a multiple-authored text, the book is a good contribution to knowledge on the topic covered.

Horace D. Graham, *University of Florida*

Lavoisier and The Chemistry of Life: An Exploration of Scientific Creativity. By Fredric Lawrence Holmes. The University of Wisconsin Press: Madison. 1985. xxiv + 565 pp. $38.50. ISBN 0-299-09980-6.

This scholarly and impressive study sprung from the author's investigation of the origins of the field of metabolism for a still unfinished study of the career of the late Sir Hans Krebs. The author must have read critically not only the collected works of that most eminent of chemists, Antoine Lavoisier (1743–1794), but all the important literature ever written about him. The author acknowledges the inspiration he received from his former teacher, Henry Guerlac, who died in May 1985. Professor Guerlac was a great teacher and scholar and this book is testimony to his effectiveness in these two roles.

The illustrations, many of them of Lavoisier's laboratory equipment, are interesting and well chosen. The frontispiece is a reproduction of David's magnificent portrait of Lavoiser and Madame Lavoisier which hangs in the Metropolitan Museum of Art.

The would-be reader of this book should be familiar with the details of Lavoisier's career since it begins just after the events described in Guerlac's classic book, "Lavoisier, the Critical Year" (1772) and it interprets just part of Lavoisier's work. Nevertheless, the reader who perseveres with this study will be well informed of the reason why Lavoisier's work is scientific creativity at its highest level even when compared with science in our own time, two centuries later.

David H. Kenny, *Michigan Technological University*

Electron Impact Ionization. Edited by T. D. Märk (Universität Innsbruck) and G. H. Dunn (National Bureau of Standards and University of Colorado). Springer-Verlag: Vienna. 1985. xii + 383 pp. $58.50. ISBN 3-211-81778-6.

The editors of this volume have attempted to produce a comprehensive treatment of electron impact ionization in a single reference book. To a large extent, they have succeeded. There are eight chapters written by recognized experts that cover the basic topics in electron impact ionization. Quantum mechanical, semiclassical, and semiempirical methods of treating electron ionization are reviewed in Chapters 1 and 2. A very interesting and useful discussion of experimental and theoretical aspects of the threshold behavior of ionization cross sections is featured in Chapter 3. A detailed exposition on differential, partial, inner-shell, and total ionization cross sections makes up the bulk of the book (Chapters 4–7). Almost all the literature cited in these chapters predates 1983. Chapter 8 treats the relatively newer topic of electron-ion ionization and also contains the most up-to-date references.

The highlight of the book is a final chapter that contains six articles on the applications of quantitative aspects of electron ionization to other fields: mass spectrometry, plasma diagnostics, astrophysics, fusion research, aeronomy, gaseous electronics, and radiation physics. Although most of the articles are overly brief, researchers in these "user" areas will find this chapter to be an important source of information.

Two articles in the last chapter are of particular interest to chemists. One article by E. C. Zipf explores electron-impact ionization processes in planetary and cometary atmospheres. Electron-impact ionization plays a critical role in geophysical and cometary phenomena because it is a copious source of photons, kinetically excited atoms and ions, and chemically active metastable species. There is a vast observational database that is a stimulus for the development of models of the physics and chemistry of planetary atmospheres. This article points out the need for accurate electron-impact excitation and ionization cross sections for aeronomically important gases to assess the realism of these models and identifies challenging experimental problems that open up a new phase of laboratory work on electron-impact ionization processes. The second article is by J. H. Futrell on applications to mass spectrometry. An incisive analysis of the successes and failures of the quasi-equilibrium theory for the breakdown of complex ions is presented. A major goal in this field is to characterize the energies and kinetics of ion decomposition, to correct for kinetic energy release in fragmentation, and to extrapolate data between instruments with different characteristic sampling times.

This book represents a major addition to the literature on ionization phenomena. It will serve as a valuable reference to many researchers whose fields touch upon electron-impact processes.

John Krenos, *Rutgers, The State University*

Journal of Chromatography Library. Volume 31. Gradient Elution in Column Liquid Chromatography, Theory and Practice. By P. Jandera and J. Churacek (University of Chemical Technology, Pardubice, Czechoslovakia). Elsevier Science Publishers: Amsterdam and New York. 1985. xx + 510 pp. $90.75. ISBN 0-444-42124-6.

This book is devoted to an important field in liquid chromatography—gradient elution. This technique is somewhat analogous to temperature programming in gas chromatography and has evolved into a rigorous scientific discipline during the last 10 years. However, relatively few books dealing entirely with gradient elution have been published. Thus, under the principle that "nature abhors the vacuum", this book fills a very important niche ignored by most other publications dealing with chromatography. It should be noted that only topics dealing with theory, practice, and application of the gradient elution technique are covered, and therefore some preliminary knowledge of chromatographic techniques, particularly liquid chromatography, is required.

The book is logically divided into four parts, with Part I devoted

entirely to the fundamentals of isocratic development. The authors discuss the role of the mobile phase composition on solute retention and solute/solvent and solute/stationary phase interactions. Retention models of Snyder, Soczewinski, Scott, and Kucera are described here in great detail. This part is a well-written authoritative review of the literature covering the time period from 1962 to 1982. However, the problems of prediction of resolution and optimization of chromatographic separations is dealt with only marginally; this part could have been expanded to include recent optimization strategies.

Part II concentrates mainly on theoretical aspects of gradient elution chromatography. Various models of gradient elution, including different gradient profiles, calculation of retention parameters, and optimization of gradient systems, are discussed. This chapter, like the first, is put together with great knowledge of many theoretical aspects of the technique and is highly recommended to a serious student or research worker in the field of chromatography.

The final two chapters cover some practical issues associated with the use of the technique. Chapter III discusses the instrumental aspects of gradient elution systems—such as various devices generating gradients, pumps, solenoid valves, columns, solvents, etc., and also deals with detection and quantitation issues.

Chapter IV presents examples of the application of gradient elution techniques to separation of different classes of compounds in various chromatographic systems. In a project of this nature, it is usually rather difficult to keep up-to-date on instrumentation and applications because of the rapid changes and developments in these areas. Thus, by necessity, some of the instruments described in the book have been discontinued or are no longer available, and new systems have appeared which are not covered in these discussions.

On the whole, the book is well-produced with many useful diagrams, graphs, tables, and chromatograms. The references cover the literature up to 1982. This book is highly recommended to graduate students, research workers, and anyone wishing to improve his or her skills in liquid chromatography.

Paul Kucera, *Hoffmann-La Roche Inc.*

Selenium in Natural Products Synthesis By K. C. Nicolaou and N. A. Petasis. CIS, Inc.: P.O. Box 7741, Philadelphia, PA. 1984. xiii + 300 pp. $37.50. ISBN 0-914891-00-6.

The authors have produced a very timely and much needed monograph dealing with selenium reagents in natural products synthesis. The information is presented in a very interesting manner, in that mechanistic rationale is given in addition to the actual synthetic transformations. One not only sees the key steps effected by the selenium reagent but also the overall synthetic strategies.

The organization of the book centers on the type of synthetic transformation that is emphasized in that particular synthesis of the natural product. After an introductory chapter, there are the following seven chapters: 2. Selenium-mediated Oxygenations; 3. Selenium-mediated Dehydrogenations; 4. Organoselenium-mediated Olefinations; 5. Organoselenium-mediated Reductions; 6. Organoselenium-stabilized Carbanions; 7. Organoselenium-mediated Cyclizations; 8. Miscellaneous Applications of Selenium Compounds. The references appear to cover through 1983 and are conveniently placed at the end of each chapter. There is also a useful index which largely lists the selenium reagents and the names of the natural products.

In view of the increasing importance of selenium reagents in organic synthesis, this book would be an excellent addition to the personal library of anyone interested in organic synthesis. The authors have chosen the synthetic examples well and have provided a cogent overview of the various processes that are synthetically unique to selenium.

Joseph P. Marino, *The University of Michigan*

Polymer Blends—Processing, Morphology, and Properties. Volume 2. Edited by M. Kryszewski, A. Galeski, and E. Martuscelli. Plenum Press: New York. 1984. IX + 287 pp. $52.50. ISBN 306-41802-9.

This book published the results of the Second Joint Polish–Italian Joint Seminar on Multicomponent Polymeric Systems held Sept 7–12, 1982, in Lodz, Poland.

Eli M. Pearce, *Polytechnic Institute of New York*

Handbook of Chemical Equilibria in Analytical Chemistry. By S. Kotrlý (Institute of Chemical Technology, Pardubice) and L. Šůcha (Institute of Chemical Technology, Prague). Ellis Horwood Ltd. (John Wiley & Sons): New York. 1985. 414 pp. $97.00. ISBN 0470-27479-4.

True to its title, this book provides a useful compendium of reliable data and practical procedures for characterizing and/or interpreting commonly encountered chemical systems under equilibrium conditions.

This book includes extensive compilations (some 145 pages) of equilibrium constants for protonation, complexation, precipitation, and redox reactions. Also provided are tables of side-reaction coefficients for protonation equilibria (about 20 pages) as well as for competitive complexation equilibria (about 54 pages) covering the pH range 2.0 to 12.0 in 0.5-unit increments. These coefficients enable ready calculation of conditional constants from equilibrium constants for a great variety of different conditions. Once calculated for a given pH and/or competitive ligand, conditional constants prove much simpler to use than equilibrium constants in predicting equilibrium concentrations of species of analytical interest, such as metal ions or anions.

Included also are descriptions of how to construct and use various logarithmic and predominance-area diagrams to simplify treatment of consecutive equilibrium systems and other complex simultaneously obeyed equilibria. The last chapter of the book is devoted to examples of applications in calculation of pH, metal ion masking efficiency, predicting the course of a redox reaction as a function of pH, and hydrolysis of metal ions.

As is true for most handbooks, this book will best serve those who have the expertise and interest to use it effectively. Although the authors have included several early chapters to cover fundamentals, their treatment of these is terse, as befits a handbook, and will lead all but the most diligent of novices to seek elsewhere for guidance. To those who have frequent or even just an occasional need for one or more equilibrium constants, this book provides a handy source of reliable data. As an analytical chemist, I am especially pleased to have this reference book near at hand.

Alfred A. Schilt, *Northern Illinois University*

Organometallic Chemistry. Volume 13. Senior Reporters: E. W. Abel (University of Exeter) and F. G. A. Stone (University of Bristol). The Royal Society of Chemistry: London. 1985. xii + 491 pp. £82.00; $131.00. IBN 0-85186-611-5.

The present volume duplicates the format and much of the authorship of the recent volumes in the series. Some 16 "Reporters", under the continuing Senior Editorship of E. W. Abel and F. G. A. Stone, cover the literature published during the year 1983 in the following chapters: Group I: The Alkali and Coinage Metals (J. L. Wardell); Group II: The Alkaline Earths and Zinc and its Congeners (J. L. Wardell); Boron with the Exception of the Carboboranes (J. W. Wilson); Carboboranes, including their Metal Complexes (J. R. Spaulding); Group III: Aluminum, Gallium, Indium, and Thallium (P. G. Harrison); The Silicon Group (D. A. Armitage); Group V: Arsenic, Antimony, and Bismuth (J. L. Wardell); Metal Carbonyls (B. J. Brisdon); Organometallic Compounds Containing Metal–Metal Bonds (W. E. Lindsell); Substitution Reactions of Metal and Organometal Carbonyls with Group V and VI Ligands (D. A. Edwards); Complexes Containing Metal–Carbon σ-Bonds of the Groups Scandium to Manganese (K. J. Karel and P. L. Watson); Complexes Containing Metal–Carbon σ-Bonds of the Groups Iron, Cobalt and Nickel (A. K. Smith); Metal–Hydrocarbon π-Complexes, other than π-Cyclopentadienyl and π-Arene Complexes (J. A. S. Howell); π-Cyclopentadienyl, π-Arene, and Related Complexes (W. E. Watts); Homogeneous Catalysis by Transition-Metal Complexes (M. E. Fakley); Organometallic Compounds in Biological Chemistry (B. Ridge); Structures of Organometallic Compounds determined by Diffraction Methods (D. R. Russell). The chapter dealing with organometallic compounds in biological chemistry has apparently become an annual rather than a biennial inclusion, reflecting the increasing interest in this area. Chapter text length varies from a modest 5 pages to a high of 54 pages. Over 4000 references occupy some 25% of the book's total space. Most of the chapters have additional reference material, either bibliographical or simply additional references (including titles) to material not otherwise covered in the report. The writing is uniform from chapter to chapter and continues to be very highly compressed; the density discourages casual perusal.

Changes in the present volume, reflecting efforts to curtail size and expedite publication, may be necessary but are regrettable. Camera-ready copy has been employed for all chapters; aside from being esthetically unappealing, it is simply not as "readable" as most typeset copy. Considerably more serious, however, is that there is no longer an Author's Index. Several of the appendices to the chapter on Diffraction Methods have been eliminated. Gone are the names and selected details that accompanied each entry in the very extensive Table, the cross-referenced Table of Ligand Listings, and the Table of Metal–Metal Bond Distances, as well as the short but interesting section commenting in some detail on a few of the year's more interesting or important structure determinations. This chapter, the book's longest, still offers an awesome compilation of some 1410 structures determined by diffraction methods.

The "Specialist Periodical Reports" occupy a highly respected position among reference works and the present volume is a worthy addition. This reviewer, however, was sharply reminded that as the Specialist *Reports*, and perhaps Annual *Reports* in general, grow increasingly condensed,

they can no longer be used as Annual *Reviews* and are not addressed to the needs of the serious browser.

J. H. Stocker, *University of New Orleans*

Polymers: The Origins and Growth of a Science. By Herbert Morawetz (Polytechnic Institute of New York). John Wiley & Sons: New York. 1985. xvi + 306 pp. $47.50. ISBN 0-471-89638-1.

Almost all chemists can gain knowledge (and pleasure) from this relatively short but admirably catholic history of macromolecular chemistry. The book is divided chronologically into three sections: From Early Beginnings to 1914; 1914–1942; and 1942–1960. The first section, in particular, traces the rise of structural chemistry during the 19th century in general terms, and polymers as such work their way into the foreground more or less gradually.

The emphasis throughout is principally on ideas and crucial experiments. Thus the scientists themselves emerge only occasionally as principal foci of interest, but there are episodes (e.g., in the admirable chapter called Staudinger's Struggle for Macromolecules) sufficiently dramatic to call them forth as distinct personages. As in Morawetz's earlier text on Macromolecules in Solution, natural and synthetic polymers range side by side, and industrial and biological aspects are not slighted. The work hangs together beautifully, and one may wonder at how this was achieved. One clue is that the author consulted all of the 1042 original references himself, being sufficiently fluent in French and German to do so.

It is too tempting not to mention the unusual frontispiece: a 1912 photo of Kaiser Wilhelm II watching the imperial limousine being fitted with the first synthetic rubber tires. This not only emphasizes the venerable history of the synthetic polymer industry but—one suspects—evades choice among the thirteen heroes whose pictures are found in the middle of the book. The author ends his brief epilog on an optimistic note: "If ever an author in the years to come writes a sequel to this book he will have a rich story to relate." A glance at the Chemical Abstracts shelves since 1960 suggests that such a future Hercules, no matter how heavily armed with computer aids, would face a task compared to which the cleansing of the Augean stables would seem trivial, if he aimed at achieving the completeness, fairness, and drama of the present volume.

Walter H. Stockmayer, *Dartmouth College*

Metal Ions in Biological Systems. Volume 18. Circulation of Metals in the Environment. Edited by H. Siegel (Basel University). Marcel Dekker, Inc.: New York. 1984. xxiii + 397 pp. $95.50. ISBN 0-8247-7226-1.

Most researchers concerned with the behavior of trace substances in natural systems will find something of value in this work. The editor has assembled contributions from a panel of international, mostly European, experts into a well-organized and stimulating volume. One finds a consistent and very welcome emphasis on the application of chemical principles to the study of highly complex systems. If one had to find fault with the editing, it would lie with the occasional syntactical infelicities that arise in rendering into English technical expressions originating in other languages. These are seldom serious enough to interfere with clear meaning.

The stated purpose of this volume is to emphasize the involvement of biological systems in the circulation of metals in the environment. In many ways, that goal is reached admirably. The two contributions by J. M. Wood, in particular, one dealing with the evolutionary aspects of metal/biota interactions, the other with biochemical adaptations to the presence of potentially toxic substances, are novel and thought-provoking. D. R. Turner provides a discussion of metal speciation in biological systems that shows how research in this area is driving development of improved analytical techniques. Most of the other contributions also are well-written, reasonably current in their coverage of the literature, and summarize a great deal of useful information that is not readily available elsewhere.

Far less satifactory are the chapters by S. E. Jorgensen and A. Jensen, which deal with the analytical determination of trace metals in various compartments of the environment, and with the processes which control their behavior. A general objection could be raised to the inclusion of material on routine analytical procedures in a volume of this sort. But beyond that, their discussion of techniques will strike many practicing analysts as outmoded and inappropriate, owing in part to the disproportionate emphasis on colorimetric determinations. The non-expert could easily be lulled into thinking that precise, accurate, and specific determination of metals at sub-ppm levels is simple and straightforward. Also misleading are some of the "typical" values for metal concentrations in the tables in Chapter 2. By not referring to current literature, the authors occasionally serve up overestimates of metal concentrations based on older determinations that have been largely discredited and superceded by newer work. Most trace metal determinations predating 1970–1975 should be viewed with skepticism. The contributions from Jorgensen and Jensen appear to be rewarmed versions of reviews published earlier by the same authors. Obsolescence is not characteristic of the information in the rest of the volume. It is unfortunate that this material appears in the early chapters, where it may inhibit appreciation of the virtues of the remainder.

Thomas Tisue, *Clemson University*

Modern Methods of Particle Size Analysis. Edited by Howard G. Barth (Hercules, Inc.). John Wiley & Sons: New York. 1984. x + 309 pp. $55.00. ISBN 0471-87571-6.

This edited text is Volume 73 in "Chemical Analysis: A Series of Monographs on Analytical Chemistry and Its Applications". The monograph contains nine chapters, written by twelve experts in their respective areas, surveying current techniques of fine particle size analysis, as well as an introductory chapter on currently available instrumentation. The range of topics is quite diverse, ranging from electron microscopy to light scattering techniques to detection systems, and more.

Each chapter is well written and documented. The pattern of most chapters appears to be the following: (a) introduce the subject and the operational details involved, (b) present the theoretical basis for the analytical device (technique) being described (in most cases the theory is summarized), (c) show some results from the recent scientific literature, (d) compare these results, and the operational facility to other comparable devices, and (e) conclude by suggesting new developments which will improve the existing analytical technology. The respective authors have been successful in achieving a good balance between theory and practice, and the book as a whole provides the reader with some very useful practical concerns related to fine particle size analysis and experimentation. Fundamental concepts are presented in such a way that the operational bases of various instruments can be understood without first obtaining an advanced degree in physics. Only in one case did it appear that the fine line of commercialism had been crossed, perhaps an unavoidable consequence of one writing about an employer's product.

The book appears to be aimed at an audience which fully understands the statistics of particle size distributions, and yet it is not completely versed in the analytical techniques of their measurement. As such, this book will probably be used as a valuable reference for those involved in fine particle research (or those just entering the field) or those involved in quality control of particulate products. It would be surprising to learn of the book's adoption as a course text in analytical chemistry; however, it also will be a useful reference for analytical chemists.

Each chapter in adequately referenced, including historical as well as very current references. However, due to the emphasis on products on the market, it is likely that much of the material will be out of date within 5–10 years. An updated edition which summarizes recent developments and new products might be expected within that time.

Robert W. Thompson, *Worcester Polytechnic Institute*

Biological Magnetic Resonance. Volume 6. Edited by L. J. Berliner (Ohio State University) and J. Reuben (Hercules, Inc.). Plenum Press: New York. 1984. xii + 300 pp. $47.50. ISBN 0-306-41683-2.

Magnetic resonance techniques are proving increasingly valuable for a variety of biological and medical applications. As a result, a large number of books have appeared in recent years which attempt to review various applications of this emerging technology. Books attempting to review rapidly developing technologies suffer two major difficulties: avoiding obsolescence and choosing a target audience. This volume, the sixth in the series, contains an excellent collection of review articles covering various applications of biological magnetic resonance. The various chapters appear to have been completed in late 1983. Most of the chapters appear to be aimed primarily at scientists actively engaged in the development of new magnetic resonance technologies or in the application of these and similar techniques to the solution of biological problems. This is best illustrated by the observation that two of the chapter titles and their respective introductory paragraphs use abbreviations (EPR and ESR) that are never defined for the general reader. The use of ESR for pulsed EPR is especially likely to confuse the naive reader.

In most cases, the chapters include considerable discussion of the theoretical foundations of the various techniques and their application to biological problems. To the specialist, these chapters will represent a significant compilation of the theoretical basis of emerging technologies and a summary of their successes in elucidating biological processes. For the general biochemist, however, such theoretical treatments will appear highly specialized and will contribute little to their appreciation of magnetic resonance techniques. It is unfortunate that such initial impressions may obscure the power of the methodology as a means of solving a variety of biological problems.

A chapter by Bolton on Two-Dimensional Spectroscopy as a Conformational Probe of Cellular Phosphates is particularly informative for

biochemists interested in structure and function of protein catalysts. Chapters by Lenkinski on Lanthanide Complexes and by Reed and Markham on EPR of Mn(II) Complexes summarize successful applications of these techniques to the structure and dynamics of proteins. These chapters are likely to be of interest to both magnetic resonance specialists and investigators studying the structure and function of proteins. Chapters by Thomann, Dalton, and Dalton on Time Domain ESR and by Maki on Optically Detected Magnetic Resonance are of more limited general interest since the required instrumentation is not commonly available.

This book will be a welcome addition to the libraries of investigators heavily involved in applications of magnetic resonance techniques to the solution of biological problems. Others will find the chapters of value for the information they impart about specific biological problems but will find the theoretical considerations somewhat overwhelming. Such individuals should find consulting a library copy sufficient for their interests.

Richard L. Weiss, *University of California*

Applied Industrial Catalysis. Volume 3. Edited by B. E. Leach (Conoco Inc.). Academic Press: Orlando, FL. 1984. xii + 397 pp. $69.50. ISBN 0-12-440203-8.

This is the last of three volumes addressed to "those active in catalysis or preparing for a career in industrial catalysis". There are nine chapters, each written by different authors and varying in length from 15 to 120 pages. The chapters seem as disparate in usefulness as in length; this may arise from lack of agreement on the intended audience.

The first chapter, on commercial catalyst preparation, contains 20 pages (of a total of 23) which list 16 unit operations in catalyst manufacturing and 12 large photographs of equipment used by the Montedison Group in Novara. Neither the pictures nor the text carry sufficient technical information to an industrial engineer interested in catalysis; no technical details of small-scale catalyst preparation, of use to a laboratory scientist, are attempted. Gel formation is covered in 12 lines, of which the following is exemplary: "Gelation times can vary within very wide limits; they can depend on micellar concentration, temperature, ionic strength of the solution, pH, nature of the starting compounds, etc." There is no mention of binders, and little more than one paragraph on making catalyst beads. Monolith supports are not mentioned here, although they are in Chapter 8.

The second chapter, Oxyregeneration and Reclamation of Catalysts, is also puzzling. One-half of the 23 pages are taken up with descriptions of DTA/TGA curves on 40-mg samples of spent catalysts. There is no mention in the chapter of any activity measurement on either fresh catalyst, spent catalyst, or catalyst after "oxyregeneration". Reclamation, treated in two pages, is of potential interest to a chemist, but the process involves complete destruction of the catalyst, recovery of valuable constituents, and catalyst preparation de novo. This chapter lists no references.

The next two chapters, on silica gels and aluminas, are excellent short summaries. The literature review on aluminas is especially good, covering a wide range of patents, company bulletins, and fundamental studies such as the classic 1961 thesis of Lippens at Delft.

The short chapter (15 pp) on ammonia synthesis catalysis is disappointing. Ten pages are spent on the history, process design, and reactor design (which seems out of place here), and only 5 pages on catalysts. Catalyst suppliers are identified only the letters A–D; there is no mention of the ICI "Catalyst Handbook" (Wolfe Scientific Books, 1970), which concentrates on unit processes important in ammonia manufacture.

Catalytic Oxidation of Hydrocarbons in the Liquid Phase is heavily weighted with organic chemistry, as is proper for the subject matter. There are 497 references, a boon to anyone interested in the subject. There is a very interesting list of what can be made by this technology, but without indication of the fraction of total industrial production (e.g., of ethanol) that is being made by liquid-phase oxidation.

Olefin Metathesis is written by Banks, one of the inventors of the process less than 30 years ago. In a short space (23 pages), there is adequate coverage of what the reader would like to know about reaction mechanism, product distribution, known catalysts, and process applications. Only a few of the intriguing syntheses possible by this route are economically attractive on a commercial scale at present.

Catalysts and the Automobile is a short history of automotive catalytic converters; it deals mainly with the development of technology, up to three-way catalysts and recent improvements in monolith and pelleted catalysts. The chapter forgoes discussion of fundamentals such as reaction mechanism or global kinetics. For the reader interested in these matters, a recent monograph by Kathleen Taylor ("Automobile Catalytic Converters", Springer-Verlag, 1984, 54 pages) is nicely complementary to this chapter.

The last chapter, Molecular Sieve Catalysts, constitutes almost one-third of the book; it *is* 120 pages long, with 183 references. It is a jewel. John Ward, the author, is an award-winner for his own research in sieve catalysts. Ward starts with a description of structures, continues with catalyst characterization and modification, and finishes with a wide range of applications from catalytic cracking to gasoline-from-methanol. One of the few areas not treated is the synthesis of various zeolites, a matter of considerable art as well as science.

Sol W. Weller, *State University of New York at Buffalo*

Therapeutic Drug Monitoring and Toxicology by Liquid Chromatography. Chromatographic Science Series. Volume 32. Edited by Steven H. Y. Wong (University of Connecticut). Marcel Dekker, Inc.: New York. 1985. xv + 500 pp. $89.75. ISBN 0-8247-7246-6.

This multiauthored text, reference book is divided into three major sections: Fundamental and Current Clinical Instrumentation (226 pp), Major Classes of Drugs (200 pp), and Laboratory Management and Miscellaneous Topics (52 pp). The first section is well written and invormative, and the chapters devoted to HPLC-mass spectroscopy and HPLC-electrochemical detectors are especially good. The HPLC-MS chapter reviews the wide variety of interfaces that are commerically available and a few of the experimental interfaces that look promising. The author of this chapter does an especially good job of giving the pros and cons of each type of interface and the material is referenced very well. Electrochemical detectors are now regarded as the method of choice for neurotransmitters, but there are few textbooks that have reviewed this rapidly developing area. This chapter reviews a very wide range of drug classes that can be assayed by this technique, it gives the specific details of the experimental conditions for representative drugs, and it gives a wealth of literature citations for other specific drugs. The chapter on sample collection and preparation is a welcomed addition and it provides an in depth coverage of how the physical and chemical properties of sample containers can influence drug assay results, but the chapter gives very poor coverage on sample preservative or on specimen adsorption cartridges. The chapter titled Liquid Chromatography and Other Methodologies for Therapeutic Drug Monitoring and Toxicology reviews the wide variety of non-HPLC methods (e.g., RIA, EMIT, ELISA), but the coverage is much too superficial to be useful and it fails badly at giving a critical evaluation of these alternate methods relative to HPLC analysis. The chapter devoted to computer applications of HPLC analysis is much too general and vague to be useful and even the analytical chemist with a moderate computer background is likely to find the chapter very frustrating.

The second major section of the text is divided into chapters on (1) antiasthmatics, (2) antibiotics, (3) antidepresents, (4) anticonvulsants, (5) antihypertensives, and (6) antiarrhythmics. This section is very well written, giving the specific details for the analysis of many drugs and a large number of literature citations to the analytical details for a large number of other drugs. For theophylline determinations, it gives the details of a specific assay method and critically evaluates the method, and it gives a brief outline of 56 other methods for theophylline determinations that have appeared in the literature. The latter section would be particularly useful to the laboratory that needs to rapidly develop an assay with the equipment and specific columns that happen to be on hand at the time. The chapter on Antibiotics (40 pp) is very extensive as to the classes of antibiotics that are covered and as to the large number of specific drugs for which assay methods are given. The chapter also covers some of the derivatization methods for the antibiotics that do not have good UV chromophors.

One of the weakest parts of the book is the index. All too often drugs that are mentioned in the text cannot be found as a specific entry in the index and the reader must wade through the whole chapter on the appropriate therapeutic drug class to find the one he is looking for. Despite these few weaknesses, the book should prove to be extremely useful to those who are presently doing therapeutic drug monitoring on a daily basis or to those who may just be entering the area. The analytical methods for a number of metabolites are given, and the general principles that are presented should make the book useful for the medicinal chemist doing drug metabolism studies.

John K. Baker, *University of Mississippi*

Survey of Drug Research in Immunological Disease. Volume 4. Noncondensed Aromatic Derivatives. Part III. Volume 5. Noncondensed Aromatic Derivatives. Part IV. Edited by V. St. Georgiev (Penwalt Corp.). Karger: Basel. 1984. Volume 4: x + 334 pp. $173.75. ISBN 3-8055-3798-9. Volume 5: x + 606 pp. $293.50. ISBN 3-8055-3856-1.

These volumes represent the 3rd and 4th in a series describing immunologic effects of noncondensed aromatic derivatives. For each compound, the author provides a structural formula, methodology for preparation, a summary of known biological effects of the compound in-

cluding its effects on the immune system, and a list of references to the literature. As one might expect, the length of the various entries varies considerably. A particularly detailed review of the platelet-activating factor (PAF-acether and its derivatives) is given in Volume 4 and salicylic acid and its derivatives are given extensive coverage in Volume 5. Flufenamic and mefenamic acids and related phenylacetic acid derivatives are also dealt with in some depth. The two volumes are intended as reference works and several indexes are provided in each volume to assist in this task including an author index, a chemical subject index, a biological subject index, and a biological activity index. Critical comments are restricted to a minimum. One might question the choice of titles for the volumes (inasmuch as most of the entries do not pertain primarily to immunological disease but rather to effects on the immune and inflammatory systems with the emphasis more toward organic chemistry rather than biology); however, the cross-referencing of chemicals under categories such as "immuno-adjuvant activity", "immunostimulant activity", "immunosuppressive activity", "lymphocyte functions, effects on", "monocyte functions, effects on", etc., makes these volumes quite useful to the immunologist studying basic mechanisms. Volumes 4 and 5 represent useful additions to the libraries of those who may need quick access to information about immunologically active drugs accumulated over 20 years and lack their own computerized informatin retrieval system.

D. A. Clark, *McMaster University*

Water. By Felix Franks. Royal Society of Chemistry: London. Distributed by Heyden and Son: Philadelphia. 1983. v + 96 pp. $6.00. ISBN 0-815186-473-2.

Felix Franks is the editor of a monumental opus entitled "Water—A Comprehensive Treaties of the Physical Chemistry of Water". Together with the monograph by Eisenberg and Kauzmann "The Structure and Properties of Water", these eight volumes summarize the state of affairs regarding water structure as of the end of the 1970s. As for properties of water, the classical reference is Dorsey, "Properties of Ordinary Water Substance"—now nearly half a century old—and the more recent volumes on oxygen of Gmelin, "Handbuch Der Anorganische Chemie". The amount of information contained in these references is overwhelming. In addition, the past half-dozen years have seen a vast journal literature on water structure, most recently dealing extensively with computer calculations to simulate water structure. Yet in spite of these extensive efforts, the structure of water still escapes a satisfactory, detailed understanding.

In the small book by Felix Franks, "Water", the author has reviewed and summarized the state of water structure as of 1982. The volume may be considered the equivalent of an extended abstract of the seven-volume treatise of which Franks was the editor and this short volume is indeed an excellent introduction to the subject of water. A few chapters are also devoted to the nature of aqueous solutions. The small volume should find a wide audience. Certainly, it can easily be enjoyed by undergraduate chemistry students with no more than a semester of physical chemistry as background. However, the utility of the volume may be considerably wider than that: it should serve as a very handy introduction to anybody who has the need to become familiar with fundamental aspects of water for whatever purpose, but particularly for those in the biological sciences ranging from cell physiology to molecular biology. The book serves as an introduction to what is currently known about water, but perhaps it serves particularly to emphasize the enormous remaining gaps in our understanding to water structure. The volume should certainly dispel any notion that the water in any aqueous system may be treated lightly and with simplified models. In a volume of less than 100 pages it is natural—but unfortunate—that many sections must first be devoted to "setting the stage", such as introducing in a very qualitative way the concepts of diffraction studies, radial distribution functions, or solution theory. Again, the book makes for comfortable reading, but of necessity cannot serve as a practical tool for anyone starting serious work on the nature of aqueous phenomena. On the other hand, the book fills a need, namely as a pleasant introduction to the subject.

Walter Drost-Hansen, *University of Miami*

Minimum Steric Difference. The MTD Method for QSAR Studies. By Z. Simon (Institute of Medicine, University of Timisoara), A. Chiriac, S. Holban, D. Ciubotaru, and G. I. Mihalas. Research Studies Press, Ltd.: Letchworth, U.K. 1984. ix + 173 pp. $47.95. ISBN 0471-90438-4.

This volume covers an interesting approach to the problem in designing pharmacologically active compounds or obtaining information about the receptor for a series of organic compounds when the structure of the receptor is not known. By assuming that the bioactive substances interact with the receptor by a common mechanism, the structure of the receptor can be implied from geometric features common to the set. The approach assumed in this volume, however, is two-dimensional when in the most general case it is three-dimensional: With the advances in computer technology, the increased emphasis on the use of these-dimensional modelling, and use of more mechanistically based approaches to this problem, the approach is out-of-date.

The book is organized with a description of the method, a comparison of it with other methods, and conclusions. This is followed by two appendices. The second part contains a review of the published structure–activity studies that have been done with the method. These are mostly from the laboratory of the authors. This is followed by an appendix with the source code for the method, which is probably the most valuable part of the book, and if the method is to be used this part is essential. If one is involved in the general problem of drug design, this book may be of use as a reference. This must be what is intended from the price which precludes its addition to most personal libraries.

William Dunn, *University of Illinois, Chicago*

Methods in Molecular Biology. Volume 1. Proteins. Edited by J. M. Walker (The Hatfield Polytechnic). Humana Press: Clifton, NJ. 1984. vii + 384 pp. $45.00. ISBN 0-89603-062-8.

This is, as its title promises, a methods book, which gives detailed descriptions of a variety of techniques currently important in protein chemistry. The topics covered range from basic analytical chromatography and electrophoresis through manual sequencing methods to immunochemistry and monoclonal technology.

The book shows an internal consistancy which indicates careful editing. Each chapter is divided into the following sections: introduction, materials, method, notes, and references. Introductions tend to be brief, with little coverage of basic theory. The references are also often sparse and cite original publications rather than reviews. The materials required are listed systematically and completely, giving a handy checklist. The real heart of each chapter, however, is formed by the method and notes sections. These give careful descriptions, generally of excellent clarity and detail, which should be most useful to the experimenter. The notes especially are a source of many observations which will be of great value to the learner and in some cases even to the experienced.

Although some techniques described could well be carried out successfully by workers with no previous experience, others (especially those involving animal work, for example, the production of antisera or monoclonal antibodies) will require the help of experienced colleagues. The volume will be most useful to new members of a laboratory where these techniques are established or to investigators who have some previous experience of the methods but who need a reliable source of practical guidance.

Douglas F. Dyckes, *University of Houston—University Park*

Advanced Organic Chemistry, Reactions, Mechanisms, and Structure. Third Edition. By Jerry March (Adelphi University). John Wiley and Sons: New York. 1985. xiii + 1346 pp. $35.00. ISBN 0471-88841-9.

Eight years after its second edition, Jerry March has revised this thick book by adding more than 5000 new references to a list of more than 10000 and taking out quite a few old, somewhat outdated references. All the old names of chemical transformations are retained along with the newly added IUPAC reaction names for the convenience of readers who now have to use IUPAC nomenclature. Like the first edition, published in 1968, and the second which came out in 1977, this third edition is easy to read, despite the encyclopedic size of the text/reference, for graduate students and chemists who are engaged in research in organic chemistry. At first glance, it looks so voluminous. However, when the contents have been followed page by page, comparing each item in the second edition with that in this volume, the entire pages devoted to chemistry are found to have been shortened to 1120 from 1143 pages in the second edition. The author has replaced many synthetically less useful reactions with new, more applicable ones and shortened many longer explanations to compact, streamlined accounts, yet preserving the familiar styles of the preceding edition as much as possible. For example, paragraphs such as Direct Introduction of an Acyloxy Group, Sulfur Ylides, or the Guerbet Reaction are omitted, the Baldwin ring-closure rules, new Lawessons's reagent, synthesis of tetrahedrane, or Ipso attack, are added, while Benzidine and the Wallach rearrangements are expanded. The noticeable expansion is the Author Index which has been enlarged to 107 pages from 76 pages in the second edition. This alone may indicate how many new references have been added to this new edition.

Like the previous edition, this book is divided into two parts. Part One (250 pages) begins with chemical bondings, followed by stereochemistry, reactive intermediates, photochemistry, acids and bases, and effects of structures on reactivity. Part Two deals with reactions and is divided into ten separate chapters: on substitutions, addition, elimination, rearrangement, oxidation, and reduction, each chapter concerned with a different kind of reaction. There are also two appendixes: the literature of organic chemistry and classification of reactions by type of compound

synthesized.

Jerry March has again done a magnificent job to put almost all the important modern information into this one volume. In order to keep the book in the size of a text/reference, however, there are quite a few undersirable omissions. For example, despite the numerous name reactions, no reference was made to the original author. Just one line of reference to the original work would be very convenient for those who are engaged in writing theses or scientific papers. The chemistry of newly developing areas, such as organometallic, biomimetic, or heteroatom chemistry, is nearly completely missing. Therefore, no mention was made of sulfuranes, the Pummerer rearrangement, or hypervalency and pseudorotation on heteroatoms of second-row elements. Even a brief mention, such as a citation of references on polymer or heterocyclic chemistry, would be quite helpful. However, these may be too much to ask for in a book already as voluminous as this one.

This third edition of "Advanced Organic Chemistry" is a must for all organic chemists who are engaged in research work or teaching. Even for those whose fields are not in organic chemistry, this book will definitely serve as an encyclopedic reference.

Shigeru Oae, *Okayama University of Science*

Bio-Inorganic Chemistry. By R. W. Hay (University of Stirling, Scotland). Ellis Horwood Ltd.; distributed by John Wiley & Sons: New York. 1984. VI + 210 pp. $24.95. ISBN 0-470-20066-9.

The book covers alkali metal and alkaline earth cations, non-redox metalloenzymes, oxygen carriers, haem and copper proteins in electron transport, vitamin B_{12}, nitrogen fixation, metal ion transport and storage and ends with a chapter on metals and non-metals in biology and medicine.

A book that discusses an interdisciplinary area like bio-inorganic chemistry can be written for biochemists who want to know about inorganic chemistry or for inorganic chemists who wish to learn of biochemistry. The first chapter, entitled General Background, creates the impression that this book is directed at the latter category. The second chapter on physical methods gives worthwhile introductions to ORD, CD, EXAFS, etc. Later on it becomes clear that the author presumes a great deal of biochemical knowledge. For instance, although proteins involved in electron transfer are briefly discussed, their function and role in oxidative phosphorylation or phosynthesis are not mentioned. Mechanisms and theories of electron transfer are not discussed. On page 137 the erroneous impression is created that cytochrome *c* oxidase could release $O_2^{-\cdot}$ and O_2^{2-}, both described as highly reactive and toxic(!).

One cannot escape the impression that the book was hastily assembled. There are numerous typographical errors; some figures do not have legends; and the style of the drawings is not consistent, i.e., some are drawn heavily and others very lightly. A sentence like "Molybdenum is the only element of the second and third transition series known to be essential to life" (p 19) create doubt about the location of Mo in the periodic system. Furthermore, I was surprised to see that the chloride content of ocean water had decreased by 90% (Table 1.1, p 10). Rather than continuing in this fashion, I would like to wish the author good luck in the preparation of a thoroughly revised second edition.

W. H. Koppenol, *University of Maryland Baltimore County*

Asymmetric Synthesis. Volume 4. Edited by J. D. Morrison (University of New Hampshire) and J. W. Scott (Hoffman-La Roche, Inc.). Academic Press, Inc.: New York. 1984. xii + 380 pp. $85.00. ISBN 0-12-507704-1.

The fourth volume in this series contains chapters on the chiral pool and chiral sulfur, nitrogen, phosphorus, and silicon centers. A major portion of the volume is devoted to the chapter on the chiral pool. Tables of available chiral fragments for synthesis as well as many synthetic schemes are included as illustrations of the usefulness of the chiral pool approach to the synthesis of chiral organic molecules. Given the great advances recently made possible by this approach, this chapter serves as an important summary of recent work which is relevant in the broader context of general organic synthesis in addition to serving as a reference work for active practitioners of the art.

The remaining four chapters focus on chiral sulfur, phosphorus, nitrogen, and silicon centers. All the chapters cover the topics satisfactorily. Following general discussions of the historial background, the authors generally describe methods of preparation, reaction types, and applications to organic synthesis for each class of compounds. The emphasis, of course, shifts as a function of each author's style, but this reviewer found that each chapter is well enough referenced to allow the serious reader to further pursue any topic which is not explicitly discussed in the text.

This volume is a valuable addition to the series and fits nicely with the current level of interest in this area of organic synthesis. The chapters are written in a readable fashion and provide sufficient leading references to satisfy more curious readers. As the art of chiral synthesis progresses, this series will be appreciated not only as a review of major contributions in that area but also as a reference work.

David Morgans, Jr., *Syntex Research*

Annual Review of Biophysics and Biophysical Chemistry. Volume 14. Edited by D. M. Engelman (Yale University), C. R. Cantor (Columbia University), and T. D. Pollard (The Johns Hopkins University). Annual Reviews Inc.: Palo Alto, Ca. 1985. XI + 478 pp. $47.00. ISBN 0-8243-1814-5.

This is Volume 14 in the series which was previously known as "Annual Review of Biophysics and Bioengineering" (Volumes 1–13). The change in title (originally intended to be simply Annual Review of Biophysics) reflects the change in emphasis intended by the new editorial board, this being the first issue totally planned by them. Their philosophy, paraphrased from the Prefaces to Volumes 12 and 13, is to focus on the solution of biological problems through the sophisticated use of physical measurements.

The change in emphasis, and title, is a natural evolution of the contents in the last several volumes where the Bioengineering aspect has been diminishing. This volume, therefore, does not represent a dramatic change of course but rather a subtle shift toward areas of interest to the current readers.

The quality of the contributions remains high. This volume contains 17 reviews touching on many aspects of modern Biophysics and Biophysical Chemistry and I found those five related to my own interests very useful and interesting.

There are two changes in style which are improvements: each review has a table of contents and the five-volume Chapter Titles index has been reorganized by key words rather than by broad subject class. This latter change is extremely helpful, particularly since most reviews appear under several key word listings. The key words are alphabetized and the index is very easy to scan for articles of interest. All other features of the previous Annual Reviews volumes have been maintained except, for better or for worse, the references in the reviews do not always include the last page.

"Annual Review of Biophysics and Biophysical Chemistry" continues the tradition established by its predecessor and is likely to appeal to much of the audience which has been reading "Annual Review of Biophysics and Bioengineering" in the past.

Nils O. Petersen, *The University of Western Ontario*

Introductory Medicinal Chemistry. By J. B. Taylor and P. D. Kennewell. John Wiley & Sons: New York. 1984. 202 pp. $17.50. ISBN 0-470-27252-X.

The authors of this book have undertaken a large task in attempting to condense the vast area of medicinal chemistry down to a 202-page text. The intent of the authors is to present an overview of the field of medicinal chemistry so that a person with a background in organic chemistry and/or biochemistry can obtain a grasp of the essentials of medicinal chemistry.

The basic approach of the authors is to follow the life cycle of a drug from its formulation to the distribution throughout the body finally ending in the excretion of the chemical from the body. Chapter 1 introduces the reader to the terminology of medicinal chemistry. Chapter 2 covers the procedures involved in drug formulation. Chapter 3 is concerned with the pharmacokinetic phase of drugs in which drug distribution and the cellular components are presented along with various approaches to determining Quantitative Structural Activity Relationships. The Topliss "Decision-Tree" Approach is nicely discussed. Chapters 4 and 5, in which drug-receptor theories and the nervous system, respectively, are presented, are clearly the highlights of the book. The authors use very clear diagrams and include many chemical examples to illustrate the topics covered. Chapter 6 presents a summary of the various mechanisms involved in drug metabolism. Although many drug disposition reactions are mentioned in tabulated form, there are few examples of actual chemical reactions. Since this book is presumably written for chemists a more delineated presentation of the formation of metabolites would be very beneficial; e.g., the use of structures to illustrate how alkoxy groups are metabolized to alcohols via the unstable hemiacetal, or showing how the P-450 catalyzed formation of α-amino alcohols which spontaneously degrade to carbonyl compounds and amines is the basis of metabolic deamination.

An omission in this book is a discussion of the influence of pH on the ionic character of chemicals. A presentation of the Henderson–Hasselbalch equation with examples would facilitate the presentation of the topics on cell membrane crossing, receptor binding, and excretion.

In conclusion, the authors have accomplished their objective in presenting a readable overview of the area of medicinal chemistry. The book is recommended to anyone who is considering medicinal chemistry as a

possible career choice. As a classroom text, this book could be used in courses for students who are majoring in the health professional areas. The use of this book in a medicinal chemistry course would require the extensive use of supplemental material.

M. Paul Serve, *Wright State University*

Heterogeneous Reactions: Analysis, Examples, and Reactor Design. Volume 1. Gas–Solid and Solid–Solid Reactions. By L. K Doraiswamy and M. M. Sharma. John Wiley and Sons: New York. 1984. xxxi + 538 pp. $66.00. ISBN 0-471-05368-6.

The first volume of the two-volume set is dedicated to gas–solid and solid–solid reactions. A broad range of subjects, including surface chemistry, kinetics, transport, reactor modelling, reactor design, and catalyst deactivation, is covered in this very attractive book. An extensive bibliography is included at the end of each of the 21 chapters. Indeed, the authors should be commended for their heroic effort to survey and summarize the enormous literature extant on heterogeneous reactions.

This book will serve as a good reference for the working-engineer with a solid foundation in the subject. In particular, it contains a multitude of standard equations and formulas. It also provides a good source for elementary explanations in some cases. However, the book cannot be used as a text book nor as a source of sophisticated explanation, although the extensive bibliographies of many subjects could serve as a starting point for indepth study. That is, many, in fact most, equations, physical models, etc., are presented without adequate development or explanation for the novice. Only the engineer with a good working knowledge of an area will be able to use this material. Occasionally, the book even fails as a reference in that tables and figures are so inadequately documented that it is difficult to imagine how they could be of value to most readers (e.g., Table 1.1, Figure 2.1, Table 2.3, Table 2.6, etc.).

In sum, this book can best be catagorized as a bifunctional encyclopedia. First, it contains reasonable but elementary explanations of many topics; this material is supported by extensive bibliographies, allowing for the pursuit of subjects in greater depth. Second, it contains more sophisticated information, particularly mathematical information, in tabulated form. Unfortunately, because of poor development, this information will be completely inaccessible to most readers.

Jonathan Phillips, *Pennsylvania State University*

Oligonucleotide Synthesis: A Practical Approach. Edited by M. J. Gait (MRC Laboratory of Molecular Biology, Cambridge, England). IRL Press: Oxford and Washington, D.C. 1984. xiii + 217 pp. $ 20.00. ISBN 0-904147-74-6.

The field of oligonucleotide synthesis has long been in need of a compendium of widely used procedures. This handbook fills that need admirably. The book is organized into eight chapters. The first chapter is an excellent introduction which provides an overview of the uses of synthetic DNA and the historical development of the chemistry of its preparation. The second chapter describes the synthesis of a number of widely used precursor nucleosides. The heart of the book is in the third and fourth chapters which give detailed descriptions and protocols for DNA synthesis by the phosphite triester (also known as phosphoramidite) and phospho triester methods, respectively. These chapters are particularly valuable in that no other detailed published protocols are available. Each chapter also contains a detailed list of commercial sources for the chemicals and equipment used in the synthetic procedures, which is of great value for both novices and experts in the field. Chapter 5 describes HPLC methods for DNA purification, and Chapter 6 describes purification by preparative gel electrophoresis as well as describing the methods used in oligonucleotide sequence analysis. The final two chapters describe current methods for RNA synthesis by chemical (Chapter 7) or enzymatic (Chapter 8) methods. These chapters do a good job of presenting the current state of the art in a rapidly developing field.

In summary, this handbook is a very useful addition to the literature which will find a place on the shelf for most people interested in DNA or RNA synthetic chemistry.

Lloyd M. Smith, *California Institute of Technology*

Progress in Polymer Science. Volume 9. Edited by A. D. Jenkins (Unversity of Sussex) and V. T. Stannett (North Carolina State University). Pergamon Press: Oxford. 1984. v + 374 pp. $132.00. ISBN 0-08-031734-0.

This is one of the most fascinating volumes in a series that has already attracted well-deserved attention. In contains seven reviews that range from synthesis to physics, from esoteric scientific to engineering aspects, and that bridge the span from biological macromolecules to ceramic–polymer aggregates.

M. D. Glasse from Leicester Polytechnic has written a lucid and remarkably complete article entitled Spontaneous Termination in Living Polymers. He demonstrates that most living polymer anions undergo aging processes and are not "living" in the traditional sense but points out that "for most practical purposes, living polymers continue to exist, and their usefulness can only be strengthened by a study of their weakness". Also concerned with synthetic aspects is J.-C. Bollinger from Limoges in his paper Recent Advances in Synthesis and Properties of Block Copolycondensates. This is a review of progress in synthesis, characterization, and physico-chemical as well as physical-mechanical properties of condensation copolymers, mainly between 1976 and 1981.

An overview over the large heuristic body of knowledge on Biodegradation of Biomedical Polymers has been prepared by J. Kopeček and K. Ulbrich (Czechoslovak Academy of Sciences). The well-organized article repeatedly directs attention to the lack of knowledge of the mechanisms of biodegradation but indicates that it will, through the necessary fundamental studies, be possible to eventually reach the enormous potential value of polymers in biomedical applications. The reaction of polymers to a different and much more aggressive environment is reviewed by W. Schnabel and H. Sotobayashi, from the Hahn-Meitner-Institut and the Fritz-Haber-Institut in Berlin, in an article on Polymers in Electron Beam and X-Ray Lithography. An excellent introduction into liquid and plasma edging techniques is followed by a thorough review of the polymers used and their properties.

A thorough and systematic discussion of Ultrasonic Studies of Macromolecules, especially of time-dependent molecular phenomena, was written by R. A. Pethrick of Strathclide. This is the elegant and complete physico-chemical heart of the volume. Those interested in conformations and conformational processes will find it rich and very rewarding. R. D. Gilbert and P. A. Patton from North Carolina State University have produced a compact paper on Liquid Crystal Formation in Cellulose and Cellulose Derivatives, which discusses the available literature and emphasizes the potential of liquid crystalline solutions in the production of new regenerate cellulose fibers without the deficiencies of the rayon products. B. A. Bolto (CSIRO, Clayton, Australia), finally, has discussed Some New Water Purification Processes Based on Polymers. This article is a refreshing mixture of research report and review as well as of polymer physical chemistry and polymer engineering. The author is well versed in both and demonstrates that a combination of traditional polymer science and ceramics can be very beneficial, both scientifically and with regards to applications.

I have enjoyed this volume of "Progress in Polymer Science" and personally found it very usefull; I recommend it warmly.

Ulrich W. Suter, *Massachusetts Institute of Technology*

Gas Hydrates. By E. Berecz and M. Balla-Achs (Technical University for Heavy Industry, Miskolc, Hungary). Elsevier Science Publishers: Amsterdam and New York. 1983. 343 pp. $83.00. ISBN 0-444-99657-5.

Many low-boiling gases react with water to form crystalline phases, particularly under pressure at low temperature, but also in some cases above the ice point. In this wide-ranging book the authors describe the history, theory, experiment, and industrial applications of this subject, from chemical composition of comets to plugs in natural-gas pipes. Much of it is in the style of one-line reviews of research papers or superficial accounts of well-known theory. Some is much more detailed, with numerous phase diagrams and tables or graphs of thermodynamic data. The problems incident to production and transportation of hydrocarbon gases in cold climates are mentioned repeatedly, but advice for dealing with them is not very specific. The emphasis is more on understanding them. A process for desalination of seawater is described. Enough examples of a more academic type are included to show that this subject is both interesting and important to many kinds of chemistry. The book is recommended as a broad survey of this field and as a guide for further reading with 587 references to texts, reviews, journal articles, conference proceedings, and industrial reports. Teachers of general chemistry may find in it some good examples of practical applications of chemistry to enliven their lectures.

David H. Templeton, *University of California, Berkeley*

Advances in Inorganic and Bioinorganic Reaction Mechanisms. Volume 2. Edited by A. G. Sykes (The University, Newcastle upon Tyne). Academic Press: Orlando, FL. 1983. x + 388 pp. $75.00. ISBN 0-12-023802-0.

This is the second volume of a series that promises to be a very valuable resource. In recent years, the field of inorganic reaction mechanisms has been stimulated and challenged by our increased knowledge of reactions occurring in biological systems containing metal ions as essential components. Both fields, i.e., study of purely inorganic mechanisms and study of bioinorganic mechanisms, have benefited from this cross-fertilization. This series combines valuable articles from both areas. I expect that most readers from either area will find several articles of interest to them in each volume.

This volume contains three articles on substitution reactions: Base hydrolysis of transition-metal complexes by M. L. Tobe, Substitution reactions of divalent and trivalent metal ions by T. W. Swaddle, and Oxygen-18 exchange studies of aqua- and oxo-ions by H. Gamsjager and R. K. Murmann. Each of these articles, while describing phemonena in purely inorganic systems, contains important material for bioinorganic chemists interested in water, ligand, and substrate coordination at metalloenzyme active sites or in the mechanisms of the zinc hydrolytic enzymes, for example. This volume also contains three bioinorganic reviews: Rapid-reaction techniques and bioinorganic reaction mechanisms by R. G. Wilkins, Do binucleating ligands have a biological relevance? by D. E. Fenton, and Molybdenum enzymes: a survey of structural information from EXAFS and EPR spectroscopy by S. P. Cramer. These rather diverse topics in bioinorganic chemistry are timely, and these reviews should prove valuable to bioinorganic and inorganic chemists alike.

This volume and the other members of the series are recommended to anyone interested in inorganic or bioinorganic reaction mechanisms and will be useful to those of us teaching courses in either inorganic reaction mechanisms or bioinorganic chemistry.

Joan Selverstone Valentine, *University of California, Los Angeles*

Dictionary of Electrochemistry. Second Edition. By D. B. Hibbert and A. M. James. MacMillan Press: London. 1984. x + 308 pp. $34.95. ISBN 0-333-34983-0.

This second edition volume aims to be a "ready reference" text for scientists and technologists concerned with electrochemical matters. As such, is does provide useful basic information on the meaning and relevance of a variety of electrochemical terms. The text has, however, at least two limitations. First, it emphasizes "applied" topics, so that a number of fundamental matters (e.g., charge-transfer kinetics, charging vs. faradaic currents, etc.) are scarcely mentioned. Electrochemical techniques are also described very unevenly; for example, the entry for "linear sweep voltammetry" is concerned entirely with adsorption, rather than diffusion-controlled processes, even though the latter is of greater importance in chemical applications. Secondly, the book is actually closer in format to an encyclopedia than to a dictionary; however, the breadth and depth of material covered are certainly not comprehensive. In this regard, it falls well short of the standard of Hampel's "Encyclopedia of Electrochemistry" even though the latter is now somewhat outdated.

Nevertheless, given its moderate price, some will find it worthwhile to include the present text on their bookshelves. In spite of the above limitations, it forms a useful member of the rapidly growing body of electrochemical texts aimed at a general chemical audience.

Michael J. Weaver, *Purdue University*

Chemistry of Hydrocarbon Combustion. By D. J. Huchnall (University of Southampton). Chapman and Hall Publishers: London and New York. 1985. viii + 415 pp. $85.00. ISBN 0-412-26110-3.

The title of this book refers to hydrocarbon combustion, which is misleading since most of the book is devoted to partial oxidation reaction steps or processes at temperatures considerably lower than those experienced in true combustion processes. Complete oxidation resulting in high temperatures (or combustion, as I would define it) is discussed to only a very limited extent.

It is of course a major task to select only the more important and also include the more recent publications. There unfortunately seems to be predominance of papers from the 1930's to 1960's and considerably fewer papers since. Only a few papers were noted for the 1980's and the most recent ones noted were 1983. Of course an author must choose those which he believes to be most important. Several papers that I think are highly important were, however, either not referenced at all or were mentioned only fleetingly, ignoring what I consider to have been major contributions. It was disappointing that the book fails to critically review the topics discussed or to make recommendations for future investigators. The dust cover of the book had indicated that a critical review would be made; the preface, however, emphasizes only a review of past literature.

The book serves as a good starting point for investigators of partial oxidation and pyrolysis. A considerable amount of literature pertaining to the partial oxidation of alkanes, alkenes, cycloalkanes, and aromatics is discussed.

Chapter 1 reports on historical literature from mainly the 1930's through the 1950's. Chapter 2 gives a review of experimental results for alkanes, alkenes, and aromatic hydrocarbons. Chapter 3 discusses hydrogen–oxygen reactions, aldehyde oxidation, role of olefins, flames, shock-tube results, low-pressure pyrolyses, and analytical techniques of use in oxidation processes. Chapter 4 considers hydroxyl, hydroperoxy, oxygen, and hydrogen atoms and their role. Chapter 5 is devoted to alkyl, alkylperoxy, alkoxy, acyl, acylperoxy, and other hydrocarbon radicals. Chapter 6 discusses numerous pyrolytic reactions including coke formation. Chapter 7 reports some but not the best models of combustion systems.

Lyle F. Albright, *Texas A&M University*

Alcohols Toxicology. By William W. Wimer, John A. Russell, and Harold L. Kaplin (Southwest Research Institute). Noyes Data Corporation: Park Ridge, NJ. 1983. x + 278 pp. $36.00. ISBN 0-8155-09480-0.

This work begins with a brief introduction to alcohol nomenclature and a brief review of the history of alcohols in general and then presents a review of toxicology studies for methanol, ethanol, propanols, and butanols. The latter section represents a relatively short historical literature survey from the 1800's through the early 1970's but includes only a few references after that time. In general, the review is interesting and easy to read. However, if the reader wishes to have a detailed analytical review of the subject, this work is useful only as a starting point. For example, the enormous body of detailed work in the last 15 years on the toxicology of ethanol has been largely ignored. In several cases, the very early works of some well-known researchers in the field are quoted, but no followup of later work is provided, even though the recent work is of high quality and great interest.

The second half of the book is a curious collection. An appendix of selected synopses and abstracts of work quoted in the historical review ins provided, but this suffers from the same criticisms as does the earlier review section. The work concludes with a second appendix of physical properties of the alcohols, a third appendix of standard free energies for methanol synthesis, and lastly, a 35 page bibliography, containing citations additional to those referenced in earlier sections, provided presumably so that the readers can themselves expand the historical review.

Patricia K. Eagon, *University of Pittsburgh*

A Pictorial Approach to Molecular Structure and Reactivity. By Robert F. Hout, Jr., William J. Pietro, and Warren J. Hehre (University of California, Irvine). John Wiley and Sons: New York. 1984. xii + 403 pp. $39.95.

This impressive volume brings the power of modern computer-generated graphics to the presentation of molecular orbitals calculated from ab initio STO-3G wave functions for a diverse and well-selected sampling of molecules. The majority of the volume is devoted to the actual displays of the orbitals in descending energy sequence starting from the LUMO and progressing as deeply into the molecular shell structures as is interesting for a particular molecule. A brief introduction to the form of display presented is given in Chapter one and three appendices give an extraordinarily terse introduction to molecular orbital theory and the construction of the three-dimensionally appearing orbital "photographs". The displays themselves are organized into groups of related molecules, the relationships being molecules that are saturated, electron-rich, electron-deficient, unsaturated, conjugated, strained, with expanded valence shells, forming complexes, and at a transition state. The authors provide a few comments of salient features of the orbitals displayed for each grouping of related molecules. Readers may want to compare the displayed orbitals in other ways and the authors comments can provide a starting point for new and creative ways of extracting and improving your own chemical intuition. It is worth remarking that the displays are not restricted to molecules containing atoms through fluorine but ranges more deeply into the periodic table. Ferrocene, for example, is included!

This volume is a continuance of the tradition to find better ways to bring the information in wave functions to the practicing chemist that started with the contour diagram, proceeded through variants of mesh or fishnet diagrams, and now comes with full three-dimensional perspective of the isoprobability surfaces. The display technique is a three-dimensional depiction of the surface that contains 70% of the orbital's probability density. Highlighting has been added to give the impression of light reflecting from these surfaces to enhance the three-dimensional perspective. The technique is highly successful and is a portent of the possibilities for representation of complicated multidimensional relationships with a visual image. Until such capabilities are widely available, the authors have provided this selection for the rest of us to savor, enjoy, and interpret. There are a few cases where direct comparison of the orbital "photographs" is awkward because of the particular molecular setting or arbitrary switch in relative phases of degenerate orbital pairs, but it is certainly not as difficult, for example, as recognizing the different possible perspectives of bicyclo compounds. I can see the book's long term utility as providing a visual aid for remembering orbital interactions in prototypical molecules over a nicely comprehensive selection of examples.

William H. Fink, *University of California, Davis*