

Book Reviews*

Biological Functions of Proteinases. Edited by H. Holzer (University of Freiburg) and H. Tschesche (University of Bielefeld). Springer-Verlag, New York-Heidelberg-Berlin. 1979. viii + 284 pp. \$42.90.

This work is a collection of 26 papers presented at the 30th Mosbach Colloquium held on April 1979, in Mosbach/Baden. The stated purpose of the symposium was to present an overview of current knowledge on the biological functions of proteinases and to highlight areas for possible future research. About one-fourth of the papers deal with intracellular protein turnover. Two papers deal with the transport of proteins across membranes, a process which may also be involved in the transfer of proteins from various cellular compartments to the lysosome. The remaining papers deal with a variety of other important processes which are regulated or mediated by proteinases. A sampling of these include coagulation, inflammation, reactions of the complement system, blood pressure control, fibrinolysis, and protein processing. The book also contains a subject index.

Much of the material presented is current. Many of the papers are extensive reviews of their subjects and contain good bibliographies with references as recent as 1979. One disappointment, the chapter on proteolysis and fertilization, an area of significant interest and research activity, is essentially a 1-page abstract. In addition, some of the topics presented have been reviewed extensively elsewhere and are likely to be familiar to those for whom they are intended.

The book largely succeeds, however, in the stated goals of the original colloquium. It provides the reader with a feeling for the direction and importance of current research on the biological functions of proteinases. It also conveys the sense that in several important areas, these efforts have served primarily to outline the nature of the problems and that much more remains to be accomplished. While established researchers could profit from this book, it should be most useful to those with recently acquired interests in the biological roles of proteolytic enzymes.

Allen Frankfater, *Loyola University of Chicago*

The Basis of Medicinal Chemistry (Burger's Medicinal Chemistry, 4th edition, Part I). Edited by Manfred E. Wolff (University of California, San Francisco). Wiley-Interscience, New York. 1979. x + 497 pp. \$29.50.

This new edition of Burger's Medicinal Chemistry collects in a single book (Part I) 12 chapters devoted to the general principles of drug action and design. Not only is this advantageous from an organizational viewpoint, but it justifiably illustrates how increasingly important these general concepts are for the modern chemist in drug research. What in the previous edition took about 240 pp to describe has been doubled in size in the present edition. Parts II (April 1979) and III (in press) constitute separate books dealing with the different therapeutic classes of drugs.

After a historical introductory chapter by Alfred Burger the book continues with chapters in: 2. Drug Absorption, Distribution, and Elimination (J. R. Gillette and K. Sandy Pang); 3. Drug Biotransformations (L. K. Low and N. Castagnoli, Jr.); 4. Chemical and Biological Factors Influencing Drug Biotransformations (S. D. Nelson); 5. Receptor Theories and Dose-Response Relationships (H. G. Mautner); 6. Drug-Receptor Geometry (I. D. Kuntz, Jr.); 7. The Nature of the Drug-Receptor Bond (P. A. Kollman); 8. Guidelines for Drug and Analog Design (P. N. Craig); 9. Approaches to the Rational Design of Enzyme Inhibitors (D. V. Santi and G. L. Kenyon); 10. The Quantitative Analysis of Structure-Activity Relationships (K. C. Chu); 11. Drug Allergy (C. W. Parker); 12. Chemical Carcinogenesis (J. K. Selkirk).

All the chapters are well written and the book is almost error free. Naturally, in a book of this type each contributing author has a different approach in presenting his topic. Some chapters are written in a review-type style where the reader is very often referred to other sources of information. This approach, although useful for the researcher active in the field, leaves a gap for those interested in learning about the fundamental principles that are used throughout the chapter. Other chapters deal superbly with the subject matter, accomplishing the goal of both supplying the background information plus the most up-to-date list of advances to further clarify the basic principles. Typical of these are Chapter 3 by Low and Castagnoli and Chapter 9 by Santi and Kenyon. Chapter 2 is also very well presented and systematically organized. In this chapter a few cases illustrating the use of the derived equations for some real examples would have been welcomed by those not actively working in the field. Chapters 4 and 12 add relatively little to the book

in view of the extensiveness and ample coverage of Chapter 3. Finally, the very provocative topics covered in Chapters 5-8 are perhaps too concise and should have been treated more extensively.

The task of assembling a book of this sort is very difficult and the Editor should be congratulated for his success. This is, in summary, a very valuable book where the advantages outweigh the shortcomings and it should be a useful tool for the researcher and graduate student in medicinal chemistry.

Victor E. Marquez, *National Cancer Institute, NIH*

Measurement of Organic Pollutants in Water and Wastewater. ASTM Special Technical Publication 686. Edited by C. E. Van Hall (Dow Chemical Co.). American Society for Testing and Materials, Philadelphia. 1979. 357 pp. \$36.50.

This monograph contains papers presented at the ASTM-sponsored Symposium on the Measurement of Organic Pollutants in Water and Wastewater held in Denver in June 1978. The symposium was organized because of the need for reliable methods for the measurement of organic compounds, especially the so-called "priority pollutants" in water and wastewater. In addition to 20 technical papers, the book contains the meeting's keynote address on the EPA's toxics-related research and development and a colloquium in which five speakers reviewed the impact of the Consent Decree on analytical chemistry in industry. A summary by the editor concludes the publication; principal findings in each paper are described, and a brief review of the Consent Decree is presented.

All aspects of the total analysis system, including sampling, preservation, preparation, measurement, confirmation, and validation, are considered in the technical papers. Sample matrices studied include drinking water, advanced waste treatment water concentrates, municipal and refinery wastewaters, industrial effluents, natural waters containing fuel spills, and water from several alternate fuel processes. Compounds of interest were isolated by manual and continuous liquid-liquid extraction, purge and trap in the field and in the laboratory, semiautomated headspace sampling, and sorption by carbon and macroreticular resins. Chromatography on silica and alumina, steam distillation, and selective derivatization were used for fractionation and sample cleanup. Further separations and ultimate determinations were achieved by gas chromatography with selective detectors, gas chromatography-mass spectrometry, gas chromatography-infrared spectroscopy, and high-performance liquid chromatography with ultraviolet detection. Topics considered which relate to the quality of analytical results include composing errors, selection of internal standards, emulsion problems, contamination, and collaborative studies.

The contributors to this monograph, many of whom are world authorities in their fields, have clearly demonstrated the advances they have made in performing accurate determinations of organic priority pollutants. Illustrative of their progress is the authors' frequent use of automated procedures and glass capillary GC columns and the special emphasis which many give to laboratory quality assurance. Procedures described in these papers should increase the reader's ability to confront and overcome problems inherent in the analysis of complex aqueous samples and to produce reliable results from these determinations. This book should prove useful in all laboratories where modern instrumentation for water and wastewater analyses is used.

Dwight B. Easty, *The Institute of Paper Chemistry*

Advances in Organometallic Chemistry. Volume 18. Edited by F. G. A. Stone and R. West. Academic Press, New York. 1980. ix + 354 pp. \$42.50.

In this latest volume of a fine series, the editors have once again brought together a diverse range of topics written by specialists in the areas.

Four Decades of Metal Carbonyl Chemistry in Liquid Ammonia: Aspects and Prospects by H. Behrens (48 pp, 184 references) is a personal account of the author's work in this field, embellished with indications of the directions in which this work has led. The carbonyl metalates $M(CO)_2^{2-}$ and $M_2(CO)_{10}^{2-}$ ($M = Cr, Mo, W$) are the subject of the first section, which discusses their syntheses, structures, reactions, and derivatives. The reactions of metal carbonyls and their derivatives with ammonia are then covered, including substitutions, disproportionations, carbamoyl complexes, and cyanocarbonyls. Brief sections also cover reactions with multidentate nitrogen ligands and high-pressure syntheses.

Organolithium Catalysis of Olefin and Diene Polymerization by A.

*Unsigned book reviews are by the Book Review Editor.

F. Halasa, D. N. Schulz, D. P. Tate, and V. D. Mochel (39 pp, 130 references) discusses mechanistic considerations when *N,N,N',N'*-tetramethylethylenediamine is used in conjunction with the organolithium reagent. Polymerization of dienes in nonpolar media, with aggregation of the alkyl lithium, is then covered, followed by several aspects of reagents used in copolymerizations, such as dilithio compounds and other metalated copolymers. The last section covers the formation of terminally functional polymers by reactions of lithiated polymers or by use of functional organolithium reagents.

An overview of Ziegler-Natta catalysis by H. Sinn and W. Kaminsky (44 pp, 208 references) gives a well-referenced introduction to ethylene and α -olefin polymerization and the development of catalyst systems. Effects of catalyst changes on stereoselectivity are discussed, along with tailoring the catalyst to specific purposes. Mechanistic studies and side reactions of homogeneous catalysts and the effects of water on several systems complete this account.

A well-illustrated account of Chiral Metal Atoms in Optically Active Organo-Transition-Metal Compounds (H. Brunner, 50 pp, 194 references) deals with the optical resolution of enantiomers and diastereoisomers of various geometries. Separations and measurement of optical purity are exemplified, along with the effects of ligand transformations and metal-centered rearrangements. Other aspects such as optical induction and absolute configuration are covered with numerous examples. Some 180 optically active organo-transition-metal compounds are tabulated.

W. L. Gladfelter and G. L. Geoffroy's very readable account of Mixed Metal Clusters (63 pp, 161 references) includes a tabulation of over 160 compounds with characterization data, along with a 1979 update listing of a further 56 reported clusters. Synthetic and characterization methods are covered, with numerous examples. Several aspects of reaction chemistry are discussed and dynamic NMR studies on a number of systems are presented.

Trends in Organosilicon Biological Research by R. J. and J. S. Fessenden (22 pp, 107 references) gives a brief coverage of silicon analogues of known biologically active compounds, as well as examples of siloxanes and silatranes with activity but without carbon analogues. Specific examples in both areas are tabulated.

Boron Heterocycles as Ligands in Transition Metal Chemistry by W. Siebert (37 pp, 112 references) introduces boron heterocycles in terms of their electron donor abilities. On this basis the monometal derivatives are discussed for specific heterocycles such as boroles, boracyclobienes, borabenzenes, and borazines. Many of the examples discussed are sandwich compounds, particularly in the sections on di- and trimetal derivatives, which include triple- and tetra-decker sandwiches, as well as approaches to their development.

As in previous volumes in this series, each of the contributions provides a very useful overview of the chemistry, current and review literature, making this another valuable reference text for organometallic chemists.

Robert F. Gerlach, *University of Michigan*

Progress in Polymer Science. Volume 5. Edited by A. D. Jenkins (University of Sussex). Pergamon Press, Oxford. 1979. vii + 240 pp. \$50.00.

The fifth volume in this series contains three, generally well-written review articles of interest only to specialists in the field: (1) Gas Chromatographic Measurements of Polymer Structure and Interactions (60 pp) by D. G. Gray, (2) Photo-Chemical Probes in Polymers (33 pp) by J. L. R. Williams and R. C. Daly, and (3) Polymer Supported Catalysts (131 pp) by Y. Chauvin, D. Commercuc, and F. Dawans. Although the volume is published in 1979 there are no references beyond mid-1976.

H. L. Frisch, *State University of New York at Albany*

Metal and Metalloid Amides: Syntheses, Structures and Physical and Chemical Properties. By M. F. Lappert (University of Sussex). P. P. Power, A. R. Sanger, and R. C. Srivastava. Ellis Horwood Ltd., Publishers, Sussex; J. Wiley and Sons, Distributors, New York. 1980. 847 pp. \$145.

This fine book represents the first comprehensive coverage of metal and metalloid amides. That it has been long due is reflected by its collection of some 2400 compounds, with over 3000 references, dating back to 1856.

The book is divided into two main parts: Part I presents the syntheses, structures, and properties of metal and metalloid amides, with chapters devoted to each of the Main Groups I to V, Transition Metal and f-Block amides and amides of Zinc, Cadmium and Mercury. Each of these chapters includes a comprehensive table, listing known amides by element, giving preparative methods, physical data, and spectroscopic data used in characterization. Each chapter in Part I begins with an introduction to the chemistry of the subsection, along with reference to the review literature on it. All synthetic methods are covered, with liberal use of specific examples. The section on physical properties includes a

lot of structural work, with some 110 X-ray and 20 electron diffraction studies presented and discussed.

Part II covers the chemical properties and applications of metal and metalloid amides. Nine chapters deal with insertion reactions, reactions with protic compounds and metal hydrides, metatheses, dehydrochlorinations, amides as Lewis acids and bases and as polymerization initiators, along with miscellaneous areas such as eliminations, rearrangements, and disproportionations. This part of the book features tables which list over 2500 specific reactions of individual amides by reaction type.

The work has been very well subdivided and is quite readable. Referencing and cross-referencing, an important part of any review work of this nature, is excellent. In Part I, sub-sectional references appear at the end of each chapter. References in Part II are collected together after the final chapter. In addition, a comprehensive Author Index lists reference both by page and reference number. The Subject Index, along with the more detailed lists of contents preceding each chapter, also provide good subject coverage. Referencing is comprehensive to mid-1978, with some updating to the end of 1978 having been made at the proof stage. An important feature of the book, allowed by such a comprehensive collection of data, is the use of many intra- and inter-group comparisons of numerous aspects of the work discussed. It also allows the authors to discuss and comment on many of the apparent trends in metal/metalloid-amide chemistry, as presented in the literature.

This is an important reference text for this area of chemistry and will be of value to main group and organometallic chemists alike. In view of this, it is indeed unfortunate that its price is likely to prove prohibitive for individual chemists and restrict its market to libraries.

Robert F. Gerlach, *University of Michigan*

Inorganic Reaction Mechanisms. Volume 6. (Specialist Periodical Reports). Edited by A. McAuley (University of Victoria). The Chemical Society, London, 1979, xix + 472 pp. \$75.00.

Volume 6 reviews the literature from June 1976 to December 1977, comprising almost 2000 references. The organometallic section (Part IV) also includes a selected bibliography of relevant material at the end of each chapter. There is a valuable cited-author index as well. The format and the goals are the same as its predecessors. Emphasis is placed on work which involves solution kinetic and mechanistic studies. The book is divided into four parts: Part I, Electron Transfer Processes (128 pp); Part II, Substitution and Related Reactions (167 pp); Part III, Reactions of Biochemical Interest (45 pp); Part IV, Organometallic Compounds (113 pp). Fortunately, the reporters continue to make ample use of figures and tables of data, which add substantially to both its readability and its value.

Wayne L. Gladfelter, *University of Minnesota*

Introduction to Magnetic Resonance. By A. Carrington and A. D. McLachlan (University of Southampton and MRC Laboratory of Molecular Biology, Cambridge). Chapman and Hall Ltd., London EC4P 4EE, England. 1979. xix + 266 pp. \$16.95.

This introductory paperback book on magnetic resonance originated from a 16-lecture course given to final-year chemistry undergraduate students at Cambridge. It sets forth the important principles of nuclear magnetic resonance (NMR) and electron spin resonance (ESR) clearly, yet succinctly, and contains several examples to illustrate the scope and applications of the technique.

The text consists of 13 chapters: (1) Principles of Magnetic Resonance; (2) Magnetic Resonance Spectra of the Hydrogen and Helium Atoms; (3) Nuclear Resonance in Solids; (4) The Analysis of NMR Spectra in Liquids; (5) Interpretation of Chemical Shifts and Spin-Spin Couplings; (6) ESR Spectra of Organic Radicals in Solution; (7) ESR of Trapped Radicals in Solids; (8) ESR of Organic Molecules in Triplet States; (9) Theory of the *g* Tensor and the ESR Spectra of Inorganic Radicals; (10) ESR of Transition Metal Ions and Complexes; (11) Spin Relaxation; (12) The Study of Molecular Rate Processes; and (13) Nuclear Resonance in Paramagnetic Systems—Double Resonance. It also contains nine appendices: (A) Matrix Elements and Eigenvalues; (B) Time-Independent Perturbation Theory; (C) Spin Angular Momentum; (D) Tensors and Vectors; (E) Time-Dependent Perturbation Theory; (F) Calculation of T_1 and T_2 for a Spin of $1/2$; (G) The Power Spectrum of a Random Function; (H) The Diffusion Equation for Brownian Motion; and (I) Tensor Averages in a Rotating Molecule. A short bibliography appears at the beginning of each chapter and suggestions for further reading can be found at the end of each chapter. Each chapter and appendices A, C, and D contain problems which allow the student to practice as well as extend the concepts covered in the text.

Although the authors attempt to simplify the mathematics, they do not sacrifice rigor in adopting a quantum-mechanical approach and making frequent use of matrix algebra. Unfortunately, this paperback

edition is unaltered from the original hardbound edition, which was published in 1967. Notably lacking in the text is any discussion of the many important advances that have been made in magnetic resonance in the past 13 years, such as Fourier transform NMR and saturation transfer ESR. The contents and pedagogical approach adopted by the authors makes this book most appropriate for first-year graduate students who are interested in learning the fundamental principles of magnetic resonance, and for this purpose it is highly recommended.

William S. Glaunsinger, *Arizona State University*

Dynamics of Synergetic Systems. Edited by H. Haken (Institut für Theoretische Physik der Universität Stuttgart). Springer-Verlag, New York. 1980. viii + 271 pp. \$37.50

This book, the sixth volume in the Springer Series in Synergetics, contains the 22 invited papers from a symposium held September 24–29, 1979, at ZIF (the Center for Interdisciplinary Research) in Bielefeld, Bielefeld, Federal Republic of Germany. The range of topics covered is broad, from Critical Properties of Relativistic Bose Gases, by D. E. Miller, R. Beckmann, and F. Karsch, to Dynamics of Interacting Groups in Society with Application to the Migration of Population, by W. Weidlich and G. Haag, but two-thirds of the book is devoted to subjects of direct interest to chemists: nonequilibrium transitions, chemical waves, chemical turbulence induced by diffusion, and cooperative replication of groups of macromolecules. Qualitatively, each of the systems exhibits self-organization in space, time, or function (synergism); mathematically, most are modeled by nonlinear reaction-diffusion equations or by master equations.

As a compendium of theoretical results, the book will be useful to researchers in the field. It includes a discussion by W. Horsthemke of nonequilibrium transitions induced by external noise, a report by P. C. Fife on the use of multiple scaling techniques in analyzing "target patterns" (expanding concentric chemical waves), and two chapters by Y. Kuramoto and O. E. Rössler on the types of chaotic behavior observable in reacting systems. A. Nitzan's paper shows that reaction-diffusion equations near the critical point for nonequilibrium transitions can be reduced to a corresponding time-dependent Ginzburg-Landau equation. Also of interest to the specialist are the mathematical contributions [L. Arnold, T. Poston (Structural Instability in Systems Modelling), and J. W. Turner] and the discussions of negative surface tension (Y. Kuramoto) and negative or complex noise (C. W. Gardiner).

Of more general interest are two chapters on prebiotic evolution by P. Schuster and K. Sigmund and three on the dynamics of multicellular systems by A. Babloyantz, H. G. Othmer, and R. Leféver. Chemical Waves in the Oscillating Zhabotinskii System by M. L. Smoes contains very striking illustrations of Zhabotinskii waves at high and low concentrations of malonic acid. This paper includes a detailed presentation of experimental data and controversial comments on one-wave and two-wave theories.

The book accurately portrays the current status of synergetics. As a group, the papers not only present recent advances in the field but also suggest important unresolved experimental and theoretical problems.

Katharine L. C. Hunt, *Michigan State University*

Kinetics of Fast Enzyme Reactions. By Keitaro Hiromi (Kyoto University). John Wiley and Sons, Inc., New York. 1979. x + 346 pp. \$47.50.

The advent of commercially available instruments for determining the kinetics of reactions with half-lives in the micro- to millisecond range has enabled many laboratories routinely to measure the transient kinetics of enzyme reactions. Indeed, the search for the elusive intermediate(s) on the pathway from substrate to product now may depend more on the availability of a suitable signal than on instrumentation. This book should be a valuable adjunct to such rapid kinetic studies. It is organized into six chapters, including a historical introduction to enzyme kinetics, a description of the measurement of fast reactions, observations of enzyme reactions, analysis of transient kinetics, the mechanistic interpretation of kinetic data, and lastly, the application of transient kinetics to elucidation of the mechanism of two enzyme-catalyzed reactions: *p*-hydroxybenzoate hydroxylase (a multisubstrate enzyme) and lysozyme.

The book contains little new or unique information and therefore may be of limited value to the experienced enzyme kineticist; however, the chapters on methods and analysis of transient kinetics summarize basic information which should be useful to kineticists new to the field of enzymology or to enzymologists new to the field of rapid kinetics. The former chapter gives a valuable summary of both the stopped flow and relaxation methods, including descriptions of the apparatus, how to make the measurements, testing the apparatus, and, importantly, how to recognize and eliminate various artifacts which can plague the unwary investigator. The technical description of stopped flow instruments naturally focuses predominantly on one of Japanese manufacture, with

little information on those more commonly available in American laboratories.

While numerous figures and diagrams are reproduced from the original literature describing various specialized instruments (such as a pressure jump apparatus and a stopped flow device which detects changes in circular dichroism), sufficient detail are not presented that such instruments could be constructed without reference to the original literature. Thus these figures contribute little to the usefulness of the book while probably adding substantially to its cost.

The chapter on kinetic analysis summarizes derivations of various standard kinetic equations, including the mathematics of the relaxation kinetics of complex systems and the approach to the steady state in enzyme-catalyzed reactions. The author makes good use of numerous examples from the literature, as well as simulations of complex systems to illustrate basic points. However, nothing is presented on the useful technique of numerical integration for analyzing complex reaction pathways whose differential equations cannot readily be integrated by exact methods.

The two chapters described above, as well as the final one on the transient kinetics of the hydroxylase and lysozyme, will be especially useful to those teaching graduate level courses in enzyme kinetics and mechanism. Students will see both the utility and the deficiencies inherent in the kinetic approach. The examples analyzed make evident the importance of correlating kinetic data with that obtained by using other physical methods such as NMR and X-ray crystallography. Each chapter also includes several sets of problems (without answers); some of these exercises are trivial, such as classifying various enzymes, while others provide the student an opportunity to derive rate equations, design experiments, plot data, and draw conclusions from the data.

The book unfortunately has no author index, although several hundred references to the original literature are cited. In addition, few papers later than 1976 are cited, with the exception of some from the author's own laboratory. It was also disappointing to see little discussion of the technique of flash photolysis. Although directly applicable only to photosensitive systems, recent work from the laboratory of Frauenfelder on ligand binding to hemoproteins, and from that of Rentzepis on rhodopsin, is providing unique insight into the dynamics of protein-ligand interaction which is surely relevant to other macromolecule-small molecule binding processes.

Robert D. Gray, *University of Louisville*

Chlorophyll Organization and Energy Transfer in Photosynthesis. Ciba Foundation Symposium 61 (new series). Excerpta Medica, Amsterdam. 1979. xi + 374 pp. \$38.25.

Appropriate to the title, the proceedings of this symposium, chaired by Sir George Porter, consist of published papers and accompanying discussion of 16 major presentations covering a wide range of study of the structure, organization, and function of antenna and reaction-center chlorophyll and energy transfer in photosynthetic processes. Following Sir George's opening remarks which primarily delineate those questions which are to be addressed by the 24 participants, the opening chapter (Katz, Shipman, and Norris) provides an extensive discussion of photo-reaction-center chlorophyll, including models for the primary electron-donor species and photochemical function. An examination of the spectra and photochemistry of monomeric and aggregated chlorophyll absorbed on polyethylene (Seely) is aimed toward understanding chlorophyll-glycolipid interaction in the chloroplast. These papers are followed by studies of chlorophyll pigment-protein complexes, including carotenochlorophyll-protein complexes, derived from purple bacteria (Cogdell and Thornber) and brown algae (Anderson and Barrett) wherein structural and functional implications of absorption, fluorescence, emission, and circular dichroism spectra are considered. Also included in this general area of emphasis is a resonance Raman study of chlorophyll-protein complexes prepared from green and blue-green algae and higher plants (Lutz, Brown, and Rémy) and a fluorescence study (Knox and Van Metter) aimed toward development of a model of light-harvesting chlorophyll *a/b*-proteins. Polarized photochemistry is employed in an elucidation of structural possibilities in chlorophyll *a* dimer in photosystem I (Junge and Schaffernicht) and a detailed paper on chloroplast structure delineating ionic and gravitational effects on stacked and unstacked thylakoid membranes utilizing electron microscopy and photofluorometry is presented neatly by Staehelin and Arntzen.

Emphasis on the chemical dynamics of energy transfer is found in papers dealing with models of the photochemistry of the photosynthetic system (Altmann, Beddard and Porter; Butler), studies of the kinetics of fluorescence on a picosecond time scale (Paillotin and Swenberg; Searle and Tredwell), and effects of structure, orientation, and properties of membranes on exciton migration (Breton and Geacintov) and energy transfer (Barber). A paper by Rijgersberg, Melis, Amez, and Swager addressing fluorescence quenching and chloroplast activity at reduced

temperatures and Duysens' report on transfer and trapping of excitation energy in photosystem II complete the formal presentations of those portions of the symposium emphasizing energy transport.

Thus, breadth is provided in the accentuation of structure on one hand and dynamics on the other, with considerable attention to theory in both areas. To this reviewer, one of the more interesting contributions of the book is a type of summary chapter entitled General Discussion which contains retrospective comments on the symposium (Clayton); speculation as to the role of manganese in oxygen evolution (Porter); the state of chlorophyll aggregation in photosystems I and II and in the light-harvesting unit (Katz); chlorophyll-protein complex structure (Thornber); and a comparison of Paillotin-Swenberg and Searle-Tredwell treatments of fluorescence kinetics (Knox). It is an understatement to say that the discussion is candid and spirited.

The book will suffer, as do all books on symposia, in soon being out of date. However it holds much appeal in that some chapters are informative even to the novice and the book will represent, for a time, the state of understanding of many who work at the frontier of a fascinating field. It is a book that delineates some of this understanding and also reveals something of the individuals and the scientific zeal of those at work on this frontier.

Henry C. Kelly, *Texas Christian University*

Nitrogen-15 Nuclear Magnetic Resonance Spectroscopy. By G. C. Levy (Florida State University) and R. L. Lichter (Hunter College, CUNY). John Wiley and Sons, New York. 1979. ix + 221 pp. \$17.50

The authors give a brief discussion of experimental methods (Fourier Transform NMR techniques, sample preparation, decoupling), citing specific pulse parameters for various nitrogen functional groups. Counter examples from ^1H and ^{13}C NMR spectroscopy provide comparisons to chemists already familiar with the latter. Nitrogen chemical shifts and scalar coupling constants are tabulated for a wide variety of compounds. The authors devote a chapter to ^{15}N spin-relaxation mechanisms and their practical consequences. Finally, there is a chapter on applications of ^{15}N NMR to determination of structure and elucidation of reaction mechanisms in organic and biochemical systems. This monograph will be a useful practical guide to an organic chemist already familiar with NMR spectroscopy and interested in doing ^{15}N NMR spectroscopy at the natural abundance level.

It is unfortunate that the chemical shift tables, potentially the most useful contribution of this book, are based on a poor choice of reference. The authors make a good case for using neat liquid nitromethane as the most suitable reference, since it is inherently reproducible, as opposed to the wide variety of references which have been used in the literature. Unfortunately, they then refuse to follow their own advice. They tabulate all ^{15}N chemical shifts with respect to anhydrous liquid ammonia at 25 °C. This only adds to the confusion in nitrogen chemical shifts in the literature. ^{15}N in liquid ammonia has a large nonlinear temperature dependence, and discrepancies exist in the various reports of chemical shifts of NH_3 liquid and vapor at various temperatures. Tabulation of chemical shifts with respect to some well-defined environment other than that of a reproducible practical reference can sometimes be justified. However, the reasons given by the authors in this case are spurious. The use of a standard corresponding to maximum shielding does not facilitate comparison of chemical shifts with those of other nuclei since chemical shift ranges are different for different nuclei; meaningful comparisons can be made only if the standard chosen for each nucleus is as close to the bare nucleus as possible.

Cynthia J. Jameson, *University of Illinois at Chicago Circle*

Joseph Priestly: Scientist, Theologian, and Metaphysician. By Erwin N. Hiebert, Aaron J. Ihde, and Robert E. Schofield. Edited by Lester Kieft and Bennett R. Willeford, Jr. Bucknell University Press, Lewisburg, Pennsylvania. 1980. 117 pp. \$12.00.

This small book contains three papers presented at a symposium commemorating the bicentennial of the discovery of oxygen by Joseph Priestly (1733-1804). The symposium was one of the special events at the Ninth Middle Atlantic Regional Meeting of the American Chemical Society at Wilkes-Barre, Pennsylvania, April 23-26, 1974.

In a preface, the editors tell something about the life and work of Priestly and about the history of the house he had built in Northumberland, Pennsylvania. Priestly lived in this house from its completion in 1794 until his death. It has been restored by the Pennsylvania Historical and Museum Commission. The preface is followed by several illustrations. It is particularly interesting to compare a sketch of Northumberland in 1798 with a 1970 photograph of the restored Priestly House.

The three papers were each written by an eminent Priestly scholar. The title of Erwin N. Hiebert's paper is The Integration of Revealed Religion and Scientific Materialism in the Thought of Joseph Priestly.

Professor Hiebert confesses that his task was a formidable one since Priestly left a collection of theological and miscellaneous works comprising 26 volumes! It would be interesting to learn what today's theologians think of Priestly's theological writings but since Professor Hiebert is an historian of science, not a theologian, his paper focuses on Priestly's religious career and writings. Professor Hiebert presents his materials in an interesting and thought-provoking way.

Professor Aaron J. Ihde's paper, Priestly and Lavoisier, the only illustrated paper of the three, tells the story of the one meeting between these two men. This paper also answers the questions, what did Lavoisier know (about oxygen) and when did he learn it and what did Priestly learn and why didn't he believe it?

I am sorry to report that Professor Ihde's admirable book, "The Development of Modern Chemistry" (1964), is now out of print.

The third paper, Joseph Priestly and the Physicalist Tradition in British Chemistry, is by Robert E. Schofield.

The editors deserve the gratitude of the American chemical community for bringing these important papers before a wider audience.

David H. Kenny, *Michigan Technological University*

Numerical Modeling of Detonations. By Charles L. Mader (Los Alamos Scientific Laboratory). University of California Press, Berkeley, California. 1980. x + 485 pp. \$40.00

In addition to the traditional uses of explosives for weapons technology and peacetime construction of roads and tunnels, the employment of blasting techniques is currently being applied to the production of fossil fuels. This book draws from 20 years of work in detonations at Los Alamos and is characterized by a profusion of figures, tables, examples, experimental records, and photographs detailing the successes and failures of computer modeling of high explosive phenomena. The author presents in a logical fashion several problems and the attempts at their solution. The reader is introduced to the jargon of the discipline: Forest Fire, Pop plot, HOM equation of state, abbreviations to various explosives. The bibliography reveals many sources of material to the reader in the form of government reports, symposia, and private communications.

Amidst all of the technical material are interjected valuable conclusions and comments; e.g., "Being the first to arrive at the scene of the (fatal) accident, the author found a scene that often returns when he is tempted to be overconfident about his understanding of the initiation mechanisms of explosives." The author points the way to additional effort... "One of the challenges for future modeling numerical modeling will be to..." This book is a valuable contribution to the literature of detonations for both the practicing scientist and those who are entering the field.

R. D. Kern, *University of New Orleans*

An Introduction to the Chemistry and Biochemistry of Pyrimidines, Purines, and Pteridines. By D. T. Hurst (Kingston Polytechnic). John Wiley and Sons, Ltd., New York. 1980. viii + 266 pp. \$39.00.

This text describes in introductory terms the chemistry and biochemistry of the pyrimidines, purines, and pteridines. In so doing, the author has succeeded in his attempt to coherently bring together a wide range of information on these nitrogenous compounds. The first chapter deals with the basic chemistry of nitrogen heterocycles. After building a base of understanding through a discussion in subsequent chapters on the chemical properties and reactions of the nucleosides and nucleotides, the book follows with an outline of the biosynthesis and metabolism of the purine and pyrimidine nucleotides and then the nucleic acids. A brief description of the function of the nucleic acids, including replication, transcription, and translation, is interfaced at this point. The final chapters conclude with a treatment of the pharmacology of nitrogenous heteroaromatic compounds. Being designed as an introductory text the volume suffers from the lack of detail desired by many readers; however, the author has provided an extensive bibliography to supplement each chapter. The presentation of information is both logical and understandable and provides an excellent starting point for those interested in this subject area.

Roger A. Lewis, *University of Nevada*

Macromolecular Syntheses. Volume 7. Edited by Edward M. Fettes. John Wiley and Sons, Inc., New York. 1979. ix + 105 pp. \$22.50.

The original purpose of the "Macromolecular Syntheses" series was to provide detailed, tested procedures for synthesis of macromolecular compounds. Volume 7 continues to meet this objective in the tradition of earlier volumes. The 22 polymer syntheses lucidly detailed in this volume encompass a broad range of polymerization mechanisms and of product structures. Solid, liquid, and gaseous monomers are utilized. Polymerizations include 8 step-growth and 14 chain-growth types, with examples of the latter proceeding by free radical, anionic, cationic and

γ -ray induced mechanisms. Some proceed with ring opening, some by ring closing, and others with rearrangement. Others involve formation of "derived" polymers, i.e., polymers prepared by chemical modification of another polymer because of the inaccessibility or undesirability of any direct route. Macromolecular products of the 22 syntheses include homopolymers (some stereoregular) as well as random, alternating, block, and graft copolymers. Methods and product structures are, in general, slightly more complex than those in the earlier volumes.

In each synthesis, details are given on the origin and purification of starting materials, and specific procedures are given on all syntheses, isolations, purifications, and characterizations. Yield range, rather than just the best yield obtained, is given in each case.

Volume 7 also contains a comprehensive and well-done index to Volumes 6 and 7.

The principles and methods implicitly and explicitly related in these syntheses will be helpful in teaching polymerization science. The practicing polymerization scientist will find the syntheses very helpful. Also the scientist who periodically needs to prepare a polymer will be nicely served by the detailed syntheses in this and prior volumes of "Macromolecular Syntheses".

James F. Kinstle, *The University of Tennessee*

Polymers as Aids in Organic Chemistry. By N. K. Mathur, C. K. Narang, and R. E. Williams. Academic Press, New York. 1980. xi + 258 pp. \$32.50.

This timely book is very useful in that in one volume of 15 chapters, it examines a wide variety of different aspects and uses of polymers in organic chemistry up to the end of 1978 and including some 1979 references. The chapters (number of references in each chapter are given in parentheses) are: Introduction (29); Polymeric Support Materials (153); Determination of Functionalization in Polymer Supports (61); Polypeptide (172), Oligonucleotide (84) and Oligosaccharide (30) Synthesis on Polymer Supports; Peptide Synthesis Using Polymeric Active Esters (43); Solid-Phase Sequencing of Peptides and Proteins (48); Polymeric Supports in General Organic Chemistry (41); Polymer-Supported Asymmetric Synthesis and Resolution of Racemates Using Asymmetric Polymeric Materials (66); Application of Polymeric Supports in Identifying Reaction Intermediates (17); Polymer-Bound Reagents (105); Polymer-Bound Catalysts [I] (137); Polymer-Bound Catalysts [II] Transition Metal Complexes Bound to Polymers (74); and Polymers as Aids in Related Areas of Chemistry (79). The authors have resurrected some references that are not well known but have omitted some others when they could just as well have been included, considering the size (6 x 9 in.) and price of the book. One of the major strengths of this book lies in the tables of functionalized polymers that are listed in the various chapters. Thus a chemist, doing solid-phase peptide synthesis requiring a new type of functionalized polymer, might not be aware of its existence if used in general organic synthesis on solid phases. This text would provide a ready source of such information. There are few typographical errors and the text is easy to read. There is a short subject index. Although many of the chapters outlined above have been treated more comprehensively in separate review articles or chapters in books by many authors, this text brings most aspects of polymers in organic chemistry together in one convenient source and is recommended for all those interested in all but the narrowest aspects of polymers in organic chemistry.

Clifford C. Leznoff, *York University*

The Permutation Group in Physics and Chemistry. Edited by Jürgen Hinze (Universität Bielefeld). Springer-Verlag, Berlin. 1979. vi + 230 pp. \$14.00.

This paperbacked volume, No. 12 in the Springer "Lecture Notes in Chemistry" series, consists of 13 articles based on talks given at the Symposium on this topic held at the Centre of Interdisciplinary Studies at the University of Bielefeld in July 1978. Besides the editor, the organizers of the symposium were Andreas Dress of Bielefeld and Ernst Ruch of Berlin.

In recent years, the permutation group has found increasing application to such chemically interesting problems as the counting of isomers, the elucidation of reaction mechanisms, the study of nonrigid molecules by group-theoretical means, and the classification of chiral properties of molecules as they vary between isomers, to mention a few. The techniques used in these applications often go considerably beyond the traditional chemist's group theory in sophistication, and have thus remained a closed book to most chemists, including many theoreticians. For those who have acquired a little bit of this extra sophistication, the present volume is a useful introduction to the present state of the art, but those to whom orbits and double cosets are mysterious will find it hard reading.

Rather than review all 13 articles, this review confines itself to brief mentions of a few that the reviewer found particularly interesting. While

this will reflect the reviewer's prejudices to some extent, the selection is sufficiently typical to convey an idea of the scope of the book.

The first three articles, by Kerber and Nourse, introduce the reader to the current state of the art in isomer counting and mechanism elucidation. An interesting article by Dress discusses a geometrical definition of the symmetry group of a nonrigid molecule. Berry gives an excellent account of the recent work of his group in correlating highly ordered structures with disordered ones, from structured molecules to liquid drops. Biedenhard and Louck present a new technique for describing the representations of the permutation group in terms of Gel'fand patterns and "Boson polynomials", followed by an application to the coupling of n spin $1/2$ angular momenta. Seligman discusses the use of double cosets in evaluating matrix elements, and the following article by Frame contains an elegant discussion of various applications of double cosets. This article is hard reading for a chemist, but worth the trouble. Ruch himself is not represented in the volume, but the final article, by Dress, summarizes in mathematical form some of his work on the theory of chirality functions with the use of the permutation group.

All in all, this is a quite useful volume, though the chemist with just the usual "Group Theory in Chemistry" course as background should not expect easy reading.

C. Alden Mead, *University of Minnesota*

Electroanalysis in Hygiene, Environmental, Clinical and Pharmaceutical Chemistry. Edited by W. F. Smyth (Chelsea College, University of London). Elsevier Scientific Publishing Co., Amsterdam. 1980. xi + 473 pp. \$70.75.

This book, volume 2 in the "Analytical Symposia Series", reports the proceedings of a recent conference organized by the Electroanalytical Group of the Chemical Society, London. Over 35 papers are presented dealing with the practical applications of potentiometric and voltammetric techniques in the fields of hygiene, clinical, environmental, and pharmaceutical chemistry. The volume is appropriately divided into these four subfields. Subjects covered by the plenary and keynote lectures in the clinical chemistry section include: new ion-selective electrodes (W. Simon et al.), calcium-selective probes (G. J. Moody and J. D. R. Thomas), polarography of nucleic acids (E. Palecek), voltammetric detection of DNA radiation damage (J. M. Segurar and P. Valenta), and clinical importance of redox measurements (J. Chayen). Other papers in this section introduce a wide range of interesting and innovative clinical analysis techniques. Especially informative are two reports dealing with the practical considerations relevant to automating ion-selective electrode systems (W. J. Scott and D. B. Kell). A subsequent separate section provides further information concerning on-line analysis with the use of electrochemical detection.

Coverage of electroanalysis in industrial hygiene includes papers on electrochemical gas monitors (I. Bergman), determination of mercury in urine by stripping voltammetry (D. Jagner and K. Aren), and novel techniques for cadmium and zinc analysis. A new carbon fibre pH electrode is also described (V. J. Jennings).

Pharmaceutical applications of electroanalysis are introduced in two fine overview papers (G. J. Patriarcho and E. Jacobson). Emphasis here is placed on polarographic and biamperometric methods as applied to formulation analysis and trace measurements of drugs and metabolites. Additional original research presentations offer more specific methodologies in these areas.

Finally, electrochemical measurements as applied to environmental chemistry are discussed within two subsections, inorganic and organic analysis. Leading research efforts in the areas of voltammetric analysis of toxic metals, pesticides, carcinogens (including nitrosamines), and organic wastes are well documented.

Overall, this volume provides a good up-to-date summary of the research activities currently being undertaken in the more applied aspects of electrochemical analysis. As such, it should be worthwhile reading for electrochemists as well as for workers in other disciplines who seek new, simplified methods for performing important analytical measurements.

Mark E. Meyerhoff, *The University of Michigan*

Analysis with Ion-Selective Electrodes. By J. Vesly and D. Weiss (Geological Survey, Prague) and K. Stulik (Charles University, Prague). Ellis Horwood Limited, Chichester. 1978. 245 pp.

This well-organized book offers an excellent overview of the rapidly expanding field of ion-selective electrode (ISE) analysis. Emphasis is placed on the practical aspects of ISEs and the wide range of measurements which can be made with these simple devices. The book contains four chapters. The initial chapter deals superficially, yet adequately for most purposes, with the theory of membrane potentials, the types of ISE membranes and the methods of determining electrode selectivity coefficients. It is a good introductory chapter to the subject and contains most of the pertinent theoretical equations describing ISE behavior.

Chapters two and three are devoted to presenting the reader with an experimental working knowledge of ISE instrumentation and analytical measurement techniques. This includes discussions of electrode construction and design, reference electrodes, sample preparation, discontinuous measurement methods, and the design of automated ISE systems. Short sections on factors influencing analytical accuracy and precision as well as clear schematic diagrams of the electrodes add to this presentation.

The final chapter provides an exhaustive up to date survey of the practical applications relevant to each ISE system. This section is organized according to the type of compound or element to be determined (i.e., fluorine, sulfur, nitrogen, calcium, magnesium, etc.) and contains over 800 references to original research papers. Summary tables, scattered throughout, cite the references associated with each analyte according to the field of application (e.g., atmosphere, soil analysis, foodstuffs, physiological samples, etc.). Additional appendices provide useful tables and conversion factors required for various ISE methods. In view of its concise style and organization, this book can be highly recommended to anyone wishing to get started in ISE analyses. It should also serve as a valuable reference book for those already working in the area.

Mark E. Meyerhoff, *The University of Michigan*

Homogeneous Catalysis: The Applications and Chemistry of Catalysis by Soluble Transition Metal Complexes. By George W. Parshall (E.I. du Pont de Nemours and Co.). John Wiley and Sons, Inc., New York, 1980. xi + 240 pp. \$28.00.

This book is a well-written, concise overview of transition metal homogeneous catalysis from an industrial perspective. After a short section on basic unifying concepts of organotransition metal chemistry, there are extensive discussions of catalyzed reactions of various organic substrates. Chapters are devoted to isomerization, hydrogenation, polymerization, addition, and oxidation reactions of olefins and dienes, reactions of CO, arenes, and acetylenes, the intermediacy of carbene/alkylidene complexes in olefin metathesis and alkane reactions, hydrocarbon oxidation by dioxygen, and condensation polymerization and related reactions. All industrial processes which are catalyzed by soluble metal complexes are described, and there is good coverage of reactions which are reported only in the patent literature. Particular reactions, whether employed on an industrial or laboratory scale, are discussed in practical terms which emphasize conditions, yields, product separations, and economic and engineering advantages and disadvantages. Reaction course as a result of kinetic and stereochemical factors is pointed out in many places. A summary of current mechanistic information, including analogues from the literature for unusual intermediates, is then provided. This logical organization is backed up by extensive scientific and patent literature references after each chapter. The last chapter lists a number of trends in catalysis research and feedstock utilization from the author's point of view.

Many chemists and engineers would benefit from this readable book. It is useful particularly for advanced inorganic/special topics courses which delve into homogeneous catalysis, especially when coupled with a text which covers basic organometallic concepts in greater detail. Active researchers in catalysis and organometallic chemistry will also find this book invaluable for several reasons. The author points out many areas where limited mechanistic information is known or where the details are controversial; such insights should promote further work in these areas. In this regard a minor but useful addition to this book would have been a listing of reactions, such as anti-Markownikoff additions to olefins or metathesis of functionalized olefins, which cannot be catalyzed either homogeneously or heterogeneously with current technology. The points made in the last chapter on trends in research, where areas such as feedstock evolution, enhancement of catalyst selectivity, hybrid (supported) catalysts, and photoactivation and metal cluster catalysis are discussed in varying detail, also should stimulate further research.

Despite the fast-moving nature of this area, this book is a very current treatment of this extensive and increasingly important field.

Louis Messerle, *The University of Michigan*

Gas Chromatography with Glass Capillary Columns (Second Edition). By Walter Jennings (University of California, Davis). Academic Press, Inc., New York, 1980. xii + 320 pp. \$25.00.

When the first edition of this book was published in 1978, one reviewer found it to be "an excellent text and reference book, well organized, well written, and well worth its price". The same can be said about this second edition which contains several new sections with nearly double the number of pages and which costs less per page than the first edition.

This book covers all the theoretical and practical aspects of glass capillary columns, including the recently introduced flexible fused silica columns. There are sections, some entirely new, on how to convert a conventional gas chromatograph to handle capillary columns, how to

attach the columns to the inlet and the detector, and how to evaluate the entire system, including the inlet, the detector, the electrometer, and the recorder. There are initial and final checkout procedures and separate sections describing the important methane injection and test mixture injection.

Glass capillary columns are not inexpensive and at the same time their performance can be severely compromised when certain factors are overlooked, even factors that may appear to be relatively minor. This book contains everything one needs to know to avoid compromises in capillary column performance; it could easily pay for itself many times over.

John G. Nikelly, *Philadelphia College of Pharmacy and Science*

Polymer Colloids. Volume II. Edited by Robert M. Fitch. Plenum Press, New York, 1980. xi + 684 pp. \$69.50.

This book includes most of the papers from the ACS Symposium held in Miami Beach in September 1978. Thirty-three papers, covering light-scattering measurements, surface properties (including surfactant absorption, physical properties, and synthesis), flocculation, and emulsion polymerization, are included. The papers include both reports on original research and discussions of historical results; individual contributions are in the range 10-30 pages. Most of the papers in this volume emphasize the study, in volume or on surfaces, of polymer (especially polystyrene) latexes as model colloids; material on detergent solutions and surfactant-latex interactions is also included.

A unique feature is the full-color front plate, showing some of the iridescence effects visible in the laboratory. This volume should be of interest to researchers and graduate students interested in the physical properties and synthesis of these systems.

George D. J. Phillips, *The University of Michigan*

Spin Labeling. Volume II. Theory and Applications. Edited by L. J. Berliner (Ohio State University). Academic Press, New York, 1979. xiii + 357 pp. \$32.00.

This is the second volume of a two-volume series on the theory and methodology of spin labeling and the use of nitroxide radicals. (Volume I was published in 1976.) Like its predecessor, this book contains chapters on a variety of topics relevant to spin labeling in chemistry, biology, and medicine, as well as a chapter on the chemistry and synthesis of nitroxides. Both sophisticated theory and practical aspects are covered.

The chapters included are: Saturation-Transfer Spectroscopy, by J. S. Hyde and L. R. Dalton; The Spin-Probe-Spin-Label Method, by J. S. Hyde, H. M. Swartz, and W. E. Antholine; New Aspects of Nitroxide Chemistry, by J. F. W. Keana; Spin-Labeled Synthetic Polymers, by W. G. Miller; Spin Labeling in Pharmacology, by C. F. Chignell; Spin Labeling in Biomedicine, by L. H. Piette and J. C. Hsia; and Applications of Spin Labeling to Nucleic Acids, by A. M. Bobst. The authors are active and well-known contributors in their fields, and the chapters are well-written. This group of reviews provides an expert summary of a unique and important field of research.

William A. Pryor, *Louisiana State University*

Actinide Separations. Edited by James D. Navratil (International Atomic Energy Agency) and Wallace W. Schulz (Rockwell Hanford Operations). American Chemical Society, Washington, D.C. 1980. xiii + 609 pp. \$43.50.

This book, published with remarkable rapidity, consists of 39 papers presented at a symposium sponsored by the ACS Division of Industrial and Engineering Chemistry at the ACS/CSJ Chemical Congress in Honolulu, Hawaii, April 3-5, 1979. The papers, prepared by investigators presently active in the field, cover new concepts, new systems, and new developments in actinide separations methodology based on fundamental actinide chemistry developed since Manhattan Project days.

The broad international complement of authors describe ion exchange, precipitation, solvent extraction, pyrochemical, photochemical, and other methods of actinide separations as well as application of these separation methods to power reactor fuel reprocessing and recovery (removal) of actinides from waste solutions.

Following the initial use of the Bismuth Phosphate Process and then the Redox Process for the processing of irradiated nuclear reactor fuels, the Purex Process became and remains the standard process for recovering and purifying uranium, neptunium, and plutonium. Papers included here describe various improvements of this process and possible modifications for the removal of actinide elements (especially americium and curium) from the waste solutions in order to improve their disposability. Other papers describe separation methods for the future, such as pyrochemical and dry processing methods, that have the potential of minimizing volumes and hence aiding in the solution of the waste disposal problem.

Other papers deal with the recovery of transplutonium elements in their production programs, improved recovery of neptunium in chemical

separation plants, application of inorganic sorbents in actinide separation processes, improved use of plutonium peroxide for recovery and purification, better solvents for separation of actinides, pyrometallurgical methods for reprocessing thorium fuels, use of photochemical methods in actinide fuel reprocessing, improvements in thorium-uranium separation in the Thorex Process, and recovery of byproduct actinides for use as heat source isotopes.

This is a valuable compilation of current information in this important field.

Glenn T. Seaborg, *University of California*

Isoenzyme Analysis. By D. W. Moss (University of London). Analytical Sciences Monographs No. 6. The Chemical Society, Burlington House, London. 1979. 163 pp. \$22.00.

The utility of isozymes as probes to study a variety of biological and chemical phenomena is now well established and documented in a number of books which have emerged in recent years.

In this monograph, Moss attempts to present a brief summary of some of the important techniques used in the analysis of isozymes. To some degree, he succeeds in presenting the advantages and limitations of a number of approaches being used in isozyme research. The chapters on immunochemical approaches and on catalytic differences are particularly well executed.

The major negative aspect of the book is that Moss has exclusively confined his discussion to a few, previously well-described, isozyme examples from human tissues. Consequently he has bypassed many exciting and unique isozyme systems in a variety of other organisms, especially those which are more easily accessible to genetic and molecular studies. The book should have been more appropriately titled to convey its content and to direct it to the proper clientele.

In general, the book is very clearly written and well organized and should serve to introduce the uninitiated to an exciting area and to the wealth of literature in the field.

John G. Scandalios, *North Carolina State University*

Prediction of Vapor-Liquid Equilibria by the ASOG Method. By K. Kojima and K. Tochigi (Nihon University, Tokyo). Kodansha Ltd., Tokyo, and Elsevier Scientific Publishing Company, Amsterdam and New York. 1979. x + 251 pp. \$56.00.

This monograph deals with the prediction of vapor-liquid equilibria by the group contribution method referred to as the analytical solution of groups (ASOG). The method, basically one in which the logarithm of the activity coefficient is the sum of group contributions expressed in the analytic form of the Wilson equation, is outlined—without any attempt at theoretical justification—in the first 27 pages. The rest of the book consists of a computer program, detailed vapor-liquid equilibrium fits for 125 systems, and brief tables of predicted values for about 1000 other systems.

The book offers no scientific understanding of liquid mixtures. The ASOG method is applied indiscriminately to nearly ideal mixtures (benzene + toluene) and hydrogen-bonding systems (ethanol + ethylbenzene) where important nonrandom ordering effects are ignored. The potential use of 465 different group pair parameters (p 14) boggles the mind; whether these numbers are consistent with modern ideas about the magnitudes of intermolecular forces is not discussed.

This reviewer cannot assess the usefulness of these empirical procedures for chemical engineers. Average deviations are quoted, but no comparisons with other methods (e.g., UNIFAC) are made. Would a group contribution approach attached to the more rational regular-solution equation (or the equivalent van Laar equation of the engineer) be useful?

The book is a manual for technicians using the ASOG method for computer predictions. Considering the content and the price, no research library needs it.

Robert L. Scott, *University of California, Los Angeles*

Structure and Bonding. Volume 40. Biochemistry. By I. A. Cohen (City University of New York), L. Que, Jr. (Cornell University), H. Umezawa and T. Takita (Microbial Chemistry Research Foundation, Tokyo), and W. Rüdiger (Universität München). Springer-Verlag, New York. 1980. 146 pp. \$47.00.

This interesting volume comprises four short reviews of disparate subjects: (1) Metal-Metal Interactions in Metalloporphyrins, Metalloproteins and Metalloenzymes, by I. A. Cohen, 38 pages, 160 references, covering principally the period 1970–1979; (2) Non-Heme Iron Dioxigenases. Structure and Mechanisms, by L. Que, Jr., 33 pages, 105 references, mostly from the period 1974–1979; (3) The Bleomycins: Antitumor Copper-Binding Antibiotics, by H. Umezawa and T. Takita, 26 pages, 57 references, 1966–1978; and (4) Phytochrome, A Light Receptor of Plant Photomorphogenesis, by W. Rüdiger, 39 pages, 198

references, 1948–1978, with emphasis on the period 1970–1978.

In the first of these reviews, I. A. Cohen presents a very readable explanation of magnetic susceptibility and its use in observing metal-metal electronic interaction in, for example, the Fe–O–Fe center in μ -oxo hemin dimers. As a further example the nitrido hemin dimer is discussed. It is unfortunate, perhaps because of timing, that this review does not include discussions of the more biologically relevant dimetal systems published in 1977, 1978, and 1979 in the *J. Am. Chem. Soc.* and elsewhere under titles such as μ -peroxohemin, cofacial porphyrins, face-to-face porphyrins, chlorophyll model systems, as well as several publications of synthetic compounds having two coppers, two irons, or one of each. This is a very active field, so much so that another review will be needed almost immediately. Cohen next presents as biological examples the oxygen-transporting protein, hemerythrin, a two iron per mole protein which apparently binds dioxygen as O_2^{2-} and shows metal-metal interaction. His brief description should serve to encourage chemists to attack the interesting problems presented by this fascinating enzyme. Next, hemocyanin, the blue dicopper enzyme which also binds oxygen, is described, again leaving the reader with the impression that this is a rich area for inorganic chemical research. Two oxidases, laccase, a four-copper enzyme, and cytochrome *c* oxidase are described. Such a short review could not hope to cover the large literature on cytochrome *c* oxidase, but this review does serve to introduce these two oxidases in an interesting way. Biochemical structure work is not covered in any detail and other reviews should be consulted for this aspect of these enzymes.

In the second review L. Que discusses three classes of dioxigenases, the intradiol cleaving catechol dioxigenases which cleave 1,2-dihydroxybenzenes between the two hydroxyl groups and sometimes adjacent to one of the hydroxyls (extradiol cleavage), the α -ketoacid dioxigenase, prolyl hydroxylase, which inserts one atom from dioxygen into the 4-position in proline and a second into the succinate which arises from α -ketoglutarate, and soybean lipoxygenase which catalyzes hydroperoxidation of unsaturated fatty acids. All of these enzymes have nonheme iron in their active sites.

In each case he first presents the rather controversial evidence for the site structure, in particular the iron ligation with and without substrate, and then proceeds to a discussion of the various proposals for the mechanisms of oxidation. This review, when combined with the recent reviews of heme and nonmetal oxidases, should give an excellent coverage of the biological oxidations using dioxygen.

H. Umezawa and T. Takita, who have participated in the discovery and structure determination of several metal-binding antibiotics of the Bleomycin type, describe in the third review in this volume the structure determination of Bleomycin and some of its congeners, both as the metal-free unfolded structure and as the metal-chelated form. Bleomycin could be termed as “poor man’s P-450” in that it seems to use iron to catalyze oxidation of organic substrates but is not a protein. The metal-free compound contains a carbamoylmannose-glucose disaccharide linked to an unusual tetrapeptide. This tetrapeptide contains a thiazoline-thiazole chromophore which apparently accounts for its binding to DNA.

The authors present the discovery and structure determination of the apoenzyme as well as those of the related pheomycin and tallysomycins followed by a discussion of the biogenesis. Evidence for the structures of the copper and iron complexes are then presented. Although the evidence for the indicated ligation of Cu^{II} and Fe^{II} is strong, it is not yet conclusively demonstrated.

The action of Bleomycin is described as combining bleomycin, Fe^{II} , DNA, and dioxygen to produce degradation products of DNA. The details of this mechanism are not discussed. The published Proceedings of a recent meeting on this subject, reviewed in *J. Am. Chem. Soc.*, **102**, 4554 (1980), might shed further light on this subject. Both of these reviews are of great interest to those who are curious about metal-catalyzed oxidations using dioxygen.

In the fourth, and most biochemical, of these reviews, W. Rüdiger surveys recent progress on the structure and function of phytochrome, a protein which acts as the light receptor in photomorphogenesis. A wide variety of biological processes appear as photoresponses due to this ubiquitous protein. These include seed germination, flowering, leaf development, etc. The discovery and isolation of the protein are described, followed by a discussion of the photoreversibility of the two forms (P_r , 665 nm and P_{fr} , 730 nm). A large portion of the review is devoted to the use of degradation, synthetic, and model compound methods and to the determination of the structure of the chromophore, its covalent attachment to the protein, and the nature of the photoreaction. This is fascinating reading for the chemist, both with regard to the spectacular photochemistry which occurs and, as the author makes quite clear, the many mysteries which remain. For example, the photoreaction has been proposed to be either photoaddition of some H–X group or photoisomerization.

The remainder of the review describes the biosynthesis and destruction and the primary action of this protein. This review should stimulate a stampede of chemists trying to prove the structure and model the photo-reactions of the two chromophores.

These four reviews, although possibly brief and incomplete for experts in the particular area, are stimulating and valuable accounts for others such as this reviewer.

Teddy G. Traylor, *University of California, San Diego*

Recent Developments in the Chemistry of Natural Carbon Compounds. Volume 9. By K. Mori, B. Stoianova-Ivanova, and Gy. Litkei. Akademiai Kiado, Budapest. 1980. 420 pp. \$41.00.

Three chapters covering diverse fields of natural products chemistry comprise this ninth volume of the series. The first chapter contains a comprehensive treatment of the area of insect chemistry under the title *Synthetic Chemistry of Insect Pheromones and Juvenile Hormones*, by K. Mori. The second chapter details a personal account of investigations in the composition of materials isolated from roses entitled *Composition of Bulgarian Rose Flower Concrete. The Structure and Biogenesis of Its Components*, by B. Stoianova-Ivanova. The third and final chapter deals with oxidations of chalcones as a function of their relationship to flavonoid chemistry under the title *Chalcone Epoxides in Flavonoid Chemistry*, by Gy. Litkei.

On the whole, the book is technically well presented. A thorough table of contents and an index, comprising mainly a list of compounds, aid the reader in locating information. The typeset and structural drawings are good. The English is adequate with only the flaws common to many non-native English-speaking authors. The book is very uneven in quality and content.

The Mori chapter comprises about half the volume. It starts out with a summary of common olefin-forming reactions. Following this brief survey of synthetic methodology is a series of schemes, with very little narrative, outlining visually the synthesis of all known insect pheromones and hormones. As in any attempt at comprehensiveness, there are routes missing. However, it is clearly the most thorough presentation of the subject to date and, from that point of view, is a nice summary of where we are. There are annoying (and sometimes confusing) errors. For example the structure for bombykol on p 37 is incorrect, but it is correct in the section on synthesis, pp 47–50. The author is uneven in his presentation. At times, he comments on the novelty and practicality of various approaches—sometimes correctly and sometimes incorrectly. Exemplifying the latter category is his statement regarding the Findlay-MacKay synthesis of JH-I in which he states the aim was conciseness, convenience, and economy to obtain suitable quantities for biological evaluation—an aim hardly achieved when two preparative GLC separations have to be employed. The chapter is somewhat overburdened with schemes which, at times, are virtual duplicates of other schemes. This situation arises because several authors have used very closely related approaches to the same compounds. Considerable space could have been saved by consolidating some. The separation of the chiral syntheses from the syntheses of racemates is artificial and undesirable. It would have been best to present the whole story for each compound in the same place. While the above deficiencies do exist, this chapter is a very valuable reference source to this continually burgeoning field. This chapter is clearly the highlight of the book.

The chapter on the constituents of roses seems somewhat out of place in its personal style of presentation. It is more an account of the work in the author's laboratory than a general review of this most fascinating field. The detail presented is somewhere between that of a journal article and a review. While many sections are entitled "composition and structure", few structures really appear. What normally is meant by those terms is carbon number. Thus, one gets relatively little solid chemical information. The biogenesis section mainly consists of correlations of constituents that are identified by using well-accepted concepts of fatty acid biosynthesis and metabolism. The most enlightening aspect of this chapter stems from the realization that trace constituents which may be very important for many of the applications of this crude resource remain to be isolated and characterized.

The chapter on flavones returns to the style of a comprehensive treatment of a well-focused field. This chapter details synthetic mechanistic, spectral, and theoretical studies involving oxidations of chalcones, especially those proceeding through chalcone epoxides. The chemistry of the latter is well detailed. It is a classical theme treated in a classical fashion. The author tended to reiterate what was in the literature, at times without evaluating its reasonableness. For example, he discusses a "four center" opening of an epoxide by HCl involving S_N2 displacement with retention of configuration (p 318)—a type of process that should be summarily dismissed. Nevertheless, this comprehensive treatment should be a handy reference to those who want to know the state of flavone synthesis from chalcones. Overall, this volume can serve as a

useful reference source but not something that one would want to read. While the \$41 price is modest for a >400 page volume by today's standards, it is still high considering the amount of useful information. It would be recommended for a library which has an unlimited budget for monographs.

Barry M. Trost, *University of Wisconsin*

Chemical Experimentation Under Extreme Conditions. Edited by Bryant W. Rossiter (Eastman Kodak Co.). John Wiley and Sons, New York. 1980. x + 369 pp. \$24.95.

This book is Volume IX of the "Techniques of Chemistry" series, the successor to the "Techniques of Organic Chemistry" and its companion—"Techniques of Inorganic Chemistry". This series is devoted to a comprehensive presentation of the various techniques in inorganic and organic chemistry. This volume, as the title indicates, is concerned with techniques involving extreme conditions of pressure, temperature, time of reaction, and so on. There are six chapters in the book: Chapters I and II, *High-Pressure Techniques*, by H. Tracy Hall; Chapter III, *Determination of the Properties of Single-Atom and Multiple-Atom Clusters*, by J. F. Hamilton; Chapter IV, *Reaction Rate Measurements in Solution on Microsecond to Subnanosecond Time Scales*, by Neil Purdie, Edward M. Eyring, and Licesio Rodriguez; Chapter V, *Chemical Measurements in the Picosecond and Shorter Time Range*, by Stephen C. Pyke and Maurice W. Windsor; and Chapter VI, *High-Temperature Techniques*, by John L. Margrave and Robert Hauge. For purposes of this volume, an extreme condition is defined as a condition not readily available in most modern scientific laboratories. Each chapter outlines the usual and readily achievable conditions and then discusses in greater detail the extreme conditions where the prime interest of the research lies.

W. W. Wendlandt, *University of Houston*

Advances in Environmental Science and Technology. Volume 10. Edited by J. N. Pitts, Jr., R. L. Metcalf, and D. Grosjean. John Wiley and Sons, New York. 1980. xv + 521 pp. \$42.50.

This annual collection of reviews marks the incipient departure of James Pitts from the editorship, after seeing the series through its first decade. The nine reviews vary considerably in length and breadth and in nature from broad overviews (e.g., *N-Nitroso Compounds in the Environment*) to accounts of fairly specific research efforts (e.g., *A Vacuum Thermostatted Solar Simulator Facility for the Study of Atmospheric Chemistry*). Some are very formal and technical and include lengthy bibliographies, and others are informal and discursive, such as the one titled *An Anecdotal History of Air Pollution*, which starts with prehistory and proceeds through the Bible, Shakespeare, and the industrial revolution to put modern concerns in perspective. The contributors have a range of backgrounds from the academic to the industrial; all but one is from the United States. There is a substantial subject index, which will extend the usefulness of the volume.

Instrumental Analysis. Edited by Henry H. Bauer (University of Kentucky), Gary D. Christian (University of Washington), and James E. O'Reilly (University of Kentucky). Allyn and Bacon, Inc., Boston. 1978. ix + 832 pp. \$22.95.

The rapid growth of sophisticated instrumental techniques for chemical analysis during the 1970's created a real need for an up-to-date undergraduate text with both breadth and depth. This text attempts to satisfy that need by employing researchers as authors of individual chapters on their specialties, an approach usually reserved for graduate level books. This approach places an added burden on the editors, who must synthesize a coherent whole for the undergraduate reader. Their effort is apparent throughout the text, and the synthesis is successful to varying degrees.

The initial five chapters on electrochemistry are well written; the three chapters by Henry Bauer and/or James E. O'Reilly are very well done and flow together nicely, as one might expect from editors as authors. The chromatography chapters by R. E. Majors (*Solid and Liquid Phase Chromatography*) and C. H. Lochmüller (*Gas Chromatography*) are also well-done and cross referenced. The ten chapters on various spectroscopic methods show the least coherence of the chapters on related subjects. This is partly due to the wide range of techniques covered, including X-ray and electron spectroscopy. There are also good individual chapters on various unrelated topics—e.g., *Computers in Analytical Instrumentation*, by S. Perone and D. O. Jones, and *Mass Spectrometry*, by M. L. Gross. Overall the material is suitable for the undergraduate level, although there are some very technical spots; e.g., the computer chapter is very good but very detailed also. The only obvious weakness of the coverage is the lack of an indepth discussion of Fourier Transform techniques. They are discussed briefly in appropriate spots, but not in sufficient detail for the undergraduate reader to understand the rationale

behind them.

Obvious advantages to using researchers as authors are realistic discussions of real versus theoretical percent uncertainty, descriptions of recent commercial instrumentation, and handy leading references to the literature throughout most chapters. The problems given at the end of chapters encompass a wide range of difficulties. There are the usual first edition hazards of occasionally incomplete information and/or incorrect answers for problems. (Answers to selected problems are given in an appendix.) Personally, I wish there were more quantitative problems. In keeping with its graduate style there are no worked out example problems, nor is there a table of standard reduction potentials in the appendices. Students are expected to get along without such amenities. Also, because of the great amount of information contained in each chapter, students must be discriminating readers and able to pick out important concepts from miscellaneous details. If your students can meet these demands, which are reasonable for juniors and seniors, I recommend you give this text a try.

Larry M. Wier, *Hobart and William Smith Colleges*

The Chemistry of Ketenes, Allenes, and Related Compounds. Edited by S. Patai. John Wiley and Sons, New York. 1980. Part 1, xiv + 485 pp. \$96.25. Part 2, xiv + 497 pp. \$96.25.

These two volumes expand the treatment of a subject to which only two chapters were devoted in the 1964 volume "The Chemistry of Alkenes" when the series "The Chemistry of Functional Groups" was very young. The field of ketenes, allenenes, and cumulenes has been quite active in the ensuing 15 years.

This work consists of 20 contributed chapters, beginning, as customary in the series, with one on theoretical methods. Structure, properties, thermodynamics, analytical chemistry, preparation, kinetics and mechanism, biological significance, etc., are treated. In addition to ketenes, their acetals, thioacetals, and imines are covered, as are carbodiimides. There is no sharp division between the contents of the two parts, except for the fact that all of the ketene derivatives are to be found in Part 2, and nearly all purchasers will want both parts. The combined index is in Part 2.

Three intended chapters, on photochemistry and cycloadditions of ketenes and allenenes, and rearrangements of ketenes, did not get written, but may appear in a future volume.

The task of editing such a large work, which in the present instance involves a team of 28 contributors, must be demanding, and it is understandable that some unevenness should creep in. The temptation to rely on previously published reviews either to simplify the bibliography or to justify the omission of a topic altogether is understandable, and has been succumbed to occasionally. The extensive application of dicyclohexylcarbodiimide in peptide chemistry, for example, is mentioned but (mercifully) not reviewed in this work. Less desirable is the sort of unevenness exemplified by the way in which preparative methods are handled. Some contributors very helpfully start with a summary of the methods, in which comparative importance and limitations are pointed out, and then proceed to the individual methods, giving a selection of specific examples, with even a short table or two. This is how it should be done, but, unfortunately, some contributors omit summaries and comparisons and take the easy path of presenting nearly everything as generalizations, without specific examples. Some writers pay enough attention to experimental methods to give the reader a good feel for what is involved, whereas others are generally vague, confining themselves to such loose terms as "on heating". It would be time consuming to eliminate these discrepancies by tighter editorial control, but if the editor can manage it in future volumes, the users of this valuable series would be grateful.

Encyclopedia of Common Natural Ingredients Used in Food, Drugs and Cosmetics. By Albert Y. Leung. John Wiley and Sons, New York. 1980. xvi + 409 pp. \$47.00.

This is an up to date and selective work on pharmacognosy, written by a man with experience in pharmacy, pharmacognosy, and natural products. It begins with two forewords, and the following content lives up to the recommendation in them.

In his preface, the author points out how the use of natural products has tended to be eclipsed by the success of synthetic chemistry in recent decades, even though plant products are widely used and in many cases are not satisfactorily replaceable. In the same period, knowledge of the chemical content of plants has grown enormously, however, and studies of the biological properties of natural products have also advanced. This encyclopedia thus serves to bring the subject up to date, and it is as fascinating as it is informative. After a useful glossary, there follow the listings in alphabetical order, using the most commonly encountered names, such as acerola, nutmeg, pectin, etc. Short botanical descriptions are given where appropriate, followed by sections on chemical compo-

sition, pharmacological or biological properties, uses (pharmaceutical, commercial, and folk medicine), and commercial preparations. Where existing reports are incomplete, uncertain, or conflicting, the facts are set out clearly, and there is adequate documentation. The book is easy to use because the author has been selective, both in choice of entries and in the information given; the reader is not overwhelmed with countless obscure remedies or masses of obsolete information. The book ends with a three-page bibliography of general references and a substantial index.

The Alaskan Shelf. By G. D. Sharma (University of Alaska). Springer-Verlag, New York. 1979. xiii + 498 pp. \$29.80.

The author is a marine scientist and writes about hydrology, bathymetry, geology, hydrography, and geochemistry. The last topic is an important one because of the presence of sediments on continental shelves and is the one of major concern to chemists. Much of the book is arranged in chapters that take up the different sections of the Alaskan shelf one by one, but the 13th chapter is more specifically devoted to geochemical evolution and chemical transformation and migration in general. Chemists concerned with the effects of environmental pollution in coastal regions should find this book to be a pertinent reference.

A Comprehensive Guide to the Cannabis Literature. Compiled by E. L. Abel (Research Institute in Alcoholism, Buffalo). Greenwood Press, Westport, Conn. 1979. 1 xv + 699 pp. \$37.50.

Cannabis sativa L. is commonly associated with drug abuse today, but it has a long history of importance as a source of hemp fiber, dating back as far as 10000 B.C. The earliest recorded mention of its intoxicant properties is attributed to a legendary Emperor Shen-Nung in the 28th century B.C. From these facts it is clear that a bibliography on the subject is no trifling matter.

The compiler includes publications on the psychotomimetic properties, industrial usage, cultivation, history, and legal status. He apologizes for the fact that his bibliography is not exhaustive, because he could not manage to include articles in newspapers and newsletters. It is nevertheless evident that he has been very thorough, for there are 8177 citations, arranged in alphabetical order of authors, with the full titles being given (translated into English where necessary). Access to articles on a given subject is made possible by a 63-p index.

LASL Shock Hugoniot Data. Edited by S. P. Marsh. University of California Press, Berkeley, Calif. 1980. xix + 658 pp. \$36.50.

The somewhat arcane title of this book refers to work done at the Los Alamos Scientific Laboratory on methods of determining the equation of state of substances. Measurements of shock-wave effects lead to the Hugoniot locus, from which states can be calculated for very high pressures not ordinarily obtainable.

Nearly all of this book consists of tabulated data for elements, alloys, minerals, rocks, plastics, some simple organic compounds, some solutions, and some explosives. There is an index of substances and a bibliography of 66 references; a short glossary of symbols used would have been a helpful addition.

Nitrogen: International Thermodynamic Tables of the Fluid State-6. Edited by S. Angus, K. M. de Reuck, and B. Armstrong. Pergamon Press, New York and Oxford. 1979. xxiv + 244 pp.

This volume originates from the Thermodynamic Tables Project of the IUPAC Division of Physical Chemistry, the object of which is to compile "internationally agreed values of the equilibrium thermodynamic properties of liquids and gases of interest to both scientists and technologists". A short preface and introduction appear in English, French, German, and Russian, followed by 23 pages of text in English discussing experimental results and short sections on the equation of state and the tables. The remainder of the book consists of seven long tables.

Organic Reaction Mechanisms: 1978. Edited by A. C. Knappe and W. E. Watts. John Wiley and Sons, New York. 1980. 719 pp. \$145.00.

This latest volume in the now well-established series is prefaced appropriately with a quotation of the rhyme *The Road Goes Ever On* from Tolkien's "The Fellowship of the Ring". The literature of organic chemistry dated from December 1977 to November 1978 has been scanned for significant contributions to the understanding of mechanism and organized into 14 review chapters by as many contributors. Those subjects that are customarily reviewed elsewhere, such as photochemical reactions and electrochemistry, are omitted in order to keep the volume down to manageable size.

The high standard, and thus the usefulness, of this series is maintained, and it continues to be a convenient way of keeping abreast of the literature. One can profitably browse or make use of the author index or the detailed subject index.