Book Reviews*

Developments in Polymer Photochemistry. Volume 3. Edited by N. S. Allen (Manchester Polytechnic). Applied Science Publishers, London. 1982. x + 353 pp. $80.00.

A useful book from a continuing series, this volume contains eight reviews on different aspects of polymer photochemistry. As is often the case with such "series" books, the weak point is the lack of continuity in the different chapters even though some are fairly closely related.

Chapters 1 and 2 are of particular interest to the synthetic chemist, starting with a review on the use of photoactive catalysts which can produce radicals to initiate vinyl polymerizations and continuing with a very interesting chapter on the vast topic of photocrosslinking. The next two chapters are much more physical: Chapter 3 covers photoconduction processes including photocarrier generation and carrier transport in polymers; this is followed in Chapter 4 by a review on some applications of polarized photoselection techniques to the study of macromolecular relaxation processes. Chapters 5–7 are concerned with the very important problem of photodegradation and light stabilization of polymers. Although numerous reviews on poly(vinyl chloride) degradation exist, this one is particularly interesting and well written, focusing successively on initiation, propagation, and finally inhibition of photodegradation. This is followed by a similar chapter on the less familiar problem of polyurethane photodegradation and, in Chapter 7, a review on the use of flash photolysis for the study of polymer photodegradation mechanisms. The last chapter on commercial aspects of polymer photostabilization was probably directed primarily to those in the plastics industry but is highly recommended as general reading as it offers some interesting insight in an area which is seldom reviewed despite its great importance.

Jean M. J. Fréchet, *University of Ottawa*

Methods of Biochemical Analysis. Volume 28. Edited by David Glick (Stanford University). John Wiley & Sons, New York, NY. 1982. viii + 430 pp. $45.00.

This volume reviews the following subjects: acquisition and interpretation of hydrogen exchange data from peptides, polymers, and proteins (Barksdale and Rosenberg); phase partition—a method for purification and analysis of cell organelles and membrane vesicles (Albertsson et al.); detection of ligand-induced and syncatalytic conformational changes of enzymes by differential chemical modification (Christen and Gehring); adaptation of polarographic oxygen sensors for biochemical assays (Lessler); visual biochemistry—new insight into structure and function of the genome (Vollenweider); the use of magnetizable particles in solid phase immunoassay (Pourfarzaneh et al.); characterization, assay, and use of isolated bacterial nucleoids (Hirschbein and Guillen); and analysis of the cross-linking components in collagen and elastin (Robins).

The editor of this volume again presents an assemblage of comprehensive and authoritative reviews on a wide range of bioanalytical techniques. The authors invariably introduce their presentations clearly and concisely before proceeding to the subject at hand. Although the reviewers are not thoroughly acquainted with a number of the subject areas, the contributions are well organized, clearly presented, and extensively referenced. The most innovative subject title is that of the "visual biochemistry" section, which surveys the applications and achievements of electron microscopy in molecular genetics.

In summary, as a source of both basic and detailed information on the subjects contained therein, this volume is recommended unequivocally.

Robert W. Zumwalt and Charles W. Gehrke, *University of Missouri*

Structure and Bonding. Volume 46. Inorganic Chemistry. By P. G. Eller et al. Springer-Verlag, Berlin, Heidelberg, and New York. 1981. 176 pp. $41.90.

The volume includes three articles from widely scattered areas of chemistry.

The first, The Context and Application of Ligand Field Theory by M. Gerloch, J. H. Harding, and G. Wooley, covers 46 pages and contains 60 references. The authors trace the formal development of ligand field theory from the elements of quantum chemistry. After a discussion of the significance of interelectronic repulsion and spin–orbit coupling parameters, a detailed justification of the angular overlap model is presented. The authors provide a useful re-examination of ligand field theory in an authoritative article.

Structure and Bonding of Transition Metal–Sulfur Dioxide Complexes, by R. R. Ryan, G. J. Kubas, and P. G. Eller, is a well-organized review with over 200 references. It will be a valuable source of information on the diverse bonding modes exhibited by SO_2 in its complexes. Some discussion of the reactivity of coordinated SO_2 is also presented.

The third article, titled Non-Commensurate (Misfit) Layer Structures, is written by E. Makovicky and B. G. Hyde. The authors give an introductory discussion of misfit structures and then describe many known examples including graphite intercalates, silicates, and heavy-metal sulfides. A discussion of interlayer bonding follows, and some conclusions about this type of structure are presented. The 119 references will provide an interested reader with an introduction to the literature in this relatively unfashionable area of inorganic chemistry.

The volume maintains the high quality of the previous members of this series. However, the editorial policy of including three articles on such diverse topics may discourage potential individual purchasers from buying the volume. It will, however, remain an important library acquisition, as an excellent reference work.

P. M. Boorman, *University of Calgary*

Principles of Polymer Systems. By Ferdinand Rodriguez (Cornell University). Hemisphere Publishing Corp., Washington, New York, and London. 1982. xvi + 575 pp. $29.95.

"Principles of Polymer Systems" can be divided into three major sections: three chapters (58 pp) provide a general introduction and comparison of the properties of polymers and low molecular weight materials; seven chapters (215 pp) are on the chemistry and physics of polymers and their solutions; and three chapters (175 pp) deal with manufacturing and fabrication technology. Two additional chapters (40 pp) cover degradation, stabilization, and analytical methods used to identify polymers. The material is presented in a compressed style made necessary by the wide variety of subjects treated and the desire to keep the book to a manageable size. Thus, it would not be suited for use in a course in which, say, only the chemistry and physics of polymers were to be treated. The style is readable, with an abundance of figures (261) to illustrate properties or give schematic representations of processes or equipment.

The section on chemistry and physics includes discussion of polymerization principles, kinetics, and methods, including examples of industrial practice presented in two chapters (67 pp). The concepts of a molecular weight distribution and characterization methods such as osmometry, light scattering, size exclusion chromatography, and dilute solution viscometry (e.g., use of the intrinsic viscosity) account for most of two more chapters (72 pp). The viscosity of polymers and their concentrated solutions is also considered (25 pp) in one of these, along with discussion of normal stresses and melt fracture, and a description of several viscometers. This presentation, which includes concepts such as free volume, chain entanglement, and nonlinear flow contains a few misstatements and is largely empirical in nature. Finally, three chapters (76 pp) dealing with rubber elasticity present the usual discussion of elongational deformation, linear viscoelasticity, ultimate properties and the concept of failure envelopes, and miscellaneous properties such as the density, hardness, and electrical properties. Linear viscoelasticity is framed in terms of Maxwell elements.

A large section of the book is focused on fabrication (76 pp) and manufacturing methods (99 pp). These sections are well organized, cover an astounding range of topics, and will acquaint the student with the qualitative features of these technologies.

The book includes problem sets and general and specific references after each chapter, as well as a tabulation of journals dedicated to polymer science and engineering, name and subject indices, tables of the properties of a number of polymeric materials, a list of symbols, and a set of eleven simple experiments designed to be carried out with a minimum of equipment.

G. C. Berry, *Carnegie-Mellon University*

Computer Assisted Learning in Science Education. Edited by G. Beech (Wolverhampton Polytechnic, England). Pergamon Press, Headington Hill Hall, Oxford OX3 0BW, United Kingdom. v + 185 pp. $35.00.

Pergamon Press publishes a journal entitled: *Computers and Education*; this volume contains a series of papers by British authors that appeared in issues 1 and 2 of Volume 2 of that journal. The volume starts with a short introduction to Computers in Science Teaching, by R. Hooper, and then continues with a series of extremely competent papers on the applications of computers, including: Numerical and Graphical Simulations of Chemical Processes (G. Beech), Interactive Computer

*Unsigned book reviews are by the Book Review Editor.

Graphics for Undergraduate Science Teaching (J. McKenzie), A Low-cost Mini-computer System in a Laboratory Environment (A. T. Vincent), Computer Assisted Learning in Physics (T. Hinton), A Computerized Approach to Simple Chemical Kinetics (J. D. Lee and A. G. Briggs), A Computerized Approach to Some Aspects of Spectroscopy (A. G. Briggs and J. D. Lee), Current Aspects of Program Exchange—Costs and Benefits (G. Beech), Some Elementary Statistical and Numerical Procedures—An Interactive Approach (J. D. Lee and D. G. Hayes), as well as a guide to suppliers of educational computer programs and a glossary of terms.

The articles include numerous excellent examples of flow charts, BASIC codes, and print outs of the dialog between the computer and a "typical" student. It would behoove individuals who are trying to develop computer-assisted instruction or laboratory simulation programs in chemistry for the first time to obtain a copy of this volume, if merely to provide excellent examples of what can be done with such computer programs. Those who have need of programs, or subroutines, to determine rate constants from polarimetric data or conductivity data, for calculations of radioactive half-lifes, for logarithmic analysis of experimental data, for calculations of concentration from spectrophotometric data, for calculating Morse potential curves or similar functions, for calculating the vibrational energy levels of a diatomic molecule, for simulating the atomic absorption/emission spectra of single electron atoms from the Bohr model, for calculating the area under the curve by Simpson's rule, for calculating standard deviations and confidence limits. for a least-squares fit to a straight line, for fitting polynomials that include terms up to the ninth order, for χ^2 calculations, or for f and T tests would probably find the price of this slim volume repaid in the time saved in writing one's own code for these tasks.

George Bodner, *Purdue University*

The Analysis of Explosives. By J. Yinon (Weizmann Institute of Science, Rehovot, Israel) and S. Zitrin (C.I.D., Israel Police Headquarters, Jerusalem, Israel). Pergamon Press, Elmsford, N.Y., and Oxford, England. 1981. xii + 310 pp. $22.50.

The major function of the "The Analysis of Explosives" is to provide the reader basic descriptions of an array of analytical techniques that are useful in analyzing explosives in bulk and trace quantities, before and after the intended fate of the material, and in detecting hidden explosives.

Examples of use are profuse. No analytical procedures are included. The array of techniques includes chemical, electrochemical, and thermal methods, chromatography, and spectroscopy/spectrometry from ultraviolet to infrared plus mass and resonance. X-ray diffraction and fluorescence were not covered except in the detection sections. For people who are not often involved with explosives or generally deal with a small range of such materials, there is an extensive listing of primary explosives with chemical formulae, identification of mixtures, and solid and liquid propellants. Within the text, the ordinary jargon (PETN, TNB, EGBN, etc.) is used.

The authors sometimes use terminology that is not in general use in the particular field, for example, in thermal analysis, terms that are well known but not part of the formal nomenclature (accepted by the International Union for Pure and Applied Chemistry, American Society for Testing and Materials and similar bodies), and one term—dT instead of ΔT—that is not at all well known.

The book was produced directly from typed copy so the right-hand margins are not justified. The double spacing presents a less attractive and less easily read page than would one and a half spaced lines. The English is not quite flawless; the errors are generally in usage rather than in grammar. There are typing errors that suggest that the manuscript was prepared in expectation of typesetting; for example, in one case there was a gap within a sentence of more than two centimeters. In another case there is a series of entries, covering almost two pages of text, in which there are incomplete lines followed by statements beginning at the left margin. One of the values of the book is that the descriptions of the techniques are written for nonspecialists, bare-bones principles with virtually no mathematics, just enough to show why the technique is useful. The examples then guide the potential user to reports in the literature.

The chromatography section covers the full range of techniques and ways of use, from trace separation for identification to larger scale separation and quantitative measurement for both identification and quality control, i.e., detection and measurement of impurities in the products. Some of the selective/specific detectors for gas chromatography are not mentioned.

Polarography has been displaced for many uses, but in explosive molecules there is such a variety of high-energy groups or conformations that polarography retains it utility. Nonaqueous or mixed solvent/electrolyte systems are needed but a number have been reported as useful. Only dropping mercury electrode methods are mentioned, but several refinements are described.

Thermal analysis is principally useful in studying the bulk properties of the explosives. Properties important to storage and handling safety can be studied as well as those related to end-use performance. The spectrophotometric, mass spectrometric, and magnetic resonance methods have the normal utilities.

Two very interesting—to the nonspecialist—and useful chapters describe the detection and identification of residues and the detection of hidden explosives. The former should be useful to nonforensic workers who may be involved in trouble shooting; the methods of trace detection and systematic search have a broad range of utility. The latter chapter too is of general interest because the ultra-sensitive techniques and the nonintrusive examinations could provide background and ideas for environmental, occupational-safety, and quality-control specialists.

Paul D. Garn, *The University of Akron*

Transplutonium Elements—Production and Recovery. Edited by James D. Navratil (Rockwell International) and Wallace W. Schulz (Rockwell Hanford Operations). Amerian Chemical Society, Washington, DC. 1981. xi + 302 pp. $37.00.

This book is a collection of papers dealing with the production, recovery, and separation of the man-made, transplutonium elements through fermium. These 17 state-of-the-art papers by international experts represent a written form of the information presented at a symposium (part of the 180th ACS National Meeting, Las Vegas, Nevada, August 27–28, 1980) devoted to this topic.

The individual papers emphasize plant-scale process schemes for the transplutonium elements. Several of the papers concentrate on americium and curium (elements 95 and 96), due in part to the greater amounts of these elements that exist and the fact that they are encountered in reactor materials. The source of such reactor materials is not limited to specialized reactors, such as the High Flux Isotope Reactor (for preparing transcurium elements) or commercial power reactors, but also arises from defense programs. From this collection of papers the reader can acquire an understanding of the preparation and purification processes, and the amounts of the transplutonium elements that are generated outside of the USSR (a contribution from the USSR was not present). A great deal of chemistry and engineering are presented, and the book provides a good summary of this technology. The separation techniques presented include both conventional and molten salt extraction, low- and high-pressure ion exchange, and precipitation. In some instances the reader may desire to make use of the cited literature references for obtaining specific details or a greater depth of understanding (over 260 references are provided). For scientists or engineers associated with this area of technology, the book serves as a useful reference on the present status of technology at different sites, and some of the individuals who are active in this field. This collection of papers should also appeal to those not directly involved in the production/recovery of these elements or their practical applications. Individuals concerned with the environmental aspects of these elements and those who desire a better understanding of how these materials are handled will find the book informative. Although the chemistry that is discussed in the book may appear to be oriented to large-scale processes, in reality such separations are frequently not far removed from the laboratory scale of operation from which they evolved. Indeed, the quantities of some products are limited to picograms or milligrams.

In short, this book is a very useful summary of the technology dealing with the production, recovery, and purification of the transplutonium elements through element 100. As such, it has a place on the reference shelf. The book does not cover, nor was it intended to cover, the production and recovery of higher transplutonium elements that are generally prepared outside of nuclear reactors in very small quantities or the tracer-scale chemistry and the basic studies that have been carried out with these materials.

R. G. Haire, *Oak Ridge National Laboratory*

Topics in Current Chemistry. Volume 78. Biochemistry. Edited by F. L. Boschke et al. Springer-Verlag, Berlin, Heidelberg, and New York. 1979. 193 pp. $48.60.

The first two chapters of this volume have a common theme, calcium; the third is unrelated, dealing with the enzymes involved in fixation of molecular oxygen. The discussion of the sarcoplasmic calcium pump by W. Hasselbach, an authority in this field, is not easy reading but covers the subject with great thoroughness. It includes a detailed analysis of the energy requirement, the nucleotide specificity, the steps of the reaction, and the nature and kinetics of formation of the phosphoprotein intermediate. It is a good, in depth review with an interesting historical introduction to the field of ion pumping.

The subject of biomineralization is not often considered by basic biochemists in the calcium transport area, even though it is an obvious

practical application. G. Krampitz and W. Witt provide a useful overview of this somewhat unexplored field, with an unbiased discussion of a variety of theories (their strengths and weaknesses) concerning the process of calcification. Intra- and extracellular mechanisms are considered, including the possible involvement of mitochondria and endoplasmic reticulum and the nature of the calcium complexes formed.

The chapter on oxygenases by M. Nozaki is a concise summary of the properties and mechanisms of these enzymes that play an essential role in biosynthesis and degradation. The majority of the discussion is on dioxygenases, catagorized according to their content of heme iron, nonheme iron, copper, or flavin; their ability to form catachols; or their requirement for α-ketoglutarate. Several clearly organized tables provide easy access to information and references. In many cases structures are given of substrates, intermediates, and products, and mechanisms are described with clear diagrams. This should be a useful reference for workers in the field.

S. Ferguson-Miller, *Michigan State University*

Metal β-Diketonates and Allied Derivatives. By R. C. Mehrotra (University of Delhi), R. Bohra (University of Rajasthan), and D. P. Gaur (University of Nice). Academic Press, London. 1978. viii + 382 pp. £20.50.

The authors have presented a fine review on the chemistry of the β-diketonates and allied derivatives and although the review does not, by the author's admission, include all references to these compounds it is quite comprehensive. There are 1890 references cited in the text and there is an author index and subject index to facilitate finding specific work.

The format of the text chosen by the authors provides an easy access to the work one is interested in reviewing. Individual chapters are devoted to the oxygen-bonded and the carbon-bonded β-diketonato complexes, the metal thio-β-diketonates, various metal thio-β-diketone derivatives, and the general applications of metal β-diketonates.

Extensive information is provided on the synthesis and physical and chemical properties of the various diketones and their derivatives. Particular emphasis is placed on the infrared, mass, and NMR spectra and on the X-ray crystal and molecular structures of the oxygen-bonded complexes.

The weakest section of the text is the chapter on applications of the metal β-diketonates. The use of lanthanide β-diketonates as shift reagents in NMR is treated lightly. Persons interested in the separation of metals by vapor-phase chromatography and solvent extraction of the metal chelates are provided references to general review articles rather than extensive coverage of the subject.

The book would be an excellent source guide for all persons interested in working with the β-diketonates.

Eugene W. Berg, *Louisiana State University*

Molecular Motion in High Polymers. By R. T. Bailey, A. M. North, and R. A. Petrick (Department of Pure and Applied Chemistry, University of Strathclyde). The Clarendon Press; Oxford University Press, New York. 1981. xvi + 416 pp. $69.00.

The plan of this book is to provide a theoretical basis of molecular motion in polymers and then to describe the phenomenological and experimental aspects. A wide range of phenomena are effectively treated, including dielectrics, ultrasonics, viscoelasticity, NMR, EPR, photoluminescence, vibrational spectroscopy, scattering, and diffusion. A unified treatment of relaxation and resonance processes is provided with a clear discussion of the experimental observations. The technological importance of polymer motion is emphasized throughout with examples.

Dielectric response in polymers in solution, solid, and two-phase systems is analyzed by the use of correlation functions. Viscoelastic relaxation in polymer solutions and melts is described by normal mode and entanglement models. NMR relaxation processes and their relaxation times are used to investigate the effects of molecular weight, chain structure, side-chain type, and other structural parameters on polymer dynamics. Mechanical relaxation in amorphous and crystalline polymers is reviewed with typical examples and some new additions. Small-angle neutron scattering is discussed, for completeness. The important chapter on spectroscopic and scattering phenomena discussed Brillouin, Raman, and infrared spectroscopy and would have benefited from more experimental examples. A chapter on diffusion-controlled reactions in polymers reflects the authors' interest in using polymer reactions to probe motions of the polymer chains. The treatment of these subjects represents the experience and views of the authors and is uniform and consistent. Many polymer scientists will agree with most of this book but will have minor disagreements on certain subjects.

For the amount of theory and equations, there are relatively few errors. A list of symbols would have made it easier to look up equation terms. Use of tables is excellent, both for comparing experimental techniques and for presenting data as a function of polymer structure. The effect of stereoregularity in PMMA is used to illustrate the effect of structure on properties. Unfortunately, different values of T_g and activation energies quoted detract from this example. The references have a usual number of errors.

Overall, the book is a significant contribution to the literature of polymer science. It can be recommended to all polymer scientists who encounter the motion of chain molecules in their work. Other scientists who are interested in the theoretical and experimental aspects of molecular motion will find this treatise enlightening.

James M. O'Reilly, *Kodak Research Laboratories*

Endorphins: Chemistry, Physiology, Pharmacology, and Clinical Relevance. Edited by Jeffrey B. Malick and Robert M. S. Bell. Marcel Dekker, Inc., New York, NY. 1982. xi + 312 pp. $37.50.

Since the publication in December 1975 by J. Hughes et al. of the existence of enkephalins and the publication of the existence of α-, β-, and γ-endorphins by the groups of R. Guillemin and C. H. Li soon thereafter, the field of neuropeptides is no longer the same. So much has been reported about these compounds that a monograph can best be written by specialists from various disciplines. In this, the editors have succeeded admirably. Throughout the book, which is divided into eight chapters, the term "endorphin" is used to generally describe all opioid active compounds containing the core tetrapeptide sequence –Tyr-Gly-Gly-Phe–. The introductory chapter relating the history of the endorphins is appropriately written by E. J. Simon, who originally coined this acronym for endogenous morphines. In the next chapter, D. Smyth surveys the structural relationship of the known opioid peptides isolated until 1980, including α-neoendorphin and dynorphin. The 31-K prohormone precursor of ACTH, β-LPH, and β-endorphin is also briefly described. Obviously, the author could not have forseen that in the relatively short period since finishing his chapter and the publication of the book the complete sequence of two other precursor proteins would be elucidated, namely, the one for Met-/Leu-enkephalin, and the other for neoendorphin/dynorphin. Classical peptide chemists have a hard time these days keeping pace with contemporary molecular biologists who, applying genetic engineering technology, are able to deduce in record time, it seems, the entire sequence of a protein without ever having to isolate it in the first place. An extensive review of synthetic enkephalin analogs and their biological activity by W. L. Dewey should attract those in search of the elusive morphine substitute devoid of addictive side effects. The numerous peptides surveyed are logically divided into several classes and grouped in tables. A survey by J. A. H. Lord, M. J. Rance, and C. F. C. Smith is devoted to a description of the assays used in endorphin research. This includes bio-, radio receptor binding, and radioimmunoassay. The existence of multiple opiate receptors is also discussed. J. P. Rossier and F. E. Bloom describe how the enkephalins and endorphins are distributed in the CNS, the pituitary, and the gastrointestinal tract. This chapter is illustrated by two drawings and six actual photographs. Their studies have shown that the enkephalin-containing system in the brain is a distinct and separate entity from the β-endorphin-reactive system confined in the pituitary. It should be noted that these localization studies only reflect a static distribution. They cannot differentiate between peptides transported into the various regions of the CNS and those generated in situ from their precursor. The chapter on physiological functions of the endorphins by B. M. Cox and E. R. Baizman constitutes the most voluminous part of the book and should be of particular interest to those engaged in opiate addiction research. The authors define what distinguishes a peptide from acting as a neurotransmitter, a modulator, or a hormone. The enkephalins, because of their small size and rapid metabolism, more aptly function as the former two, whereas the bigger and more stable β-endorphin may act as a true hormone. The pharmacological action of endorphins in animals is dealt with by the two editors. Use of endorphins as analgesics, as potential drugs of abuse, in tolerance studies, and as causative agents of certain behavioral effects is discussed at length. The possibility that endorphins may play a biochemical role in the process of learning and memory is intriguing. Clearly more studies will be needed and it may well be true that we are only scratching the surface of endorphin pharmacology. L. Terenius, one of the pioneers in the search for an endogenous ligand for the opiate receptor, wrote the final chapter on perhaps the most important aspect of the endorphins, namely their potential relevance as a clinical agent. The report of the accumulation of an "abnormal" Leu^5-β-endorphin in the blood of schizophrenic patients is of great interest. However, to my knowledge the actual isolation and unambiguous identification of such a β-endorphin analog has yet to be achieved. Also, clinical studies trying to establish a direct relationship between endorphins and schizophrenia so far remain inconclusive.

Overall, this monograph is well worth its price and should be recommended reading for all those interested in the what, where, and why of the endorphins.

L. Tan, *University of Sherbrooke Medical Faculty*

Polyelectrolytes and Their Applications. Edited by Alan Rembaum (Jet Propulsion Laboratory) and Eric Sélégny (Université de Rouen). D. Reidel Publishing Company, Dordrecht and Boston. 1975. viii + 343 pp. $39.50.

This volume, the second in a series on "Charged and Reactive Polymers", is based largely on a symposium held at the California Institute of Technology in 1973. It contains 19 papers, mostly concise reviews, classified under three headings: (I) General Properties and Synthesis, (II) Biomedicine, and (III) Water Purification, Petroleum Recovery, and Drag Reduction. Among the papers focused on chemistry, two each deal with conformational transitions in polyelectrolyte solutions (Dubin and Strauss; Muller, Fenyo, Braud, and Sélégny) and charged polymer latices (Fitch; Plueddemann). Other topics are ion binding (Rinaudo and Milas), effects of polyelectrolytes on kinetics of ionic reactions (Ise), and "Pyran" cyclopolymer (Butler). DNA is the subject of two papers: one on the polyelectrolyte behavior of the Na-DNA system (Vasilescu, Grassi, and Rix-Montel) and another on interactions with dyes (Crescenzi and Quadrifoglio). Among the papers concerning applications are contributions on preparation of ion-exchange hollow fibers (Rembaum, Yen, Klein, and Smith) and on grafting polyelectrolytes to reverse-osmosis membranes (Stannett, Hopfenburg, Kimura-Yeh, and Williams).

As this synopsis suggests, the present volume brings together a number of well-known workers discussing a range of topics that is extraordinarily diverse. For this reason, scarcely any reader would be interested in all of the book, but each report does offer a concise, readable account of its special area.

Edward F. Casassa, *Carnegie-Mellon University*

Metal-Catalyzed Oxidations of Organic Compounds. By Roger A. Sheldon (Océ-Andeno BV) and Jay K. Kochi (Indiana University). Academic Press, New York. 1981. xxi + 424 pp. $56.00.

The subject of catalytic oxidation usually embraces the three traditionally different fields of homogeneous ligand-phase oxidations, heterogeneous gas-phase oxidations, and biochemical enzymatic oxidations. These three areas have generally developed as separated disciplines and are treated as different research fields. This book is aimed to show how a consideration of the general principles of organic and inorganic chemistry can lead to a common mechanistic basis for unifying these three seemingly disparate fields.

In the first part of the book, the mechanistic principles of metal-catalyzed oxidations are discussed in eight chapters: oxidations with molecular oxygen (radical chain reactions), metal catalysis in peroxide reactions, activation of molecular oxygen by metal complexes, homolytic oxidations by metal complexes, direct oxidation by oxometal (M=O) reagents, activation of organic substrate by coordination to metal complexes (mainly the Pd^{II}-catalyzed oxidations), and biological (and biomimetic) oxidations. The second part on synthetic methodologies covers reactions with olefins, aromatic hydrocarbons, and alkanes. These chapters are subtitled by reaction types such as epoxidation, allylic oxidation, etc. Oxidations involving alcohols, ethers, ketones, phenols, and nitrogen-, sulfur-, and phosphorous-containing compounds can be found in the last two chapters. A collection of glossary and an overview of the various reactions and processes provided at the beginning of the book are very useful to the readers who are unfamiliar with the subject.

The authors should be commended not only for the fresh perspectives they brought to these fields with the unified approach but also for the excellent bibliography they provided. The extensive index will surely add to the value of this book as a reference.

C. K. Chang, *Michigan State University*

Annual Review of Biophysics and Bioengineering. Volume 10. Edited by L. J. Mullins. Annual Reviews Inc., Palo Alto, CA. 1981. 631 pp. $20.00.

This volume contains much useful information to scientists and engineers studying the molecules in living organisms. The articles have a more physical slant than those in other related members of the "Annual Reviews" series. Chibata and Tosa's excellent chapter on the Use of Immobilized Cells is the only contribution with a real engineering approach.

Each chapter has a very general introduction which makes it accessible to a wide audience. Jaenicke's Enzymes Under Extremes of Physical Conditions is the only contribution where a glossary of biological terms would have been useful. This chapter reviews adaptations to extremes of temperature, pressure, low water activity, electrolytes, and pH; one is left with a sense of admiration for the resilience of the process of life, as opposed to our usual concept of the fragile existence of individuals. There is a wealth of information here for those interested in evolutionary biochemistry. The only other chapter specifically devoted to enzymes is Nemethy, Peer, and Scheraga's expert review of protein–solvent interactions.

Five chapters deal specifically with nucleic acids, Hearst's Psoralen Photochemistry, Berman and Young's discussion of intercalating drugs, Kleinschmidt, Klotz, and Seliger's Viroid Structure, Favre and Thomas's review of photochemical methods applied to transfer RNA, and Gorenstein's chapter on the use of ^{31}P NMR in conformational analysis. I found much useful information in these chapters.

Five chapters are related to current topics in membrane structure and action—Rand's analysis of the forces in interacting phospholipid bilayers is complemented by Cafiso and Hubbell's EPR Determination of Membrane Potentials which offers a method for studying membranes as they approach and fuse. Poo's In Situ Electrophoresis of Membrane Components covers a field in its infancy with considerable promise for relating in vitro and in vivo results. Birge's review focuses on the physical chemistry occurring when light falls on rhodopsin. Villegas and Villegas discuss studies of sodium channel components incorporated into vesicles.

The remaining chapters focus on specific methods: Dubochet, et al. on Low Temperature Electron Microscopy, Scott and Baxter's Applications of ^{13}C NMR to Metabolic Studies, Bloomfield's review of quasielastic light scattering, Blasie and Stamatoff's discussion of resonance X-ray scattering, Chen, Castro, and Quivey's Heavy Charged Particle Radiotherapy, Zierler's A Critique of Compartmental Analysis, and Hoppe's Three-Dimensional Electron Microscopy.

The editors are to be complimented on their balanced selection of timely topics and their insistence upon sufficient introductory material to make the reviews accessible. Volume 10 is another in this series with distinguished authors and readable reviews.

Philip N. Borer, *University of California at Irvine*

Hydrogen in Metals. Volumes I and II (Topics in Applied Physics. Volumes 28 and 29). Edited by G. Alefeld and J. Völkl. Springer Verlag, New York and Heidelberg. 1978. Volume 28: 430 pp. $49.00. Volume 29: 370 pp. $43.00.

The reactions of hydrogen with metals have been studied since 1866 when Thomas Graham in his final paper, three years before his death, described palladium hydride. The behavior of that hydride led him to the concept of metal hydrogen alloys and to ascribe metal-like properties to "hydrogenium". Lattice expansion and changes in the electrical resistivity and magnetic susceptibility of palladium on hydrogen absorption were also studied by Graham.

Palladium hydride has continued to play a central role in the attempt to achieve a basic understanding of metal hydrogen systems. Direct evidence for the dissociation of the hydrogen molecule as it goes into solution in metals comes from Sievert's law, which in turn rests on the statistical mechanical treatment of non-ideal solubility isotherm (Lacher). The band theory of metals was applied by Mott and Jones to the atomistic processes occurring in the solution of hydrogen in palladium showing that the concept of hydrogen as a quasimetal, introduced by Graham, is still a fruitful working hypothesis.

The binary hydrides as exmplified by palladium hydride have been studied for a long time but an essentially new field of hydride research has developed explosively in the last decade with the discovery of intermetallic hydrides such as $LaNi_5H_6$. The hydrogen absorption and desorption properties of many intermetallics provide a class of thermally reversible reactions which proceed at prodigious rates at moderate temperatures and pressures. These materials have therefore aroused considerable interest for purposes of hydrogen storage and energy conversion.

The two volumes, "Hydrogen in Metals", edited by Alefeld and Völke contain authoritative chapters on most of the research topics currently being actively pursued in this field. These are meaty volumes crammed with detailed information for the specialist. Volume I deals with Basic Properties. H. Wagner treats the theory of elastic interaction as well as spinodal decomposition and shape dependence of physical properties. Peisl deals with the methods for measurements and the results involving the strain field around H atoms dissolved in a lattice. The changes in the phonon-dispersion curves and the appearance of local or optical modes is presented by Springer while the changes of electronic properties due to solution of hydrogen in metals are given by Switendick. Extensive data on the Mössbauer effect in relation to changes in electronic properties are summarized by F. E. Wagner and Wortmann and a detailed discussion of the magnetic properties of metal–hydrogen systems is given by Wallace. In Chapters 8–13, emphasis is put on hydrogen diffusion data: the rate theory of H diffusion (Kehr); nuclear magnetic resonance techniques (Cotts); quasielastic neutron scattering (Sköld); magnetic disaccommodation technique (Kronmüller); H diffusion as a function of

temperature, isotope, and structure (Völkl and Alefeld); and muon vs. proton diffusion (Seeger).

Although Volume II is subtitled "Applications Oriented Processes", some of the chapters are very basic in character. There is an introductory chapter in which Alefeld gives a lucid discussion of metal hydrides as energy converters. Schober and Wenzl's chapter contains a collection of phase diagrams of H in V, Nb, and Ta. A summary of the extensively studied Pd–H system is given by Wicke and Brodowsky. Fascinating new hydride phases produced under high-pressure conditions are discussed by Baranowski. Hydrogen energy storage and conversion technology is given its due by Wiswall while Stritzker and Wühl outline the state of knowledge concerning superconducting metal–hydrogen systems. Recent experimental progress in electrotransport of protons in metals is described by Wipf, and in the final chapter, Wert discusses the interaction of hydrogen with defects in metals.

The chapters conform to a uniformly high standard and the editors are to be congratulated on having inspired so talented a roster of scientists to produce these two landmark volumes. All of us interested in hydride research are indebted to them for a lucid account of major accomplishments in this important field of research. I highly recommend these two books not only to researchers already in the field but also to anyone who wishes an authoritative overview of the accomplishments and potentials for hydrogen in metals.

D. M. Gruen, *Argonne National Laboratory*

Quantum Chemistry Literature Data Base. Bibliography of *ab initio* Calculations for 1978–1980. By K. Ohno (Hokkaido University) and K. Morokuma (Institute for Molecular Science, Okazaki). Elsevier Scientific Publishers, New York and Amsterdam. 1982. ix + 459 pp. $104.75.

This book is a computer output of the "Quantum Chemistry Literature Data Base" constructed in Japan. It attempts to provide a set of references as complete as possible for the ab initio calculations done during the years 1978–1980. Its aim is therefore very similar to the book series "Bibliography of *ab initio* Molecular Wave Functions" by Richards and co-workers. It is nevertheless presented in a very different way. It is divided into three parts. First, a compound index where each system is assigned one or many numbers. Second, a master listing where each number corresponds to a reference—for each reference the basis set is provided as well as some key words. The third part is an author index. This presentation provides an extremely efficient way to locate any calculation among the 2500 references quoted. Its high price is certainly the only disadvantage in this otherwise very useful reference book.

O. Eisenstein, *University of Michigan*

The Proteins. Third Edition. Volume V. Edited by Hans Neurath (University of Washington) and Robert L. Hill (Duke University). Academic Press, New York and London. 1982. xiv + 704 pp. $78.50.

This volume is part of a series devoted to methods used to determine the chemical and physical aspects of the structure of proteins, polypeptides, and peptides and the relationship of structure to function. The first chapter, Glycoproteins, was written by Nathan Sharon and Halina Lis, the second, Optical Spectroscopy of Proteins, by Charles R. Cantor and Serge N. Timasheff, and the third, The Cyclic Peptides: Structure, Conformation, and Function, by Yu. A. Ovchinnikov and V. T. Ivanov. Each chapter contains a large number of references to original literature.

Chapter 1 (144 pp) includes a brief survey of the functions and distribution of glycoproteins, the common carbohydrate–peptide linkages, a review of the methodology used for their isolation, purification, physicochemical characterization, and determination of the chemical structure of the carbohydrate moiety. The latter includes discussion of recent advances such as use of highly specific glycosidases, nuclear magnetic resonance, and improved chemical methods to determine sequence, anomery, and linkage positions. The results of a number of carbohydrate structure determinations are discussed with emphasis placed on several "core" structures which are common to many oligosaccharide moieties. Generalities about the sequences and conformation of linkage regions on the protein portion are also presented. Following that, the biosynthesis and catabolism of glycoproteins are reviewed. The chapter is concluded with a section on the glycoproteins for which the carbohydrate moiety has a definite function.

Chapter 2 (162 pp) deals with several methods which can be applied to the determination of protein conformation in solution. These are based on ultraviolet, visible, fluorescence, infrared, and Raman spectroscopy and circular dichroism. Optical spectroscopy of proteins has undergone major changes since last reviewed in "The Proteins" in 1964, because the availability of the three-dimensional structures of many proteins permitted development of empirical methods of analysis of results as well as experimental tests of new advances in theory. In addition, there were major advances in instrumentation. Cantor and Timasheff describe the basic principles underlying the methods, indicate which molecular characteristics can be determined by each, and list their strengths and limitations. The presentation is quite suitable for those with a general interest in proteins and some background in physical chemistry. Specialists will be able to take advantage of the references to current literature for more specific information about techniques.

Chapter 3 is an extensive (336 pp), well-illustrated review of the chemical structure, conformation, and function of cyclic peptides. This class of compounds is important because it includes antibiotics, hormones, regulators of ion transport and toxins, as well as other active substances. Included is a review of the synthesis of cyclic peptides of various sizes and the isolation of naturally occurring cyclic peptides. With respect to conformation, the authors list X-ray diffraction studies of the three-dimensional structures of about sixty crystalline cyclic peptides and discuss the use of ultraviolet, infrared, Raman, and nuclear magnetic resonance spectroscopy, circular dichroism and optical rotatory dispersion measurement, and theoretical calculations to determine the conformation of cyclic peptides in solution. The discussion includes strengths and weaknesses of the individual methods and the desirability of using combinations of them to obtain reliable results. Several detailed examples of structure and its relation to activity are given.

Milton E. Noelken, *The University of Kansas*

Analytical Techniques in Environmental Chemistry. Edited by J. Albaiges (Environmental Chemistry Unit, Institute of Bio-Organic Chemistry (CSIR), Barcelona, Spain). Pergamon Press, New York and Oxford. 1980. xii + 646 pp. $85.00.

This book contains 60 papers from an International Congress on the title subject held in Barcelona late in 1978. All major areas of environmental analysis are included. Among the analytical techniques described in more than one paper are gas chromatography and GC-MS, liquid chromatography, UV–visible and atomic absorption spectroscopy, X-ray emission spectroscopy, and ion-sensitive electrode potentiometry. About one-third of the papers are by authors from the U.S.A., with the remainder coming primarily from western European countries (all papers are in English, and generally well-written). In several cases the authors provide useful information about environmental studies in their local areas. Indeed a number of the articles really deal with environmental chemistry rather than environmental analysis. While some of the articles are simply reports of the author's research, many are critical reviews of the literature on the topic. Hence, although there probably is little that is newly published in this volume, the book would be a worthwhile library purchase for the perspectives on environmental analysis it provides.

Roland F. Hirsch, *Seton Hall University*

Handbook of Heats of Mixing. By J. J. Christensen, R. W. Hanks, and R. M. Izatt (Brigham Young University). John Wiley & Sons, New York. 1982. xiv + 1586 pp. $130.00.

This enormous compilation is effectively a gigantic table, in which are presented the components, their purity, the method of measurement, mole fraction, temperture, and measured heats of mixing (generally in joules/gram-mole), plus the reference. The entries are arranged in alphabetical order, beginning with acetaldehyde/diethyl ether. A synonym index provided is a help in cases of uncertainty, but it has substantial deficiencies; for example, it contains an entry "ethananamine see ethane, amino", but does not contain an entry under the most widely used name, ethylamine. Nevertheless, the authors have performed a notable service in making this source of reference available.

Pyrylium Salts: Synthesis, Reactions, and Physical Properties. By A. T. Balaban, A. Dinculescu, G. N. Dorofeenks, G. W. Fischer, A. V. Kobbik, V. V. Mezheritskii, and W. Schroth. Academic Press, New York and London. 1982. xii + 434 pp. $59.50.

This volume is Supplement 2 in the series "Advances in Heterocyclic Chemistry" edited by A. R. Katritzky. An Introduction of eight pages not only sets the subject in perspective and explains the recent resurgence of pyrylium chemistry but also is a guide to the various reviews on the subject. The section on synthesis is a supplement to the review of that subject in Volume 10 of "Advances in Heterocyclic Chemistry", but the other chapters, on reactions, physical properties, practical applications, and perspectives, start at the beginning. A substantial part of the book is a series of tables totaling 185 pages in which syntheses of various types of compounds, such as steroid pyridines, azulenes, etc., from pyrylium salts are comprehensively recorded. These tables give only references, plus in some cases the melting points, but not yields. A very long author index and a brief subject index complete this valuable work of reference.