Book Reviews*

Structure and Bonding: Adsorbed Monolayers on Solid Surfaces. By G. A. Somorjai (University of California) and M. A. Von Hove (Lawrence Berkeley Laboratory). Springer-Verlag, Berlin, Heidelberg, Germany. 1979. viii + 146 pp. $37.40.

The literature concerning structures of surfaces and of chemisorbed atoms and molecules on surfaces is growing by leaps and bounds. Consequently, reviews such as the current one are quite valuable to the various workers in this field. In addition to tables organizing the literature by crystal surface type, a brief review of the terminology and current experimental methods is included. Also included are discussions of the current view of various specific systems.

On the basis of the coverage of the reviewers' own papers (75% of relevant papers were cited), it appears that the literature has been fairly thoroughly covered. However, the references in this book only go through most of 1978 (the copyright date is 1979; I am not sure why a book review was requested in 1982). Consequently, the literature citations are now of limited use. A new tabulation of the literature would certainly be welcome.

This book can serve as an introduction to the concepts and literature on surface studies, and in 1979 I would have enthusiastically recommended purchase by various surface science groups (despite the price of $37.40). At this late date, I would still recommend this book to libraries associated with surface science.

William A. Goddard III, *California Institute of Technology*

Extended Linear Chain Compounds. Volume 1. Edited by J. S. Miller. Plenum Press, New York. 1982. xvi + 481 pp. $52.50.

On reading this volume, the first in a series of three, two points are immediately obvious. Firstly, this area is a truly interdisciplinary one. The fields of inorganic, polymer, synthetic and physical organic chemistry, crystallography, and theoretical and experimental solid-state physics meet at a point here. The book provides a useful focus for many of these diverse studies. Secondly, the reviews are extremely comprehensive, are full of detail, and appear to capture the bulk of the literature in this rapidly expanding area. I found this large amount of material in some of the chapters in Volume 1 somewhat of a problem since much of it of course is a relatively simple variation on a theme (a different metal or different ligands). Thus tetracyanoplatinate, bis(oxalate) platinate, and related iridium complexes are found in three separate chapters. Little attempt has been made to integrate this material or correlate the results of one chapter with those of another. At first sight many of the figures appear identical with others in other parts of the book, so slight are some of the variations. What is missing is a basic overview chapter containing some simple ideas of theory (we have to wait until Volume 2 for anything approaching this) and a brief survey of the structural elements of the field. In spite of these drawbacks which face the reader who wishes to read from cover to cover, this volume represents the start of a valuable resource where everything you need to know about these fascinating systems will eventually be collected together.

Jeremy K. Burdett, *The University of Chicago*

Annual Review of Pharmacology and Toxicology. Volume 22. Edited by R. George, R. Okun, and A. K. Cho. Annual Reviews Inc., Palo Alto, CA. 1982. vii + 739 pp. $25.00 ppd.

There are 25 contributed chapters in this volume, including a prefatory one and a review of reviews. The majority of them are about the mode of action of specific compounds, such as tetrachlorodibenzodioxin, or classes of compounds, such as thiono-sulfur compounds. An intriguing chapter is on the neurochemical basis of acupuncture anesthesia. There are author and subject indexes, and cumulative indexes of chapter titles and contributors.

Stability Constants of Metal–Ion Complexes. Part A. Inorganic Ligands. By E. Högfeldt (The Royal Institute of Technology, Stockholm). Pergamon Press, Oxford and New York. 1982. xiv + 307 pp. $85.00.

This volume is No. 21 in the IUPAC Chemical Data Series, and is the second supplement to the original tables published in 1964. For the years 1969 through 1974, equilibrium constants are given, along with the method of determination, temperature, medium, and reference. Hydrogen ion is included among the "metals", and the electron is included among the ligands. The table thus includes redox equilibria. Some thermodynamic data are included, using Kcal. or cal. in order to be consistent with previous volumes. Where differing values are reported, no attempt is made to evaluate their reliability. Indexes of ligands, metals, and solvents make this work a convenient key to the literature.

Developments in Polymer Characterization. Volume 3. Edited by J. V. Dawkins. Applied Sciences Publishers Ltd., London and New Jersey. 1982. x + 266 pp. $60.00.

This book is an excellent source of information for special techniques in Polymer Chemistry. The various chapters explain the theory behind the techniques, cover the subject in general, and then discuss the subject in detail. Extensive reference sections at the end of each chapter are very helpful. This book brings the reader up to date in several areas of polymer characterization.

Elbert W. Crandall, *Pittsburg State University*

From Medical Chemistry to Biochemistry: The Making of a Biomedical Discipline. By Robert E. Kohler (University of Pennsylvania). Cambridge University Press. Cambridge. 1982. ix + 399 pp. $34.50.

This is a fascinating book about the development of biochemistry as a discipline or, more specifically, how the political economy determined where biochemistry departments would be established, what their place would be in the universities, and what might be the new extensions and limits of research.

In Europe, the strong physiology departments absorbed the more chemically minded researchers that were interested in medicine or biology. In the United States, the reform movement of the medical schools brought about their reorganization and attachment to universities. Increased entrance requirements for medical school included college chemistry. This meant the chemistry taught while in medical school could be devoted to physiological and clinical chemistry. Therefore, faculty were needed who specialized in physiological chemistry. Chemistry departments were usually not interested in adding these persons to their staffs. Thus, the medical schools established their own "chemistry" departments. New departments meant new research thrusts, new journals, and new professional organizations. Perhaps the most controversial aspect of the book is the author's assertion that being tied to medical schools caused biochemists to overlook the great problems of biology. Thus, the one-gene-one-enzyme concept, the α helix, and the double helix were not developed by biochemists.

The book is very well documented. I totaled 1069 citations. These are listed and numbered separately for each of the 12 chapters. The citations do not interfere with the flow of reading.

"From Medical Chemistry to Biochemistry" will be of greatest professional interest to historians of science. It will also be of interest to any chemist (and others) but especially biochemists that have an interest in the development and trends of our profession. The book is well written and mostly easy reading. It was interesting to me to read many well-known names and how these individuals either facilitated or hindered the growth of the new discipline.

J. Lindsley Foote, *Western Michigan University*

The Chemical Physics of Solid Surfaces and Heterogeneous Catalysis. Volume 4. Fundamental Studies of Heterogeneous Catalysis. Edited by D. A. King (University of Liverpool) and D. P. Woodruff (University of Warwick). Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. xiv + 468 pp. $148.75.

This is the fourth volume of a series which, according to the publishers, "will provide a comprehensive survey of the interdisciplinary science of solid surfaces". This volume is an effective contribution to that goal.

The first chapter by R. J. Madix covers basic theories relating to surface reactivity. The specific topics discussed in the remaining chapters include surveys on the hydrogen–oxygen reaction on metal surfaces (P. R. Norton), oxidation of carbon monoxide (T. Engel and G. Ertl), surface reactivity of silver in oxidation reactions (M. A. Barteau and R. J. Madix), synthesis and decomposition of ammonia (M. Grunze), the H_2–D_2 exchange reaction (T. Engel and G. Ertl), hydrocarbon conversions over metal catalysts (S. M. Davis and G. A. Somorjai), exchange and reforming reactions of hydrocarbons on metals and alloys (V. Ponec), nitric oxide reduction (W. F. Egelhoff, Jr.), and the methanation reaction (R. D. Kelley and D. W. Goodman).

Coverage within each topic is good, and the discussions, though generally concise, are clearly presented. An average of over 106 references per chapter gives an excellent literature background. The chapter on hydrocarbon oxidations includes an appendix with 60 pages of kinetic

* Unsigned book reviews are by the Book Review Editor.

parameters and 150 additional references. A subject index is included.

Jay E. Taylor, *Kent State University*

Membrane Electrodes in Drug-Substances Analysis. By V. V. Cosofret (Institute of Chemical and Pharmaceutical Research, Bucharest). Translation Editor: J. D. R. Thomas (UWIST, Cardiff). Pergamon Press, Oxford. 1982. XVI + 362 pp. $60.00.

To the reviewer's knowledge, this book is the first of its kind. It is divided into three parts. The first gives a concise but thorough and extremely well written account of the theory and application of membrane electrodes. It also provides some useful tables comparing the response characteristics of several commercial membrane electrodes. The second part purports to deal with general methods of analysis with use of membrane electrodes but is actually a discourse on the determination of inorganic species such as is to be found routinely in texts on analytical chemistry and electrochemistry. The remaining 60% of the text is concerned with the analysis of drug substances. The organization of this third part, by chapters, deals with groups of drugs according to their pharmacological actions (e.g., pyschotropic drugs, antiseptics) rather than their electrochemical properties. This tends to cause considerable repetition and lengthening of the text. However, the treatment of drug determination by membrane electrodes is thorough, encyclopedic, and very readable. The book will certainly be of interest to anyone interested in electrochemistry or pharmaceutical analysis.

Stephen G. Schulman, *University of Florida*

Advances in X-Ray Analysis. Volume 24. Edited by Deane K. Smith (The Pennsylvania State University) and Charles S. Barrett, Donald E. Leyden, and Paul K. Predecki (University of Denver). Plenum Press, New York. 1981. xx + 428 pp. $49.50.

This volume constitutes the proceedings of the 1980 Denver Conference on the Applications of X-Ray Analysis and includes 56 papers presented at that conference; 17 papers presented are not included, but their titles and authors are listed. The papers printed are categorized under one of the following six general headings: Practical Applications of Automated Analysis of Diffraction Data (5 papers); XRD Mathematical Methods, Techniques and Instrumentation (6 papers); XRD Applications of Position Sensitive Detectors, X-Ray Strain Measurement, Fatigue Characterization (17 papers); Other XRD Applications (7 papers); XRF Applications in the Minerals Industry (6 papers); XRF Techniques and Instrumentation (7 papers), and Other XRF Applications and Mathematical Methods (8 papers).

The category titles just listed give a good indication of the large range of topics covered. There are few papers relating to three-dimensional structure determination, but this is not surprising, since the conference has in the past dealt principally with powder diffraction. Topics treated range from the theoretical (a few) to the applied (a large majority), with considerable emphasis on automation and the associated hardware and software. An individual with interests included within the general categories listed above would do well to consider the contributions contained in this volume.

Daniel S. Jones, *University of North Carolina at Charlotte*

Advances In Transport Processes. Volume II. By Arun S. Mujumdar (McGill University, Canada) and R. A. Mashelkar (National Chemical Laboratory, Pune, India). John Wiley & Sons, New York. 1982. vi + 432 pp. $37.95.

The modelling and analysis of heat, mass, and momentum transport processes are two of the most fundamental tasks of the scientist or engineer. The user who wants to keep abreast of current developments must take account of contributions from physical chemists, workers in transport phenomena, and numerical analysts as well as those in his own field.

To select the most useful material from different areas of transport phenomena and present it in a form suitable for assimilation by graduate students and researchers is indeed a formidable task in which the authors and editors have been very successful.

This volume contains six authoritative reviews in the areas of environmental, electrochemical, and polymer engineering as well as on particle motion and multiphase flow. The chapters concerned with the environment involve the modern modelling of aquatic systems by presenting in an organized description the basic equations relating hydrodynamics and stream quality and dust removal from hot and compressed gas streams by fibrous and granular-bed filters. The chapter on electrohydrodynamic enhancement of convective heat and mass transfer presents an excellent review on the fundamentals of electric wind phenomena and their potential for viable industrial applications. The review on the isothermal and incompressible flow of inelastic and viscoelastic fluids in circular entry flows provides the reader with a clear analysis and description of entry flows essential for proper and efficient design for processing systems and in the measurement of flow properties of materials. The material in the chapter of multiphase flow models is most welcome, because the flow of multiple phases is treated in a proper theoretical manner, thus, avoiding the misconceptions and erroneous conclusions to which the empirical treatment of this subject has so often led us. These theoretical models, together with those in David Azbel's 1981 book of two-phase flows, may provide a basis for the analysis and design of systems involving more than one phase like nuclear, chemical, and biochemical reactors. The last chapter of this volume presents a comprehensive review of the transport processes involved during steady and unsteady particle motion in various flow fields. The shape of the particle may be that of a sphere, cylinder, or plate.

Appropriately selected material from the book could provide support for graduate courses in transport phenomena.

I shall be glad to have this book on my shelves, providing an authoritative survey of the current state of the art in the transport processes included in this volume.

A. I. Liapis, *University of Missouri—Rolla*

Methods in Enzymology. Volume 84. Immunochemical Techniques. Part D. Selected Immunoassays. Edited by J. J. Langone (National Cancer Institute) and H. Van Vunakis (Brandeis University). Academic Press, New York, NY. 1982. xxii + 707 pp. $65.00.

According to the editors, a major goal of this volume is to "illustrate the variety of immunological procedures involved in the development of a successful assay for substances of diverse structural and biochemical properties". In doing this, the volume describes immunoassays for a number of biologically important molecules, including both macromolecules as well as low molecular weight non-antigenic compounds that require chemical modification before they can be used in the production of specific antibodies used in the assay. The essentials of assay methodology are described under the following headings (examples of specific materials in parentheses): Oncofetal Proteins (α-fetoprotein, carcinoembryonic antigens); Proteins and Peptides of the Blood Clotting System (factor VIII antigens, platelet factor 4, β-thromboglobulin, human fibrinopeptides); Metal and Heme Binding Proteins (metallothioneins, calmodulin, ferritin, myoglobin); Nucleic Acids and Their Antibodies; Toxins (botulinum toxins A, B and E, cholera toxin, staphylococcal enterotoxin, thyroid hormones T_3 and T_4); Endogenous Compounds of Low Molecular Weight (serum bile acids, edcysteroids, motilin, vitamin B_{12}); Drugs (methotrexate and related folate derivatives, bleomycin, neocarzinostatin, benzodiazepines, meperidine derivatives, fentanyl, haloperidol, pimozide, morphine, acetylcholine, digoxin, *n*-butylbiguanide, metyrapone, pyrazolone derivatives); Environmental Agents (2-acetylaminofluorene-DNA adducts, chlorinated dibenzo-*p*-dioxins, nicotine and related compounds). Techniques which are illustrated by examples include the following: a variety of modifications of radioimmunoassay, rocket electrophoresis, counterimmunoelectrophoresis, enzyme linked immunosorbent assay (ELISA), solid phase RIA, chemiluminescence immunoassay, magnetizable particle solid phase RIA, among others.

Both established users of this methodology such as the distinguished list of contributors as well as novices at RIA and related methods will find this book an extremely useful reference, although its cost will normally limit it to library collections. The author found the volume to be well-written, relatively error free, and very well referenced. One noticeable detracting feature was the rather mysterious placement of thyroid hormone RIA procedures under the section on "Toxins", when it seems that this discussion should properly have been placed in the section on "Endogenous Compounds of Low Molecular Weight".

This volume serves its purpose very well indeed, not only with its interesting presentation of specific assays but more importantly with its clear illustration of various modifications of Immunochemical Techniques and its extensive references to many other published articles utilizing these techniques.

Larry J. Loeffler, *University of North Carolina at Chapel Hill*

Introductory Medicinal Chemistry. By J. B. Taylor and P. D. Kennewell (Roussel Laboratories). Ellis Horwood Publishers, Chichester, England. 1981. 202 pp. $59.95.

This book is an excellent starting point for any scientist interested in learning the basics or in developing a solid foundation in medicinal chemistry. The authors have succinctly and clearly described the important fundamentals of medicinal chemistry in six chapters. In the first chapter an historical review of drug development is presented, appropriate terminology is defined, and the major processes of drug action outlined. The next three chapters describe in some detail these three major processes—the pharmaceutical phase (the science and technology of getting a drug in an appropriate form for clinical use), the pharmacokinetic phase (how the drug gets from its point of entry into the body to its site of action), and the pharmacodynamic phase (the interaction of a drug with its site of action). The last two chapters deal with neuro-

transmitters/receptors (only the nervous system not the endocrine system is discussed) and drug metabolism. These topics will allow the reader to have a basic understanding of medicinal chemistry which will permit, if desired, a more in depth perusal of the literature in specialized areas. The book is concise and well-written and can be read quickly. It adequately describes the complexities of medicinal chemistry and the design of drugs and will either frighten away potential medicinal chemists from pursuing the field or intrigue them to study more in depth. In either case, the book superbly accomplishes its purpose—to introduce medicinal chemistry.

Richard B. Silverman, *Northwestern University*

A New View of Current Acid–Base Theories. By Harmon L. Finston (City University of New York, Brooklyn College) and Allen C. Rychtman (Glyco, Inc.). John Wiley and Sons, New York. 1982. viii + 216 pp. $45.00.

The title, jacket, and preface of this book lead one to believe that a "unified, all-encompassing" acid–base theory has been developed, based on the premise that "all chemical reactions are charge-transfer reactions". Instead, one finds in Chapters 1–5 an essentially historical account of acid–base concepts including the early ideas of Arrhenius, Hantzsch, Brønsted, Lowry, Franklin, Wickert, Lewis, Usanovich, and others. These concepts are brought more or less up to date by inclusion of more recent topics such as Hammett H_0 and the related H_- functions, gas-phase acidities, Pearson HSAB theory, and Gutmann donor–accepter numbers. Also included, somewhat inexplicably, are the Edwards and Klopman–Hudson reactivity equations. The book appears to be adapted from the Ph.D. dissertation of the same title by the junior author, which may explain why Chapter 6 is devoted to experimental results purported to verify and reconcile the various acid–base theories by demonstrating that redox processes can be included in acid–base chemistry, an idea attributed to Usanovich. In his 1980 book, "The Lewis Acid–Base Concepts. An Overview" (reviewed in *J. Am. Chem. Soc.* **1981**, *103*, 3616), W. B. Jensen points out that by 1934 the English organic chemists Robinson and Ingold, under the guise of nucleophilic and electrophilic reagents, had developed almost all of the qualitative principles of Lewis acid–base chemistry, clearly recognizing their relationship to oxidizing and reducing agents and making the 1939 paper of Usanovich somewhat anachronistic. The present book is bound to evoke unfavorable comparison with the longer, better organized, more detailed, and much more rigorous Jensen book, which covers much the same material.

Frederick G. Bordwell, *Northwestern University*

Nitrogen Fixation. Volume I. Ecology. Edited by W. J. Broughton (Max-Planck-Institut für Züchtungforschung, Köln). Clarendon Press, Oxford. 1981. xi + 306 pp. $54.00.

This is an interesting book, and it is reasonably balanced in its coverage of N_2 fixation by a variety of organisms. Despite the book's title, the approach of several of the authors is more agronomic and physiological than ecological; this is not meant as a criticism. A rather broad audience interested in biological N_2 fixation should enjoy reading this volume.

P. Fay opens the book with an interesting review of the blue-green algae and photosynthetic bacteria. His emphasis is on the blue-greens in aquatic habitats. The interactions of photosynthesis and N_2 fixation are described, as well as the influence of a variety of environmental factors on each process.

The ecological impact of the heterotrophic N_2-fixing organisms usually is given scant attention, because it has been the general consensus that they contribute little fixed nitrogen to their habitats in soil and water. Jensen points out that recent studies suggest that their contribution may be greater than is generally appreciated. He has presented a comprehensive coverage of the factors that control the distribution, growth, and N_2 fixation by the heterotrophs.

The non-leguminous root-nodule symbioses are discussed by Akkermans and van Dijk. They cover the *Cycas*, *Parasponia* and *Alnus* type symbioses and include useful tables to classify plants in these three groups and to indicate their characteristics. The authors' thorough review of *Cycas* and *Parasponia* systems is particularly welcome.

Lie has covered the environmental physiology of the legume-*Rhizobium* symbiosis. He calls attention to the fact that dominant natural populations of legumes are rather uncommon because of the special requirements of the legume symbiosis. The process of nodulation is reviewed, and factors that limit N_2 fixation are discussed: limiting and excessive water, temperature, light, carbon compounds, photorespiration, and dissipation of energy by H_2 evolution.

N_2 fixation in "terrestrial environments" is covered by Waughman, French, and Jones, and this includes forests, polar and alpine tundra, hot arid and semi-arid regions, peatlands, and sand dunes. This is followed with a discussion of N_2 fixation in ecological successions and N_2 fixation in animals. N_2 fixation in animals usually is passed over lightly, but the authors have taken the time to dig out and evaluate the literature.

Paerl et al. cover N_2 fixation in aquatic ecosystems, both freshwater and marine. The treatment is thorough and critical, and the authors include a number of useful tables. The discussion of N_2 fixation in the ocean by *Oscillatoria* spp is particularly helpful. Paddy fields are divided into four environments for discussion by Watanabe and Brotonegoro: flood water, surface oxidized soil, reduced soil and, rice root and rhizosphere. Each presents special conditions for N_2-fixing organisms, and each has its particular microflora. Contributions by associative N_2 fixation are considered questionable, whereas the *Azolla* association fixes well and blue-green algae when growing very actively may contribute up to 0.5 Kg N ha^{-1} day^{-1}.

Henzell examines the ecological factors that influence N_2 fixation by forage legumes and the methods available for measuring N_2 fixation in the field. Henzell remains a skeptic about the very high rates of N_2 fixation reported in the field but seems willing to accept values up to 250 Kg N ha^{-1} fixed annually by forage legumes.

R. H. Burris, *University of Wisconsin—Madison*

Coloring of Plastics. Edited by Thomas G. Webber (Consultant). John Wiley & Sons, New York. 1979. XVII + 220 pp. $25.00.

After an initial chapter, Color Measurement, which is an appropriate introduction to color theory, color descriptive systems, colorimetry, and color matching, with references for further in-depth exploration, "Coloring of Plastics" continues, in 23 additional chapters, to describe pigments and dyes used for coloring plastics, equipment and methods for dispersing colorants in plastics, and the coloring of thermoplastic and thermosetting polymers. In addition to the coloring of the major commercial plastics, the book contains chapters on the coloring of some specialty polymers such as ionomer resins, silicone elastomers, poly(vinylbutyral), and fluoropolymers. The coloring of poly(vinyl chloride) is covered in three chapters—Fluid Vinyls, Flexible Vinyls, and Rigid Vinyls.

In the Preface the editor states the book is "designed to cover the fields of color, colorants, dispersion equipment, and the difficulties of coloring individual plastics". This objective is met generally satisfactorily. Each chapter on the coloring of a plastic briefly describes the plastic, how it is made, its chemical nature, some of its physical properties, uses, and special characteristics which influence its coloration. Each such chapter usually contains a listing of pigments or dyes used in practice and some written discussion of colorants for the plastic.

The most successful chapters present information on the value of specific colorants for a plastic thereby providing guidance to pigment selection. However, that is done in only a limited number of chapters; in most instances the colorant information is general and descriptive. The editor addresses this matter in the Preface: "In the case of older well-established products, it is possible to be quite specific regarding the best colorants to be used. Other resins are highly complex .... Specific recommendations might be misleading in these cases". Nevertheless, it would have been helpful to the reader to be provided with more specific colorant recommendations, more specific information on concentrations generally used, and more information on sources of supply, including masterbatches.

Peter P. Klemchuk, *Ciba-Geigy Corporation*

Preparation and Analysis of Protein Crystals. By Alexander McPherson (University of California at Riverside). John Wiley & Sons, New York. 1982. vii + 371 pp. $50.00.

Although there is a wealth of textbooks about crystallography, until relatively recently there has been little to help students of often diverse backgrounds to master the problems of macromolecular structure determination. Nevertheless, during the last quarter century, this branch of crystallography has revolutionized much of biochemistry, has been especially demanding on a fundamental understanding of diffraction, and has been particularly exacting on the quality of instrumentation.

The McPherson book covers similar ground as Blundell and Johnson's "Protein Crystallography" (Academic Press, 1976), although with a strong slant given by the author's own experiences which tends to emphasize practical knowledge rather than fundamental theory. Unlike the earlier book, it is almost affordable, albeit at a corresponding loss of printing quality. McPherson's writing is excellent and he covers all essential topics. A physicist with interest in structural biology will find the chapters on separation methods, analytical methods, sources of heterogeneity, crystallization, and formation of heavy-atom derivatives especially useful, whereas the biologist and biochemist will find the chapters on the nature of crystals, diffraction of X-rays, and preliminary analysis enlightening. Crystallographers with other backgrounds may be surprised by the wealth of ideas in the chapters on data collection, methods for structure determination, analysis, and utilization of results

as well as the chapter on electron microscopy. The experienced macromolecular crystallographer will greatly appreciate the numerous tables and appendices that bring together a mass of experience. In short, McPherson's book complements but does not replace Blundell and Johnson's work and will certainly be a recommended textbook to students who show curiosity in macromolecular crystal analysis.

Michael G. Rossmann, *Purdue University*

Heavy Ion Reactions: Lecture Notes (complete in two volumes). Volume I. Elastic and Inelastic Reactions. By Richardo A. Broglia and Aage Winther (Niels Bohr Institute). The Benjamin/Cummings Publishing Company, Inc., Reading, MA. xvi + 291 pp. $29.50.

During the last decade, the study of heavy ion reactions has been one of the forefront research topics in nuclear science. Interest in this field was stimulated by the discovery and elucidation of the properties of damped or dissipative heavy ion collisions, a reaction type intermediate between the previously well studied direct and compound nucleus reactions.

In view of the recent rapid developments in heavy ion reactions, it is timely to have written, by two of the leading theorists in the field, a unified description of heavy ion reactions ranging from grazing to highly dissipative collisions including fusion. The present volume deals with elastic and inelastic reactions and serves to give a description of nuclear structure in terms of elementary modes of excitation. The use of a classical treatment of the relative motion serves to establish the connection with a macroscopic description of strongly damped reactions to be dealt with in the forthcoming companion, Volume II.

The titles of the four chapters in Volume I are, Nuclear Phenomena in Heavy-Ion Collisions, Coulomb Excitation, Elastic Scattering, and Inelastic Scattering. Each chapter is divided into a number of subsections and presented in a format and at a level to make the material useful to the experienced research worker as well as to first year graduate students. The chapter on Elastic Scattering, for example, discusses in some detail the nuclear ion–ion potential, including folding and proximity potentials, deflection functions, and rainbow scattering including the nuclear rainbow, partial waves, phase shifts, solution of the radial equation, WKB approximation, cross sections, etc. It is noteworthy also that three of the chapters are enriched with a number of appendices.

This excellent volume is highly recommended as a source book for students and research workers interested in the theoretical aspects of heavy ion nuclear science.

John R. Huizenga, *University of Rochester*

Coal Utilization: Technology, Economics and Policy. By L. Grainger and J. Gibson. Halstead Press, A Division of John Wiley and Sons, New York, NY. 1981. XXII + 503 pp. $49.95.

This is an important book that presents the case for increased coal utilization in an authoritative and even handed manner. While the book is broad in scope and conception, it is also full of detail and specific information. The book is divided into four large sections: Introduction to Coal and its Utilization, Technllogy of Coal Utilization, Economics of Coal Utilization, and Coal in Energy Policies. A bibliography of general articles, books, and reports is given at the end of the book. No specific references are given in the chapters. While it is not suitable as a text book, it is a valuable reference work for chemists. After all, coal is our most abundant fossil fuel. It is readily available, convenient to use, and a reliable and flexible source of energy. Furthermore, it is a future source of chemicals.

In the first section the chapter titles are: What is Coal, Why is Coal Important, How Much Coal, How is Coal Won, and How Can Coal be Used? The authors present the basic information on energy and fossil fuels, coal structure and properties, coal resources, coal mining, and coal utilization needed to appreciate the latter sections of the book. The treatment is brief (61 pages) but still understandable. Chemists with little or no background in coal will find the section useful although demanding.

The second section of the book presents the technological aspects of coal utilization. The chapter headings are: Combustion, the Carbonization of Coal, Gasification, Liquefaction of Coal, Chemicals from Coal, and In-Situ Processes: Underground Coal Gasification. Details of the multitude of processes are outlined with an assessment of their weak and strong points. The processes are placed within the overall framework of contemporary technology and areas of future development are indicated.

The chapter headings in the third section are: General Considerations of Coal Utilization Economics, Economics of Combustion and Power Generation, Economics of Carbonization, Economics of Coal Gasification, the Economics of Liquefaction, Economics of Chemicals from Coal, Economics of Underground Coal Gasification, Environmental Impact, and Multi Component Plants: Coalplexes. The economic aspects of coal usage are discussed with emphasis on the factors which affect the relative advantage of coal in comparison with other sources. Of necessity the results of the economic analyses are imprecise. Nonetheless it is clear that coal is now a valuable energy resource and in the future it will become an important source of chemicals (principally by gasification and synthesis gas chemistry).

In the fourth and last section of this book, the authors discuss energy policies and the importance of coal utilization in the global energy scene. The chapter headings are: Distribution of Coal in Relation to Energy Networks, Relationships of Coal to Nuclear Power and Other Energy Sources, and Coal Utilization in Relation to World Energy Strategies. Here policies are proposed for the best use of coal.

Laurence J. Boucher, *Western Kentucky University*

Measurement of Dissolved Oxygen. By Michael L. Hitchman (Laboratories RCA Ltd., Zurich). John Wiley & Sons, New York. 1978. xvi + 255 pp. $23.50.

The book is true to its title. It adheres to dissolved oxygen (DO) measurement, avoiding unncessary excursions into other oxygen measurement challenges. The author has devoted about one-quarter of the sapce to: (1) Introduction and Principles, (2) The Membrane-Covered Polarographic Oxygen Detector (MPOD), (3) Other Methods (including Winkler), and (4) Appendixes. The latter is mostly devoted to quick reviews of the principles necessary to better understand the membrane-covered polarographic detectors. These reviews should be useful to a significant portion of readers. Not surprisingly, about one-half of the book is on the MPOD or its background principles. Any chemist with this book could find all the information to become competent in the theory and use of these widely used devices. The Winkler method properly receives significant space in a fashion which can bring the reader "up to date" on its development. The other methods treated include potentiometric, conductometric, manometric, mass spectrometry after degassing, etc. In general the review and discussion is short but adequate, and refers to well-selected reviews and reference works.

Dr. Hitchman's stated intention (Preface) to emphasize the "whys" rather than the "hows" of DO measurement is followed consistently. In the second and third chapters he reviews pertinent thermodynamics and kinetics in a style appropriate to this type of book. The required relationships and equations are presented, the essential principles from which they were derived are reviewed, and their significance to the subject matter is shown. These chapters, with appropriate appendix sections, can serve as a useful, succinct basis for personal study.

The preface of this book is fun to read! The book also has other commendable features. It contains a single list of symbols. Careful references to earlier reference works, literature reviews, and other literature is included. Dimensions, including an appendix on dimensional analysis, are given decent attention. The chapter heading quotations are enjoyable. This monograph has provided and will continue to provide an important reference for further work in DO measurement, especially where principles are essential as in developing improvements upon present methodology.

Calvin O. Huber, *University of Wisconsin—Milwaukee*

Phase Transitions in Surface Films (NATO Advanced Study Institutes Series. Series B: Physics. Volume 51). Edited by J. G. Dash (University of Washington) and J. Ruvalds (University of Virginia). Plenum Press, New York, NY. 1980. xii + 367 pp. $42.50.

This volume consists of a series of lectures (each chapter a different lecture) presented at the Advanced Study Institute at the Ettore Majorana Centre for Scientific Culture in Erice, Sicily, during the summer of 1979. Selected topics dealing with recent experimental work and new theoretical concepts in the growing field of condensed, two-dimensional matter physics are presented. The principal motivation of the lecture series, which resulted in the volume, was to provide a review of the most current monolayer concepts; however, most of the presentations include new results (almost entirely in table or graphical figure form).

The series of topics, each topic covered by an expert in the field, is prefaced with the first chapter by R. B. Griffiths dealing generally with surface thermodynamics concepts. The remainder of the volume consists of specialized topics best understood from the chapter titles: Chapter 2 (M. Bienfait), Two Dimensional Phase Transitions in Classical Van Der Waals Films Adsorbed on Graphite; Chapter 3 (M. Schick), Theory of Helium Monolayers; Chapter 4 (A. Luther, J. Timonen, and V. Pokrovsky), Domain Walls and the Commensurate Phase; Chapter 5 (M. Nielsen, J. P. McTague, and L. Passell), Neutron Scattering Studies of Physisorbed Monolayers on Graphite; Chapter 6 (M. Richards), Nuclear Magnetic Resonance in Adsorbed Helium; Chapter 7 (J. M. Kosterlitz), Ordering in Two Dimensions; Chapter 8 (J. D. Reppy), Superfluidity in Thin Helium Four Films; Chapter 9 (E. Bauer), Chemisorbed Phases; Chapter 10 (M. Pomerantz), Studies of Literally Two-Dimensional Magnets of Manganese Stearate; Chapter 11 (J. G. Dash), On a

Standardized Measure of Substrate Uniformity.

As is evident from the chapter titles, this volume is probably not for the library shelves of most chemists; however, for those interested in the specialized areas considered, it does provide an excellent picture of current work in selected areas of monolayer physics. Furthermore, as the volume preface points out, it does illuminate, "those topics that might otherwise be unnoticed by newcomers to the field".

Forrest W. Getzen, *North Carolina State University*

Chemistry and Physics of Solid Surfaces. Volume IV. Edited by R. Vanselow and R. Howe (University of Wisconsin, Milwaukee). Springer-Verlag, Heidelberg/New York. 1982. xiv + 496 pp.

This book is another example of a genre with which I have never become fully comfortable. Although they have the external look and feel of "real" books, they turn out to be conference proceedings, put together by photographing typescripts submitted by the speakers. Already growing slightly stale, they have neither the authority of a textbook, nor the immediacy of a journal, nor the coherence and readability of a topical review. Given the many factors that influence the selection of invited speakers, there is inevitably no consistent level of quality, and some contributions are casually written and proofread. The question arises: should anyone—even libraries—buy expensive books whose chapters mostly have shelf lives of 1 to 3 years?

There is, of course, not inconsiderable value during those few years in a "snapshot album" (however fuzzy) of the state of an art as recorded by its practitioners. And the editors of the book under review have done a commendable job of bringing together contributions on a large variety of techniques used to study surfaces, interfaces, and overlayers. Some of these are techniques being subjected to refinement ad nauseam; others, such as helium atom diffraction, are quite new and promising. In addition, there are chapters on such topics as critical phenomena, defects, metal clusters, desorption, and surface segregation. Inevitably, there are omissions. While LEED studies of adsorbed films are described in an excellent article, the major and growing area of X-ray diffraction from monolayers and surfaces is completely ignored. Again, Monte Carlo simulations are discussed but molecular dynamics remains unrepresented. Possibly Volume III (which I have not been able to find) complements this volume; and in any case such collections must reflect the prejudices and backgrounds of the editors and of their particular circle of contemporaries. When this book is compared with "Ordering in Two Dimensions" (edited by S. K. Sinha, North Holland, New York, 1980), the differences in emphasis are particularly striking; anyone who is familiar with one of these books would do well to spend some time with the other.

P. Dutta, *Northwestern University*

Structure and Bonding in Crystals. Volume II. Edited by Michael O'Keeffe and Alexandra Navrotsky (Arizona State University). Academic Press, New York. 1981. xv + 357 pp. $51.00.

Despite the disclaimer by the editors of this volume that it and Volume I of the same title are by no means "conference proceedings", the two volumes in fact grew out of an NSF-sponsored meeting at Arizona State University in January 1980, of which virtually all of the contributors to this book were participants. The contributions are very diverse in content and style. Taken as a whole, they do not constitute by any means an overall coverage of the title subject area, but represent rather a sampling of important and timely aspects.

The articles in this volume, numbered 14 through 26 (Volume I contains 1 through 13), divide roughly into two groups. The first group deals with topics such as bond length, bond strength, atomic and ionic radii, etc.; these have been traditional topics for decades, but are here treated in some novel ways—14: I. D. Brown, the bond valence method; 15: W. H. Baur, interatomic distance predictions for computer simulation of crystal structures; 16: R. D. Shannon, bond distances and radii in sulfides; 17: A. Navrotsky, energetics in phase transitions in AX, ABO_3, and AB_2O_4; and 18: J. C. Jamieson, M. H. Manghnani, and L. C. Ming, crystal chemical effects on geophysical equilibria. The second group deals with the problems of classifying complex solids and with systematizing their structural relationships—19: R. M. Hazen and L. W. Finger, modular structure variations and stability; 20: J. M. Sanchez and D. de Fontaine, theoretical predictions of ordered alloy superstructures; 21: T. J. McLarnan and P. B. Moore, graph theoretic enumeration of structure types; 22: J. B. Thompson, Jr., polytypism in complex crystals; 23: F. Liebau, influence of cation properties on the conformation of silicate and phosphate anions; 24: S. Andersson, complex alloy structures; 25: E. Parthe, structural features of rare-earth-rich transition metal alloys; and 26: F. Hulliger, polycationic and polyanionic tetrelides, pnictides, and chalcogenides. Certainly this is a distinguished collection of authors, most of them very well known.

In the judgement of this reviewer the articles numbered 16, 22, 23, 25, and 26 are especially valuable for their painstaking scholarship. Two theoretical articles, 20 and 21, while of limited practical use at present, are challenging and may stimulate new ideas. Despite the excellent work of Sten Andersson, his article 24 on Description of Complex Alloy Structures is much narrower than seems to be promised by its broad title and omits several very important aspects of the description of tetrahedrally close-packed structures as well as some key references (especially, Yarmolyuk, Ya. P.; Kripyakevich, P. I. *Sov. Phys. Crystallogr.* **1974**, *19*, 334–337). For the individual seeking to become armed with new mathematical and physical methods to employ in the field of structure and bonding, Volume II may appear somewhat less attractive than Volume I with its treatments of such timely subjects as pseudopotentials and charge density distributions. Taken as a whole, however, this volume is a worthy companion to the first one.

David P. Shoemaker, *Oregon State University*

Chemical Applications of Raman Spectroscopy. By J. G. Grasselli, M. K. Snavely, and B. J. Bulkin. John Wiley and Sons, New York. 1981. x + 198 pp. $29.95.

The advent of commercial lasers in the late sixties has broadened considerably the range of application of Raman spectroscopy. Since then, several review articles and monographs dealing with the theory and with specific applications of the Raman effect have appeared. However, there has been a dearth of books presenting in one volume a full-scale discussion of the application of Raman spectroscopy in chemistry. Grasselli, Snavely, and Bulkin's book is therefore a valuable addition to the literature of Raman spectroscopy.

The book opens with two chapters where the authors review briefly the theory of the Raman effect and describe spectrometer components and instrumental techniques such as microsampling and the use of optical multichannels. Chapters 3 to 9 deal essentially with the application of Raman spectroscopy to organic, inorganic, and organometallic chemistry, polymers, biological systems, liquid crystals, surfaces and catalyst, as well as to petroleum, coal, and drug industries. Finally, Chapters 10 and 11 are devoted to band-shape analysis and nonlinear effects. The subject coverage in each chapter is comprehensive and is well documented by an extensive list of references. Examples are well chosen to provide a clear overview of the treated topics.

In summary, this book surveys much of the current research and industrial chemical applications of Raman spectroscopy and is highly recommended as a valuable introductory guide.

Michel Pézolet, *Laval University*

Fundamentals of Preparative Organic Chemistry. By R. Keese (University of Berne), R. K. Müller (Hoffmann LaRoche, Basle), and T. P. Toube (University of London). Ellis Horwood Limited, Chichester. 1982. 149 pp. $42.95.

The authors of this volume have attempted to prepare a concise description of conventional organic laboratory practices. It appears to be a distillate of many of the "methods" texts, which the authors have conveniently listed, punctuated with typical "procedures", "helpful hints", and "rules of thumb". Examples include graphs for choosing chromatography column sizes, a method for guessing reduced pressure boiling points, and a useful, if simplistic, chapter on the purification of solvents. The procedures described in detail are the most straightforward and therefore most likely to be used under normal circumstances. The chapters covering different laboratory techniques are not uniform in quality, some (crystallization, distillation, chromatography) being quite useful while others (spectroscopic identification, hints on synthesis) serve little useful function. Surprisingly, gas chromatography is never mentioned as either an analytical or a preparative separation technique. That safety is given first billing and repeated mention is laudable; that it is often confusing or missing at crucial times is unfortunate, given the expected readership. That gloves are recommended only in the discussion of carcinogens and radioisotopes ignores their benefit in many chemical-handling situations. No mention is given of compounds or structural features which pose a significant explosion or fire hazard when subjected to the "normal procedures" (i.e., azides, perchlorates phosphines, metal alkyls).

It seems this book is designed to bootstrap new members of a research group to a minimum level of expertise and laboratory folk wisdom. It also sets pointers to more detailed discussions of individual topics. These functions it performs adequately. The authors do not discuss any subject in enough detail to serve as a primary reference, in keeping, perhaps, with the "fundamental" nature of the text. It provides little or no insight into the problems encountered during the syntheses of compounds which are toxic or sensitive to light, heat, acid, or base. This lack is most evident in that there are no alternative suggestions given to aid the reader faced with one of these annoying complications.

This volume will serve a useful purpose in laboratories where organic chemistry is performed, especially if constructively annotated. At its price, it is not destined to become an undergraduate text.

Mark E. Jason, *Amherst College*

Hormonal Proteins and Peptides. Volume 10. β-Endorphins. Edited by Choh Hao Li (University of California, San Francisco). Academic Press, Inc., New York. 1981. xi + 359 pp.

In a field as rapidly advancing as that of the opiate peptides, research findings are in a dynamic and often conflicting state. Comprehensive, critical, and frequent reviews are essential for the nonspecialist and highly useful for the specialist. When these reviews are not only timely and wide-ranging but also presented by acknowledged experts, their value is often enhanced. Workers in the endorphin area have thus probably already discovered and profited from Volume 10 of the C. H. Li-edited series, "Hormonal Proteins and Peptides".

The discovery of the enkephalins and the larger peptides from which they can be derived (α-endorphin, γ-endorphin, recently sequenced precursor proteins, etc.) provided a rationale for the existence of "opiate" receptors in the brain. However, a bewildering array of studies have not as yet fully clarified the physiological relationships of these peptides nor led to the originally hoped for breakthroughs in new pain-relieving agents, mental illness, and behavioral insights. Nevertheless, successes do exist: a rational basis for acupuncture therapy; clarification of tolerance/addiction relationships; shock and trauma therapy by opiate antagonists. This volume adequately covers many clinical applications of the endorphins but also summarizes recent structural and biochemical studies.

In the first chapter, C. H. Li clearly demonstrates that the endorphin peptides and their various synthetic and truncated analogues differ significantly with respect to relative binding, behaviors in tail flick, mouse vas deferens and guinea pig ileum assays and their response to radioimmunoassays. Multiple receptors, coupled interactions between different receptors, dual receptor occupancy by endorphins, and proteinase processing (by which larger peptides are degraded to still active fragments—including enkephalins) provide partial explanations for these anomalies. Proteinase action is briefly but thoughtfully covered ("metabolism or biotransformation?") in Chapter 2 by Laszlo Graf and Agnes Kenessey, while the third chapter by G. Boileau, N. G. Seidah, and M. Chrétien covers the biosynthesis of β-endorphin from the ribosomal synthesis of its 36K preprotein precursor to its elaboration along with other peptides including ACTH, α-MSH, and β-MSH.

The opiate receptor is thoroughly and comprehensively discussed in a chapter by A. P. Smith and H. H. Loh. Evidence for its existence is carefully reviewed and critically examined; apparent contradictions are uncovered and the various proofs of heterogeneity are given. Hormonal and neurotransmitter roles for the endorphins are also considered. In Chapter 5, Stanley J. Watson and Huda Akil present anatomical details regarding the endorphin-containing systems. Numerous figures and photos help simplify an otherwise complex pattern of distribution of the proopiomelanocortin-derived peptides while the strengths and weaknesses of the technique of immunocytochemistry are used to introduce this section.

The next three chapters continue the movement toward the neurobiology of the endorphins. The sensitive reader is startled to learn that the cold water swim and rectal probing must be added to the list of insults suffered by rats already subjected to food deprivation, hot tails, and induced epileptic seizures (Chapter 6, J. W. Holaday and H. H. Loh). This diversity of assays is perhaps adequate testimony to the ubiquity and diversity of endorphin actions. Chapters 7 and 8, by P. A. Berger and J. D. Barchas and by D. H. Catlin, D. A. Gorelick, and R. H. Gerner, briefly cover clinical studies of β-endorphin in mental illness and in drug addiction, respectively. The final section by E. Leong Way is the familiar concluding historical perspective that characterizes this series. In this selection, the development of the opiate antagonist nalorphine is described, and the circumstances surrounding an apparently controversial synthesis are interpreted by the author who admits to a unique interaction with several of the involved parties. However, the overall effect, as with essentially all the selections in this work, is that the coverage has been fair and thorough. In summary, this volume is highly recommended.

Arno F. Spatola, *University of Louisville*

Reaction Engineering in Direct Coal Liquefaction. By Yatish T. Shah (University of Pittsburgh). Addison-Wesley Publishing Company, Inc., Reading, MA. 1981. xiv + 416 pp. $47.50.

Among the various technologies currently under development for converting coal into an improved, nonpolluting energy source, direct liquefaction is potentially the most attractive in terms of both thermal efficiency and economics. Higher thermal efficiencies and lower capital costs are due to the fact that direct coal liquefaction plants require fewer chemical changes and processing steps to convert solid coal into liquid than into gaseous fuels and employ milder process conditions.

In recent years, an intensive research and development effort has advanced considerably the understanding of the fundamentals of coal liquefaction reactions and a vast amount of pertinent information has been published in the literature. Much of the available information, however, appears fragmented, inconclusive, and even contradictory at times, the main reason being the complexity and inhomogeneity of the structure of the coal and its behavior under different environments. This incoherence makes it very difficult to design liquefaction systems, a fact which impedes the commercial application of coal liquefaction processes.

The present book, the third in the "Energy Science and Technology Series" (a series of texts and monographs dealing with a variety of energy-related topics), is a first and much needed attempt to systematically organize the voluminous amount of published literature on direct coal liquefaction and to present a comprehensive review of the state of the art based mainly on technological and engineering points of view. The book restricts its discussion to reaction engineering associated with three major variations of liquefaction technology presently undergoing large-scale development, namely the Solvent Refined Coal process (SRC-I and SRC-II), the Exxon Donor Solvent (EDS) process, and the H-Coal catalytic hydrogenation process.

Chapter 1 reviews briefly those processes and identifies the research areas of major importance for future process optimization and commercialization. Chapter 2 on the structure of the coal and the mechanism of coal liquefaction is more of an engineering overview of the subject rather than a detailed discussion of the liquefaction chemistry. The emphasis here is on the effect of coal properties, in particular mineral-matter content and composition, on the liquefaction behavior, and the subject is covered thoroughly. Chapter 3 deals with the removal of heteroatoms (oxygen, sulfur, nitrogen) during liquefaction, especially during catalytic hydrogenation. In addition, the fate of heteroatoms in thermal cleavage of model compounds under liquefaction conditions is also discussed in some detail.

The next three chapters constitute an important contribution of this book to the liquefaction literature. Chapter 4 is an interesting and thorough discussion of the wide spectrum of the lumped kinetic models that have been applied to donor-solvent coal liquefaction. Proposed reaction networks are critically reviewed, and the validity of both the resulting rate expressions and the estimated kinetic constants is examined in the light of the large amount of experimental data that have been accumulated in kinetic studies using both short- and long-residence-time reactors.

The use of simple kinetic models along with other hydrodynamic and transport parameters in the engineering design of commercial coal liquefaction reactors is presented in an integrated fashion in Chapter 5. Pressure-drop and heat-transfer considerations for reactor preheaters are discussed in some detail, but the main focus of the chapter is on demonstrating the use of axial-dispersion reactor models for predicting product-yield structure and thermal behavior of liquefaction reactors. This procedure is coupled with the estimation of the required physical, transport, and kinetic parameters.

The last chapter, Chapter 6, reviews various problem areas and possible solutions in upgrading coal liquids. The emphasis is on catalytic hydrotreating of the liquids to reduce the heteroatom content and increase the hydrogen-to-carbon ratio of the fuel. The discussion includes reaction mechanisms and catalyst evaluation in both model-compound studies and in actual coal–liquid processing. Catalytic hydrocracking and reforming of coal liquids are also examined briefly.

The material covered in the book is systematically organized and the available information is well interpreted and critically evaluated. The book is written by a prominent researcher in the field of coal liquefaction, and each chapter is coauthored by a different expert in the specific topic covered in the chapter. The book is not an introduction to coal liquefaction. It is, however, an excellent advanced reference for researchers and practicing engineers who are engaged in research, development, and design of coal liquefaction systems.

Nicholas P. Vasilakos, *University of Texas at Austin*

Mutagenicity Testing and Related Analytical Techniques. Edited by R. W. Frei and U. A. Th. Brinkman (The Free University, Amsterdam). Gordon and Breach Science Publishers, London, New York, and Paris. 1981. ix + 320 pp. $46.50.

This book contains selected papers from the 10th Annual Symposium on the Analytical Chemistry of Pollutants held in Dortmund, Federal Republic of Germany, May 28–30, 1980, and is published as Volume Three in "Current Topics in Environmental and Toxicological Chemistry". From the title of this book and its preface, one expects that the first section will deal with the various microbial and mammalian cell mutagenicity tests that are currently in use or under evaluation. However, this is not the main emphasis of the first section (111 pp), entitled

Mutagenicity Testing. Instead, one encounters papers dealing with the environmental impact of chemicals, ecotoxicological testing, and suggestions for the management and legislation of these chemical pollutants. Standard mutagenicity testing (microbial or mammalian) is a minor consideration. The papers concentrated on the escape of chemicals from the technosphere to the ecosphere where these chemicals exert unwanted effects upon the biological and physical environment. Even the chapter by Zimmermann, titled Biological Tests for the Detection of Mutagenic Chemicals, concentrated on the environmental sources of chemicals, both naturally occurring and man made, that have been shown to be genotoxic (mutagenic) rather than a discussing the types of mutagenicity testing available. These chapters contain excellent discussions of the environmental effects of the chemicals and I hope that people interested in this field will not be misled by the title. Only in the last chapter of the section does one find a description of a testing procedure. Seiler describes a test in which the inhibition of DNA synthesis in testicular cells of mice by chemicals is correlated with their known muitagenic and carcinogenic properties.

The second section of the book is precisely what one expects: detailed analytical procedures concerned with the identification of known mutagens and carcinogens generally from environmental sources. These include ways of identifying aromatic amines in the workplace, mutagens in drinking water, mutagens in petroleum substitutes such as coal- and shale-derived oils, mutagens in diesel exhausts and automobile exhausts, and the presence of fibers such as asbestos in the environment. Anyone interested in identifying or isolating mutagens (carcinogens) from environmental sources would find this section helpful.

Linda B. Jacobsen, *Purdue University*

Molecular Enzymology. By C. W. Wharton (University of Birmingham) and R. Eisenthal (University of Bath). John Wiley and Sons, New York and Toronto. 1981. x + 326 pp. $46.95.

This book is part of the series "Tertiary Level Biology" written primarily for advanced undergraduate students majoring in biology or biochemistry. The treatment of the subject in this book is not more "molecular" than that in any other contemporary enzymology book that must reflect on current advances at the molecular level.

There is an emphasis on enzyme kinetics, which dominates five of the ten chapters of the book (simple enzyme kinetics, effects of inhibitors and pH, complex kinetics and cooperativity, the analysis of enzyme mechanisms by means of fast reaction techniques, and practical enzyme kinetics). The chapters describing the fundamentals of catalysis (the nature of catalysis, chemical catalysis, protein structure, and coenzymes), although short, cover most of the relevant material and are clearly written. Enzyme mechanisms are discussed by reviewing a selection of well-established examples; most thoroughly described are the reactions catalyzed by the proteolytic enzymes. At the end, a chapter-to-chapter compilation of bibliography is included that serves as a guide for the selection of additional reading material. A concise subject index completes the volume.

Chemists working in other areas of specialization may find this book of interest as a valuable introduction to enzymology.

T. I. Kalman, *State University of New York at Buffalo*

Management of Plutonium Contaminated Waste. Edited by J. R. Grover (Harwell, UK). Harwood Academic Publishers, New York, NY. 1982. X + 186 pp. $30.00.

The European Atomic Energy Community commissioned this work which is Volume 3 in a series of monographs and tracts on Radioactive Waste Management. Current practices in the management of plutonium-contaminated wastes (PCW) are reported for the United Kingdom, Belgium, France, Germany, and Italy.

PCW, often referred to as transuranium or α-bearing wastes, is used in this study as "...a general term to cover all wastes, whether solid, liquid or gaseous, which are contaminated with plutonium (or other alpha) emitters". A reference mixed oxide fuel fabrication plant is used as the source for the PCW. Emphasis is placed on minimization of wastes, recovery of plutonium from wastes, and practices for storage and disposal of PCW. Criteria and guidelines are set forth for the management of PCW. Only brief points are made on special problems involving criticality considerations, toxicity, and hazards. Security and safeguard aspects are outside the scope of this study.

HEPA filters are used for filtering plutonium-contaminated gases which are discharged from stacks in a manner to achieve adequate dispersion to the environment. Possible environmental effects are not considered in this study. IAEA regulations permit the sea dumping of properly monitored and packaged wastes arising from the management of solid and liquid contaminated wastes. Detailed information on current practices for the accumulating storage of solid wastes at various land sites is presented.

Chapter 4 is devoted to general principles of design and management which would present a systematic approach to the minimization of the volume and plutonium content of the wastes. Included is a description of the research and development being undertaken, recognizing that sea dumping can neither handle all PCW nor can its availability be assured in the future.

Monitoring includes both the instrumental and managerial measures taken for determining and establishing the record keeping of the "... content of plutonium isotopes and other fissile materials and actinides present in a PCW item and/or PCW stream". The state of the art and highlights of this research and development are presented in Chapter 5.

A brief review of Immobilized Waste Forms is presented in Chapter 6. The approach is taken that "...there may be a need to develop some intermediate disposal system which may be somewhere between shallow land burial (for the low level or suspect waste) and disposal in deep geological formations (for the highly contaminated wastes)".

A simplified logic diagram for strategy options for managing PCW is discussed in Chapter 7 and the conclusions are that with good management the volume of the immobilized wastes generated from the mixed oxide fuel fabrication plant can be reduced by factors of 5 to 10 and the plutonium content by at least a factor of 8 for a reference plant.

Seven recommendations are presented in the concluding chapter including study of other portions of the fuel cycle, continuation of ECC research and development programs on PCW, coordination of research and development within member states, and the development of criteria for disposal of PCW.

H. S. Isbin, *University of Minnesota*

NMR of Chemically Exchanging Systems. By Jerome I. Kaplan (Indianapolis Center for Advanced Research) and Gideon Fraenkel (Ohio State University). Academic Press, New York. 1980. xi + 165 pp. $19.50.

This book is a thorough, well-organized introduction to the use of density matrix equations for NMR line shape analysis of chemically exchanging systems. The book contains extensive derivations of the underlying quantum mechanics of the density matrix formalism as applied to weakly and strongly coupled systems under low and high radio frequency power. The nine chapters deal with an introduction to the density matrix (no prior knowledge is assumed), incorporation of contributions from other relaxation mechanisms (e.g., quadrupolar), the effects of low and high radio frequency power on line shape analysis, and double resonance and transient effects on chemical exchange. Specific examples of density matrix equations for several exchanging systems are provided and effectively demonstrate the methods and several useful approximations. The authors frequently point out situations where alternate approaches can result in significant savings of computer time during matrix manipulation. Each chapter is well referenced to the original literature and to a number of general references, and some problems are provided at the end of each chapter for the serious student.

Researchers in dynamic NMR spectroscopy will find this book extremely useful as a guide to line shape analysis by this method.

Louis Messerle, *The University of Michigan*

Polymer Interface and Adhesion. By Souheng Wu (E. I. du Pont de Nemours & Company). Marcel Dekker, Inc., New York. 1982. xviii + 630 pp. $75.00.

The complicated nature of adhesion, and the loss of adhesion, to polymer surfaces is emphasized by the fact that the treatments of the subject in different chapters are presented in terms of thermodynamics, chemical bonding, mechanical interlocking, weakening or enhancing boundary layers, internal stresses, environmental effects, fracture mechanics, and creep and fatigue fracture. It is apparent, however, that Wu's favorite approach to adhesion is through data generated by contact angle and surface tension measurements. For example, 66 of the 111 tables in the book include contact angle and/or surface tension data and 278 pages are concerned with adhesion as understood or studied by wettability phenomena. The treatment is thorough, but perhaps a little too much so since the chapter on experimental methods for the measurements of contact angles and interfacial tensions is not critical to the understanding and a reference to standard texts would have been sufficient.

The chapter on modifying polymer surfaces to promote adhesion is particularly good. All the common methods are discussed and much information is given on the chemical changes induced in the polymer surface by various chemical, physical, and thermal processes. The chapter is a treasure house of useful facts and includes 214 references, 35 of which were published in 1975 or later.

The chief shortcoming of the book is the inadequate discussion of environmental effects on adhesion loss. For example, adhesion loss at the polymer/metal interface because of corrosion or the application of a

cathodic potential is not discussed and the reversible nature of wet adhesion loss of some polymeric coatings in hot aqueous media is neglected. The peeling of paints from wood or metals during atmospheric exposure should also have been discussed. These omissions do not void the value of the book since the author's prime thrust is the science of adhesion as a route to understanding the more applied aspects of adhesion.

Henry Leidheiser, Jr., *Lehigh University*

Annual Review of Materials Science. Volume 11. Edited by Robert A. Huggins (Stanford University), Richard H. Bube (Stanford University), and David A. Vermilyea (General Electric). Annual Reviews, Inc., Palo Alto, Ca. 1981. 583 pp. $20 USA; $21 elsewhere.

Volume 11 continues the series of outstanding presentations of important research topics in the field of materials science. This volume should have wide appeal to investigators involved in both theoretical and experimental areas of study. The volume consists of articles dealing with the following areas: Experimental and Theoretical Methods, Preparation-Processing, and Structural Changes, Properties and Phenomena, Special Materials, and Structure. There is an extremely broad range of materials problems discussed from a preparative point of view including excellent chapters on silicon nitride ceramics and indium phosphide. In addition, a number of the chapters deal with such characterization techniques as Auger spectroscopy, crystallography at high pressure, and ionic transport in amorphous solid electrolytes. There are in addition two chapters that deal with the structural aspects of materials which are important but not too well understood by material scientists, namely ceramic systems and polymer alloys. There were several other chapters of particular interest to this reviewer concerning ionic transport in amorphous solid electrolytes and recent developments in lattice imaging of materials. This series contains articles of uniform high quality which should be read by research scientists concerned with problems of preparation, characterization, and processing of important classes of materials.

Aaron Wold, *Brown University*

Chemical Engineering Kinetics. Third Edition. By J. M. Smith (University of California at Davis). McGraw-Hill Book Company, New York. 1980. xix + 676 pp. $30.50.

The third edition of Smith's popular textbook retains many of the excellent features of the previous edition. The author states that the overall objective of the book remains unchanged—this is "to provide a clear yet reasonably rigorous exposition of reactor design with illustrations taken from practical and realistic chemical systems". As in the previous edition, the author emphasizes "the viewpoint that the design of a chemical reactor requires, first, a laboratory study to establish the intrinsic rate of reaction, and subsequently a combination of the rate expression with a model of the commercial-scale reactor to predict performance".

The first six chapters are basically a minor revision of those in the previous edition. The discussion on mass balances in reactors and numerical methods for reactor simulation is expanded and new sections on recycle reactors, optimum temperature profiles in reactors, and conversion according to the recycle-reactor model are added. However, the shorter section on the prediction of reaction rates from kinetic theories (§2.6) is not as clear as that given in the previous edition. Chapters 7 and 8 update and reorganize Chapters 7–9 of the previous edition and present a clearer introduction to heterogeneous catalysis, including a new section of examples of industrial catalysts. Chapters 9–11 give a reasonable discussion of catalytic reaction rates, pore diffusion, and transport limitations important in hetergeneous reactions. New sections on redox rate equations, kinetics of catalytic deactivation, stable operating conditions, diffusion in liquids, and improved mass transfer correlation in slurry reactors are added. Chapter 13 represents a key strength of the text, and describes in some detail the complex problems of catalytic reactor design. New design principles of slurry, fluidized-bed, and trickle-bed reactors are included. Finally, Chapters 12 and 14 represent a minor revision of those in the previous edition.

As in the previous edition, a key strength of this book is the presentation of many good illustrative examples, mostly considering realistic reactions as well as kinetic and design data. Most of the typographical errors in the previous edition have been corrected. New homework problems and literature references are added. Although it is stated on the book cover that SI units are used throughout the book, a mixture of English, cgs, and SI units is actually jarring in many example problems (see, for example, Example 1-1). Also, a number of books referred to in the text, for which new editions are available, have not been updated [for example, Wylie (1960) cited on p 114 and Denbigh (1965) cited on p 118].

To summarize, the latest edition of the book contains an impressive coverage of many of the important principles and applications of chemical kinetics and reactor design. It will continue to be a popular textbook for undergraduate students and an excellent reference for industrial chemists and chemical engineers.

Y. A. Liu, *Virginia Polytechnic Institute and State University*

Electrons in Chemical Reactions. By L. Salem (CNRS and Université de Paris-Sud). John Wiley and Sons, New York. 1982. x + 260 pp. $35.00.

This book provides an overview of the role of electronic structure in determining chemical reaction rates and mechanisms. Included are the following: (1) discussions of the generalized valence bond and molecular orbital approaches to electronic structure; (2) the qualitative characterization of potential energy surface features and their influence on reactivity; (3) qualitative molecular orbital descriptions of several diradical and zwitterionic species important in organic reaction mechanisms; (4) the application of orbital, state, and spin symmetry to determining chemical reactivity; (5) perturbation approaches to chemical reactivity including frontier molecular orbital theory and hard and soft acids and bases; and (6) solvent effects on reaction rates and mechanisms.

The treatment is generally at the advanced undergraduate or beginning graduate level. It could be used as a text for organic chemistry students after an introductory quantum mechanics course. The theoretical description is well organized and nicely qualitative so that researchers in organic, inorganic, and biochemistry should find the material both easy to read and stimulating.

Perhaps the book's strongest asset is its well-organized and coherent treatment of the influence of orbital, state, and spin symmetry on chemical reactivity. Certain example systems are treated from several complementary points of view, providing much insight into the interrelationships of these different descriptions. Less coherent are the sections pertaining to reaction dynamics. Although unimolecular reactions are discussed, unimolecular decay theory is not. Transition-state theory is mentioned, but not the variational aspects of it. Several methods for calculating reaction paths and locating saddle points are discussed, but none of these are as powerful as the recent method of Cerjan and Miller (C. J. Cerjan and W. H. Miller, *J. Chem. Phys.*, **75**, 2800 (1981)). These points are not major weaknesses, however, and overall the book provides an excellent overview of the dominant electronic structure related aspects of chemical reactivity.

George C. Schatz, *Northwestern University*

Ions, Electrodes and Membranes. By Jiří Koryta (J. Heyrovský Institute of Physical Chemistry and Electrochemistry). John Wiley and Sons, New York. 1982. VIII + 197 pp. $39.95.

As noted in its preface, the intent of this book is to explain the basic concepts and applications of electrochemistry to readers who lack a physicochemical background. This is, of course, a formidable task; the author has, however, selected and organized his material very carefully and uses simple thought experiments to introduce and illustrate the subjects he wishes to discuss. These efforts have produced a book which is both very informative and very readable. Furthermore, because electrochemistry is an interdisciplinary science, there is a great need for books, such as this one, that bridge the gaps between disciplines. For these reasons, this book is highly recommended.

"Ions, Electrodes and Membranes" is divided into three chapters. Chapter 1, Ions, deals primarily with the field of ionics. A wide variety of subjects including ion solvation, ionic conduction, and Debye–Hückel theory are discussed. Chapter 2, Electrodes, deals primarily with electrodics. The principles of electrode reactions are reviewed and topics such as the structure of the double layer, rates of electrochemical reactions, and electroanalytical chemistry are discussed. The final chapter is called Membranes. The structures and properties of biological, ion-exchange, and ion-selective electrode membranes are reviewed and ionic transport and its relationship to a variety of biological processes (e.g., development of potential gradients in electric eels) is discussed.

Charles R. Martin, *Texas A&M University*

Chemical Derivatization in Gas Chromatography. By J. Drozd (Czechoslovack Academy of Sciences). Elsevier Scientific Publishing Company, Amsterdam. 1981. XIII + 232 pp. $58.00.

This book is Volume 19 in the "Journal of Chromatography Library Series", and continues the tradition of excellence in this series. Chapter 1 gives a brief explanation of the various reasons for making chemical derivatives prior to gas chromatographic analyses. These include enhancement of the sample's volatility, improvement in chromatographic peak shapes, improvement of chromatographic resolution, enhancement of detection sensitivity and selectivity, and as an aid in solute identification. Chapter 2 gives some brief guides to sample pretreatment, and includes a description of sample drying, extraction, evaporation of extracting solvent, and thin-layer chromatography. Several examples of extensive schemes of sample pretreatment are given and serve to convey the flavor of sample workup methodology, while giving some practical

information and hints. Chapter 3 is concerned with identification and quantitation of chromatographic peaks. The section on identification is a bit one-sided in its emphases on identification by chromatographic retention data. Although retention data are probably an under-utilized source of information, combinations of GC with mass spectroscopy and infrared spectroscopy are probably more generally useful. The section on quantitation is a useful review of such concepts as detector response factors, calibration curves, use of internal standards, and the method of standard additions. Special quantitative considerations (yields, losses) which must be taken into account when chemical derivatives and sample pretreatments are used are also discussed. Chapters 4 and 5 constitute the real heart of the book. Chapter 4 deals with derivatization reactions and is organized according to the class of derivative formed. The types of derivatives considered are esters, ethers, acyl derivatives, silyl derivatives, oximes, hydrazones, and "cyclic" derivatives. A good amount of useful data and hints are included in this chapter. Chapter 5 is probably the most useful part of the book, as it is organized according to the class of compound being derivatized. The classes considered are: alcohols and phenols; aldehydes and ketones; amines; sulfur compounds; carboxylic acids; amino acids; thyroid hormones; steroids; sugars and related compounds; nucleic acid bases; insecticides and other pesticides; pharmaceuticals; anions of mineral acids; metal cations; and "miscellaneous". At 115 pages and with 654 references this chapter is quite thorough. A good number of details about reaction conditions and yields as well as suggestions for chromatographic operating conditions are included. There are two appendices in the book. The first is a handy guide to purification methods for important reagents and solvents. The second is a short list of commercial suppliers of derivatization reagents, which may be of use to those new to this kind of work. Overall, this should be a very useful book to those who work or wish to work with chemical derivatives in GC. The organization of Chapters 4 and 5 should promote ease in use of the book. Certainly all chemical research libraries should have a copy, and the book will be a good addition to the personal library of those working routinely with derivatives in GC.

James W. Jorgenson, *University of North Carolina*

Chemical Mutagens: Principles and Methods for Their Detection. Volume 7. Edited by F. J. de Serres (National Institutes of Environmental Health) and A. Hollaender (Associated Universities, Inc.). Plenum Press, New York, NY. 1982. xxvi + 497 pp. $49.50.

As in the previous volumes in this continuing series, volume 7 contains chapters that describe specific experimental test systems useful in detecting potential chemical mutagens and chapters that review some general features of the production of chemical mutagens. The detailed chapters on the various experimental systems used to detect chemical mutagens are written by scientists who are experts in the use and application of these systems and these chapters are an especially strong feature of this continuing series. Volume 7 contains chapters on the production of chromosome aberrations in male and female germ cells by chemicals (I.-D. Adler and J. G. Brewen), on the use of immunological techniques to detect somatic mutations in individual mammals (A. A. Ansari and H. V. Malling), on the promotion of aneuploidy by chemicals (A. J. E. Griffiths), on the use of human leukocytes to detect chemical mutagens (G. Obe and B. Beek), on unscheduled DNA synthesis in mammalian germ cells due to chemical exposures (G. A. Sega and R. E. Sotomayer), and on the use of *Aspergillus nidulans* as a test organism to detect chemically induced genetic damage (B. R. Scott and E. Käfer). These chapters alone will justify the purchase of this volume by workers in the area and by appropriate institutional libraries.

P. E. Hartman has contributed a chapter on the pharmacodynamics of nitrates and nitrites in humans. While this chapter does not explicitly discuss mutagenic N-nitroso compounds (this topic is reviewed in Volume 4 of this series), Hartman presents a detailed and critical review of all aspects of human exposure to nitrates and nitrites, including the potential relationships between such exposure and specific cancers. The accumulated data are evaluated, critical discrepancies are described, the need for additional analytical results noted, and a model of gastric-cancer induction is presented. This chapter will be invaluable for individuals who wish to develop a comprehensive understanding of the effects of the "nitrate–nitrite problem" on human health.

The chapters that review the roles of microorganisms (D. F. Callen) and of plants (M. J. Plewa and J. M. Gentile) in the conversion of chemical promutagens into proximate or ultimate mutagens summarize results that are of importance to both short-term test systems and to human health. The chapter of the alkylation of DNA by agents such as methyl methanesulfonate and *N*-ethyl-*N*-nitrosourea (E. Vogel and A. T. Natarajan) should be especially interesting to physical organic chemists. This chapter reviews experimental results that relate the observed regioselectivities of DNA alkylations to the Swain–Scott electrophilic constants, *s*, for the various alkylating reagents. Possible correlations between the Swain–Scott constants and the biological parameters of cytotoxicity, chromosome abberations, mutagenic effectiveness, and carcinogenicity are analyzed.

Finally, this volume contains a chapter that reviews metabolic activation schemes for a range of known promutagens and then relates this information to short-term screening tests for mutagens based upon both subcellular and cellular activating systems (H. Bartsch et al.). Since separate volumes can, and have, been written on these topics, this chapter represents an ambitious undertaking. Despite the scope of this chapter the authors succeed in presenting a valuable introductory review and summary of this area.

The specific topics presented in this volume and the quality of the presentations combine to make this one of the more valuable volumes in this continuing series. My only criticism is a lack of references to results published after 1979. In the context of this volume, "recently established" generally refers to work published in 1978 or 1979. Given the nature and intent of the articles, however, this feature does not significantly decrease the value of this volume.

William L. Alworth, *Tulane University*

Adhesion and Adsorption of Polymers (Volumes 12A and 12B in Polymer Science and Technology). Edited by Lieng-Huang Lee (Xerox Corporation, Rochester, N.Y.). Plenum Press, New York. 1980. xv + 897 pp. $79.50 (two-volume set).

This collection of 45 papers, reproduced from a justified typescript, is drawn (mostly) from an International Conference on Adhesion and Adsorption of Polymers held in Honolulu in 1979 as part of the American Chemical Society/Chemical Society of Japan Joint Chemical Congress. About half the papers are of American origin, ten are Japanese, and the remainder are from eight different nations.

The papers are organized in eight topical minisymposia on properties of polymers in adhesive bonds and on adsorbed polymers. The first group, entitled Polymer Surface Interactions, contains papers on the statistical mechanics of surface tension and adsorption, donor–acceptor interactions at interfaces, and molecular forces in adhesion of polymers to polymers and of polymers to other materials. These papers establish at the outset an emphasis on the nature of interfaces at the molecular level. The second group turns to experimental characterization of adhesive interfaces by such physical methods as acoustic spectroscopy, Auger and photoelectron spectroscopy, dielectric relaxation, ultrasonic measurements, β-ray backscattering, neutron radiography, and scanning electron microscopy. Some of the papers in this section are concerned with adhesive bond strength, and this becomes a central theme in the third and fourth groups, Polymeric Structural Adhesives and Fracture Strengths in Polymeric Systems. The latter contains the longest paper by far in these volumes, a 70-page analysis of adherence and fracture mechanics for a pair of viscoelastic bodies in several contact geometries.

The fifth group, Modification of Polymer Interfaces, is the most diverse. It draws together largely practical studies: on the role of the interface in strength of composites; on modification of polyethylene surfaces by radiation grafting and by corona discharge; on radiation-cured resins as adhesives; on adhesion of photoresist materials, plasma-polymerized films, and filled polyolefins to various substances.

With the sixth group entitled Kinetics of Polymer Adsorption (though half the papers do not deal with kinetics) the emphasis turns decisively to adsorption. The structure of adsorbed polymer layers is considered both theoretically and experimentally. There is also an interesting contribution on selective adsorption of polymer from dilute solutions of mixed polymers. The papers on kinetics in this section are all concerned with behavior of biological systems: processes leading to instabilities in biological membranes and adhesion of fibroblast cells and plasma proteins to hydrophobic–hydrophilic copolymers. The next group of papers deals mostly with physical characterization of adsorbed polymer layers, but it concludes with a completely unrelated paper on microstructure of polytetrafluoroethylene.

The final section, Adsorption of Biopolymers, opens with a survey of the three-dimensional structure of proteins at hydrophobic solid interfaces. The three other papers in this group are also concerned with aspects of protein adsorption. An evident motivation for this work is the problem of biocompatibility of polymeric prostheses.

Each minisymposium is prefaced by the chairman's comments and followed by a transcript of discussions. The discussions are ample and informative, and it is evident that the participants had opportunity to expand on their original remarks. An appendix offers biographical notes on the 50 contributors to the conference. Each volume is curiously embellished with a frontispiece of snapshots of the editor and some friends in Honolulu. One of the latter is incorrectly identified in the caption.

Like most others of its proliferating genre, this symposium collection does not escape the consequences of uncoordinated authorship. There

are evident disparities in scope, sophistication, and degree of relevance to the overall design, and a few of the manuscripts would have benefited by decisive editorial intervention to rectify lapses from English idiom. Nevertheless, this publication does provide a useful status report on research in the two broad areas indicated in the title, and the organization of the symposium so as to emphasize their interdependence in the contexts of basic science, technology, and biological phenomena is certainly commendable.

Edward F. Casassa, *Carnegie-Mellon University*

Atomic & Molecular Collision Theory. Edited by F. A. Gianturco (Citta Universitaria, Rome). Plenum Press, New York and London. 1982. viii + 505 pp. $59.50.

This is the Proceedings of a NATO Advanced Study Institute held at Il Palazzone di Cortona, Arrezzo, Italy in September of 1980. The actual content of the book is somewhat less than the title might suggest. However, the editor's stated intent is to provide a compact view of the field and to serve as a source from which to begin a systematic study of the area. To this extent, the book is largely a success.

There are ten chapters, each with a different author, grouped into three areas: collisions involving electrons and photons (with contributions from C. J. Joachain, P. G. Burke, J. N. Bardsley, R. McCarroll, and H. Van Regemorter); collisions of atoms and molecules (M. S. Child, F. A. Gianturco, and R. P. Levine); and collisions under special conditions (I. C. Percival and M. H. Mittleman). The first area comprises the majority of the book, which is appropriate, considering its importance and the amount of current activity in the area. Many of the chapters contain a considerable amount of background material, which is very useful, although there are very few derivations of any kind. The authors have generally attempted to thoroughly cover their areas, so that the discussion of any particular topic is rather limited. But the overall impression is not unpleasant—a "Cook's Tour" of atomic and molecular collision theory, if you will. The usefulness of the book is greatly enhanced by the extensive bibliographies at the end of each chapter.

Paul L. DeVries, *University of Missouri—St. Louis*

Methods in Enzymology. Volume 81. Biomembranes. Part H. Visual Pigments and Purple Membranes. Part I. Edited by L. Packer (University of California, Berkeley). Academic Press, New York. 1982. xxxi + 902 pp. $79.00.

This volume of "Methods in Enzymology" is a well-rounded review of recent techniques in visual pigment chemistry and biochemistry. The 110 contributions are divided into 13 sections beginning, appropriately, with a short section devoted to the morphology of visual photoreceptors. The discussion proceeds with contributions on the isolation and characterization of organelles, membranes, and visual pigment proteins. Individual sections covering protein chemistry, chemical modification of rhodopsin, membrane lipid chemistry, techniques for studying spectral and electrical responses of photoreceptors to illumination, as well as regeneration of bleached visual pigments follow. A large chapter is devoted to the detection and characterization of biochemical responses (phosphorylation, nucleotide and cyclic nucleotide turnover, and calcium release) of outer rod segments to light. Physical characterization of the molecular organization and molecular dynamics of visual receptors by optical, chiroptical, magnetic resonance, and diffraction techniques is covered in the largest single section of the volume. The book concludes with a section on biogenesis of photoreceptors and a section entitled Other Retinal Proteins which seems appended as an afterthought. A future volume (Volume 88) will cover halobacteria, purple membranes, molecular structure, and theories of color.

Quality of individual contributions varies from satisfactory to excellent. Although the overall organization of the volume is good, the major sections lack internal continuity which is almost certainly the result of having to collate such a large number of contributions. Perhaps future volumes would benefit from contributions which are broader in scope and fewer in number. In all, the book is consistent with the traditional high quality of the series and is a valuable addition to any experimental membrane chemists' book shelf.

Richard N. Armstrong, *University of Maryland*

Iron–Sulfur Proteins. Edited by T. G. Spiro (Princeton University). John Wiley and Sons, New York, NY. 1982. ix + 434 pp. $80.00.

This volume is the fourth in a series on "Metal Ions in Biology", edited by T. G. Spiro. The book is very readable, although many of the specialized topics will be of interest only to a small discipline. The text, however, should be of value to both biochemists and chemists.

The contents of the book can be divided into three easily definable sections: the first portion includes most of the first four chapters and describes the structures of Fe–S centers, the difficulties involved in determining whether the clusters contain from one to four iron ions, and methods used to distinguish which type of Fe–S center is involved in a particular protein. The second portion (through chapter eight) of the book goes into considerable detail describing specific biochemical functions of Fe–S proteins. The emphasis through this section is on the type of Fe–S center, how the protein provides the ligands for the cluster, and the Fe–S center's relationship to the biochemical activity of the protein. The third section of this book includes chapters on low-temperature magnetic circular dichroism, X-ray absorption, and resonance raman spectroscopy. The focus of this section is on recent developments in instrumentation in these areas and what types of information they can provide toward the understanding of Fe–S proteins.

The reviewer was impressed with the quality of the tables, particularly those dealing with crystal data for Fe–S proteins and synthetic Fe–S cluster analogues. In both cases large amounts of data were condensed into a workable form. The chapter on Fe–S protein crystallography can be read and understood by the non-X-ray crystallographer. In this latter chapter the use of stereoviews of the Fe–S centers, ferrodoxin, and rubredoxin makes this section particularly lucid.

The more physiological sections of the text suffer from a lack of a uniting outline or table that summarizes the spectrum of Fe–S proteins and their biochemical functions. A possible explanation for this deficiency is the existance of several recent reviews on the biochemistry of Fe–S proteins and the fact this section of the book was written by several authors.

Hugh A. Akers, *Lamar University*

Light Absorption of Organic Colorants, Theoretical Treatment and Empirical Rules. By J. Fabian and H. Hartmann (Technical University of Dresden). Springer-Verlag, New York and Heidelberg. 1980. viii + 245 pp. $79.00.

This is a compact, slim book with a title that whets the appetite. It is aimed at a reader who is already fully conversant with quantum chemical concepts, and who wishes to have a concise summary of the work in this area. This book of only 245 pp contains 1078 literature references dating from 1868 to 1980, 76 figures, 48 tables, and numerous structural formulae for colorants. The text is necessarily very concise, and replete with acronyms for the different theoretical approaches: it often reads like an "Annual Review of Progress" rather than the expansive monograph that might have been expected.

Those who are seeking an introduction to this area will be disappointed, unless they already have the necessary quantum chemical and spectroscopic background. One finds primarily discussions of the results obtained from applications of the different theoretical approaches to the interpretation of the light absorption of a given colorant, and the different theoretical approaches are themselves sketched only in outline.

Chapters VI–XV each refer to a specific class of colorant: e.g., Polyene Dyes; Azo Dyes; Carboximide, Nitro and Quinacridine Dyes; Quinoid Dyes; Indigoid Dyes; Diphenylmethane, Triphenylmethane and Related Dyes; Polymethine Dyes, Porphyrins and Phthalocyanines; Conjugated Betaine Dyes; Multiple Chromophore Dyes. Each of these Chapters comments briefly on the uses of the colorants, identifies the chromophoric system, and then reviews the literature.

Chapters I–V are intended to be introductory, but only 23 pp are used to cover Phenomenological Conceptions on Color and Constitution; UV/VIS Spectroscopy and Quantum Chemistry of Organic Colorants; Relation Between Phenomenological and Quantum Chemical Theories; Theoretical Methods for Deriving Color–Structure Relationships; and, Classification of Organic Colorants. Many readers will have to turn to other textbooks, and to review papers, to supplement this section. The authors offer suggestions as to suitable sources.

The authors recognize that "chemists are often disappointed with the outcome of quantum chemical studies". The eye is very sensitive to color differences, and the detailed shape of the broad absorption bands of a colorant has a significant effect on the color perceived. The quantum chemical calculations offer approximate predictions of the wavelengths of maximum absorption, and of the relative absorption intensities at these wavelengths, but there is essentially no information on the shapes of the absorption bands. Even for a comparatively simple colorant such as azobenzene there can be as many as six different *fragmentation modes*, or partitions of the chemical structure into subunits, each of which forms a possible basis from which to embark on spectral predictions.

So one is presented with a situation in which trial and error, and intuition, and "chemical models", and experiment, become interwoven in a complex interaction with quantum chemistry. This almost impenetrable web has not yet led to results which would satisfy the industrial color chemist. On the other hand, a rational basis is shown to exist for predicting or explaining an impressive number of observations on the light absorption of organic colorants.

This book should certainly be available for reference. It is extremely comprehensive, but it is not compelling reading. It will be accessible only

to those who will put forth the necessary intellectual effort, in an area in which progress comes but slowly. The central importance of color in human life justifies this effort.

Ralph McGregor, *North Carolina State University*

Chloroplast Metabolism. By B. Halliwell (King's College). The Clarendon Press; Oxford University Press, New York. 1981. xi + 257 pp. $45.00.

This book is another contribution to the recent explosion of reviews, encyclopedias, symposia, etc., dealing with photosynthesis. Some advantages of this book are that it is rather concise, yet thorough and covers topics in the later chapters that are not generally included elsewhere. The potential usefulness of the book is probably best obtained by a consideration of the chapter titles, which are as follows: 1, Structure, Function, and Isolation of Chloroplasts; 2, The Light Reactions of Photosynthesis; 3, Enzymes of Carbon Dioxide Fixation: The Calvin Cycle; 4, Regulation of the Calvin Cycle. Synthesis of Starch and Sucrose; 5, Enzymes of Carbon Dioxide Fixation. The C_4 Pathways and Crassulacean Acid Metabolism; 6, Import and Export Across the Chloroplast Envelope in C_3 Plants; 7, Photorespiration; 8, Toxic Effects of Oxygen on Plant Tissues; 9, Synthesis of Phenolic Compounds, Membrane Lipids, Chlorophyll, and Carotenoids in Chloroplasts; 10, Nitrogen and Sulfur Metabolism in Photosynthetic Tissues.

The presentation is aimed at the graduate student, and would be suitable for an advanced course. However, many chapters provide an almost too detailed review of the recent (up to about 1980) literature, with a careful presentation of any contrasting and "controversial" results. Therefore these chapters may be somewhat confusing and unsatisfying to some graduate students as an introduction to chloroplast metabolism.

I found two minor faults to be the use of the older teminology, ribulose diphosphate, fructose diphosphate, etc., instead of the general preference for ribulose bisphosphate, etc., and the inclusion of an assay for chlorophyll in the appendix, the purpose of which is unclear. However, an appendix of botanical vs. common names of plants referred to in the text was thoughtful.

Archie R. Portis, Jr., *University of Illinois and USDA/ARS*

Review of Annual Reports on the Progress of Chemistry. Volume 76. Section C. Physical Chemistry. The Royal Society of Chemistry, London. 1979. xvi + 332 pp. £22.

This first volume of Annual Reports devoted entirely to Physical Chemistry appears at a time when the boundaries defining this classical area are almost completely eroded by hyphenation. Faced with this problem the editor (Prof. M. C. R. Symons) may have resorted to Webster's dictionary which variously defines "report" as "an official presentation of facts, or a loud resounding noise especially one made by an explosion", to solicit both "contributions on middle-of-the-road physicochemical topics and reviews on currently exciting areas of strong development". In this he has succeeded admirably, with "hard-core" chapters on Catalysis (D. A. Dowden), Gas-Phase Molecular Spectroscopy (M. T. McPherson and R. F. Barrow), Kinetics of Reaction in Solution (J. R. Jones and J. E. Crooks), Molecular Structure by Diffraction Methods (M. R. Truter), Macromolecular Chemistry (E. A. Boucher), and Thermochemistry (M. N. Jones and H. A. Skinner) and current reviews of Spectroscopic Studies of Intermolecular Forces in Dense Phases (J. Yarwood), Neutron and X-ray Diffraction Studies of Concentrated Aqueous Electrolyte Solutions (G. W. Neilson and J. E. Enderby), and Electron Solvation Phenomena (B. Webster).

The chapters are all clearly written, well-balanced, and placed in sufficient perspective to enable a novice in the field to follow recent developments; the liberal use of diagrams in most cases is a particularly welcome feature, and although most authors do not claim an exhaustive literature survey, the appearance of ~3500 names in the author index surely testifies to an in-depth coverage. The volume is tastefully produced and remarkably free from printing errors in view of the fact that proofing was restricted to one stage in an attempt to offset delays by industrial problems in the printing industry. For a concise relatively recent update in areas outside his/her own expertise the practising physical chemist can make no better investment.

Brian Stevens, *University of South Florida*

Volumes in the ACS Symposium Series

New Approaches to Coal Chemistry. Edited by B. D. Blaustein, B. C. Borkrath, and S. Friedman. American Chemical Society, Washington, D.C. 1981. xi + 462 pp. $41.00.

A symposium held in Pittsburgh in 1980 gave rise to 24 to the 25 chapters in this volume. They are grouped under the headings Structure and Behavior of Coal, Coal Liquefication, Chemistry of Coal Liquids, and Chemistry of Sulfur in Coal. The chapters are reports of original research and are reproduced from the authors' typescripts.

Upgrading Coal Liquids. Edited by R. F. Sullivan. American Chemical Society, Washington, D.C. 1981. x + 277 pp. $39.00.

The twelve chapters in this volume are based on the presentations at a symposium held in Houston in 1980. They are reports of original research and are reproduced from typescript.

Federal R&D and Scientific Innovation. Edited by L. A. Ault and W. N. Smith. American Chemical Society, Washington, D.C. 1979. xiv + 170 pp. $23.50.

This volume includes presentations made at a symposium held in Miami Beach in 1978. They are primarily concerned with innovation and commercialization of technology developed industrially with federal funding.

Biomaterials: Interfacial Phenomena and Applications. Edited by Stuart L. Cooper and Nicholas A. Peppas. Americal Chemical Society, Washington, D.C. 1982. 539 pp. $71.95.

Based on a symposium held in Chicago in 1980, this volume contains 32 chapters. The emphasis is on the design and interaction of biomaterials, organized into three sections: blood-materials interactions; protein adsorption on biomaterials; and new biomaterials systems and applications.

Textbooks on Introductory Chemistry

Chemistry: A Unified Approach. Fourth Edition. By J. W. Buttle (University of London), D. J. Daniels (University College, Bahrain), and P. J. Beckett (North Kesveten School, Lincoln). Butterworths, London and Boston. 1981. 646 pp. $18.95.

Chemical Principles in the Laboratory. Third Edition. By Emil J. Slowinski (Macalester College), William L. Masterson (University of Connecticut), and Wayn E. Wolsey (Macalester College). Saunders College Publishing, Philadelphia and New York. 1981. ix + 331 pp.

Frantz/Malm's Chemistry in the Laboratory. By James P. Ifft and J. D. McGown (University of Redlands). W. H. Freeman and Company, San Francisco and Oxford. 1981. x + 272 pp. $8.95.

Chemistry for Science and Engineering. By W. G. Breck, R. J. C. Brown, and J. D. McGowan (Queen's University). McGraw-Hill Ryerson Limited, Toronto. 1981. 721 pp. $29.95.

General Chemistry: Principles and Structures. Third Edition. By James E. Brady (St. John's University) and Gerard E. Humiston (Widener University). John Wiley & Sons, New York. 1982. xvii + 831 pp. $27.95.

Introduction to Chemical Principles. Third Edition. By Edward J. Peters (West Valley College). Saunders College Publishing, Philadephia and New York. 1982. viii + 654 pp. $24.95.

Problem Exercises for General Chemistry. Second Edition. By G. Gilbert Long and Forrest C. Henz (North Carolina State University, Raleigh). John Wiley & Sons, New York. 1982. 351 pp. $9.95.

Fundamentals of General, Organic, and Biological Chemistry. Second Edition. By John R. Holum (Augsburg College). John Wiley & Sons, New York. 1982. xv + 717 pp. $25.95.