Book Reviews*

Topics in Enzyme and Fermentation Biotechnology. Volume 6. Edited by Alan Wiseman (Biochemistry Division, Department of Biochemistry, University of Surrey, Guildford, UK). John Wiley and Sons, New York. 1982. 232 pp. $59.95.

This collection of papers will probably be most useful to biochemical engineers and industrial chemists. A chapter devoted to 4-hydroxycoumarin antibiotics is followed by a detailed presentation of antibiotics as secondary metabolites. This includes sources, commercial interest, culture methods, and screening techniques. Subsequent chapters present new approaches to enzyme stabilization, developments in beer fermentation, and the use of the yeast mitochondrial system to test for antimitochondrial drugs and mutagens. The final chapter discusses microbial oxygenases and their potential application. References as well as the cumulative index for Volumes 1–6 are included.

M. C. W. Smith

Microbial Adhesion to Surfaces. Edited by R. C. W. Berkeley (Department of Bacteriology, University of Bristol) and others. Ellis Horwood Ltd., Chichester. 1980. 559 pp. $110.00.

The publisher describes this book as being a definitive and multidisciplinary work that describes the current state and future prospects of the whole area of research into microbial adhesion. This collection of papers will be useful not only to workers in the area of coatings and anti-fouling agents but also to pathologists and biochemical engineers. Topics covered in the 28 chapters include cell surfaces and adhesion, the role of interfaces, physicochemical aspects, measurement of adhesion, microbial adhesion in natural environments, passive vs. active attachment, interaction of microorganisms with ion-exchange resins, interaction between bacteria and animal cells, surface interaction between clay minerals and microbes, viruses and soluble organics, dental plaque and bacteria of the mouth, and polysaccharides in the adhesion of marine and fresh water bacteria. References and an index are included.

M. C. W. Smith

Glass: Science and Technology. Volume 5. Elasticity and Strength in Glasses. By D. R. Uhlmann (Massachusetts Institute of Technology) and N. J. Kreidl (University of New Mexico). Academic Press, New York, N.Y. 1980. x + 280 pp. $35.00.

Very extensive research on the mechanical properties of glassy materials during the last 25 years has resulted in impressive progress from a collection of empirical observations to an exact physical science, but the theory in many areas is still incomplete and far from being quantitative. This book gives an excellent review of those areas where most active research is concentrated at present and highlights remaining problems. It is organized very appropriately to include three chapters that deal with the response of glassy materials to mechanical stresses followed by three chapters that include an in-depth treatment of the techniques and problems of strengthening glasses.

Almost inevitably, the approaches of the authors of the various chapters, all of whom are leading authorities in glass research, are slightly different. For instance, the opening chapter, covering elastic properties, is very concise and is aimed at readers already familiar with this area. It is followed by two chapters on fracture mechanics and on inelastic deformation and fracture which constitute comprehensive reviews of these areas and give detailed illustrations of generalized concepts. They contain numerous figures comparing theoretical predictions with experimental data, making it possible for the reader to realize at once the inadequacy of current theories. For instance, in many cases, such as fractographic analysis and plastic flow, current linear models are shown to give fits that are unsatisfactory at best. (A minor problem, encountered most frequently in Chapter 2, is that the reader has to refer back to original papers for explanations of symbols.) Further progress in this area requires the development of models that will take into account the complexity of glass structure, which consists of numerous types of structural elements of various sizes and mobilities. The effect of interaction with the environment on mechanical properties is another challenging area.

The last three chapters give a comprehensive overview of thermal and chemical techniques of producing glasses with a higher strength, based on the recognition that due only to the presence of surface cracks and flaws ordinary glasses are weaker by a factor of 250–1000 compared with their theoretical strength. As in the case of the first three chapters the discussion is detailed, comprehensive, and highlights current developments in theory. In particular, Robert Gardon's chapter on thermal tempering (Chapter 5) is an outstanding review, combining systematic development of concepts with a clear, stimulating, and well-organized presentation of experimental findings.

This book is extremely valuable for both scientists and technologists in an area of great practical importance and of challenging problems in basic understanding of the properties of amorphous materials, and it fulfills an urgent need for a comprehensive text in this area.

Aaron Barkatt, *The Catholic University of America*

Lasers in Photomedicine and Photobiology. Edited by R. Pratesi and C. A. Sacchi. Springer-Verlag, Berlin. 1980. xiii + 235 pp. $29.50.

This volume records the proceedings of an international conference on the biomedical applications of lasers held in Florence in September 1979 under the auspices of the European Physical Society. The book is divided into six main segments, each dealing with a particular aspect of photobiology or photomedicine: (i) Introductory Material (5 papers); (ii) Phototherapy of Tumors (6 papers); (iii) Photodermatology (6 papers); (iv) Phototherapy of Hyperbilirubinemia (3 papers); (v) Absorption and Fluorescence Spectroscopy (4 papers); and (vi) Raman and Picosecond Spectroscopy (8 papers).

Especially useful for those nonspecialists wishing to be informed on the current problem areas in photobiology are the papers by J. A. Parrish (Photomedicine: Potential for Lasers), K. C. Smith (Common Misconceptions about Light), A. C. Giese (Basic Photobiology and Open Problems), K. C. Smith (Photobiology of Ultraviolet Radiation), G. Rodighiero (Light-Induced Covalent Combination Between Furocoumarins and DNA), G. Jori (The Molecular Biology of Photodynamic Action), and T. J. Dougherty and R. E. Thoma (Photoradiation Therapy of Malignant Tumors; Role of the Laser). The remainder of the papers occupying ca. 75% of the volume are largely of a specialist nature and will be be appreciated by those who are expert in the various areas of photobiology.

The main theme of the book is an exposition of the various ways in which lasers, both continuous and pulsed, are being used to obtain fundamental information about the primary processes and transient phenomena of photobiological change. However, the caution issued by Kendric Smith (p 25) is worth repetition: "Many people still feel that light from lasers has magical properties. Lasers can *seem* magical if their unique properties of micro-dot focussing, very high intensity, coherent radiation, possibility of ultra-short pulses and monochromicity are made use of. If the first four properties are not useful in a particular application, then lasers are just expensive monochromatic light sources..."

Michael A. J. Rodgers

Applied Regression Analysis. Second Edition. By Norman Draper (University of Wisconsin) and Harry Smith (Mount Sinai School of Medicine). John Wiley and Sons, Inc., New York. 1981. xiv + 709 pp. $24.95. **Statistics for Technology. A Course in Applied Statistics. Second Edition.** By Christopher Chatfield (Bath University, England). Chapman and Hall, London (Halsted Press, USA). 1978. 370 pp. $8.25 (paperback). **The Statistical Analysis of Failure Time Data.** By J. D. Kalbfleisch (University of Waterloo, Ontario) and R. L. Prentice (University of Washington). John Wiley and Sons, Inc., New York. 1980. xi + 321 pp. $24.95.

These three statistical monographs are reviewed as a group. The first, "Applied Regression Analysis", in its first edition has already become a modern classic in applied statistics. The basic goal of regression analysis is to find a mathematical relationship between variables. The simplest form is linear regression, the ubiquitous fitting of a straight line by least squares, which pervades much of chemical data analysis. Nonlinear parameter estimation with use of nonlinear models (for example, an exponential model) is an extension of the linear techniques. It is often possible to transform a nonlinear dependence to a standard linear model (linearization). Chemists commonly do this on logarithmically transforming exponential dependence into linear dependence. Parametric estimation theory, including regression analysis, is, however, a highly developed formalism that goes well beyond the use of a standard least-squares computer routine. An examination of residuals (Chapter 3 in Draper and Smith) often discloses important phenomena that might be missed if these residuals were ignored and considered to be merely observed errors of a correct model; most of the greatest discoveries of astronomy have come from an examination of such residuals. More complicated linear models involving multiple independent variables are

* Unsigned book reviews are by the Book Review Editor.

also important. Numerous techniques have been developed for selecting the best regression equation (Chapter 6) including ridge regression and robust regression. Draper and Smith is a textbook and contains numerous examples and exercises. It is, perhaps, the definitive treatment of linear regression and is highly recommended to those who need to know more about regression or would like to become competent data analysts.

The second monograph, "Statistics for Technology", is a useful compendium of statistical data analysis techniques. Chatfield treats the theory of probability, discrete and continuous distributions, estimation, significance tests, and regression and correlation in an understandable and practical way that is accessible to all scientists. In a section on applications, Chatfield treats experimental design, quality control, and life-testing or reliability/failure time analysis. The book contains numerous examples and exercises.

The third monograph, "The Statistical Analysis of Failure Time Data", is an addition to the extensive Wiley series in "Probability and Mathematical Statistics". Analysis of failure–time data is a somewhat specialized topic, although it includes numerous phenomena. The topic treats the modeling and analysis of data that have an end point at which an event occurs. Such events are called failures. Numerous applications involve medical studies on chronic diseases and industrial life testing. One such application is an analysis of the time until mortality that results from the insult of a carcinogen being administered to a rat. The formalism involves a study of failure–time distributions, survivor functions and curves, and various linear and nonlinear failure–time models including linear and exponential regression models.

R. D. Larsen, *University of Michigan*

Catastrophe Theory for Scientists and Engineers. By Robert Gilmore (Institute for Defense Analysis). John Wiley and Sons, Inc., New York. 1981. xvii + 666 pp. $45.95. **Stabilité Structurelle et Morphogênèse. Deuxieme Edition.** By Renē Thom (Institute des Hautes Etudes Scientifiques). Inter Editions, Paris; Addison-Wesley, Reading, Mass. 1977. xx + 350 pp. $24.50 (paperback). **Elementary Stability and Bifurcation Theory.** By Gerard Iooss (Universite de Nice) and Daniel D. Joseph (University of Minnesota). Springer-Verlag, New York. 1980. xv + 286 pp.

The three monographs in this review are related. Renē Thom, who is considered to be the father of modern Catastrophe Theory, revised his classic "Structural Stability and Morphogenesis" in 1977. The first edition was published by Benjamin, Inc. in 1972 and appears in an English translation, also published by Benjamin in 1975. The copy received by *JACS* for review is the Inter Editions-Paris version, in French, distributed in the USA and Canada by Addison-Wesley.

Catastrophe Theory is a relatively new branch of mathematics, having arisen mostly since the 1950's, and particularly, since Thom's first edition, as an identifiable formulation. It has generated considerable intellectual excitement. There are both pure and applied aspects to the theory. Thom's theory deals with certain general kinds of discontinuous processes, called "catastrophes", that fall into seven elementary classes, among them being the fold, cusp, swallowtail, and butterfly catastrophes. Each catastrophe is associated with an energy function and a geometry. The elementary catastrophes have structural stability—small changes in the energy function do not change the geometry.

There has been somewhat of a proliferation of monographs on Catastrophe Theory in recent years. Most of these develop, expand, and apply the basic mathematical theory, which is quite sophisticated and deep. Gilmore's monograph, despite its title, will not readily be digested by most scientists and engineers. Part 1, consisting of ten chapters, and titled Catastrophe Theory for Pedestrians, is anything but for pedestrians—it deals with such topics as the local character of potentials, the implicit function theorem, the "Crowbar Principle", the geometry of the fold and cusp, and diagrammatic representations. Parts 3 and 4 are even more difficult, for they go beyond elementary Catastrophe Theory and show the nature of the mathematics in more detail. Part 2, Applications of Elementary Catastrophe Theory, on the other hand, does contain exciting glimpses into applications in thermodynamics (primarily phase transitions and critical points), structural mechanics, aerodynamics, geometrical optics, quantum mechanics, (primarily systems with model Hamiltonians like the MGL and Dicke Models), and climatology.

Applications of Catastrophe Theory within biology, with many fine photographic illustrations, are characteristic of Thom's first and second editions. The English translation is highly recommended.

The monograph by Iooss and Joseph, "Elementary Stability and Bifurcation Theory", although also written for the broadest possible audience, including chemists, biologists, and engineers, involves very sophisticated mathematics beyond most scientists' and engineers' interests. Bifurcation theory is a theory of equilibrium solutions of nonlinear differential equations. Many important time evolution problems can be studied with the techniques of bifurcation theory. As in Catastrophe Theory, the implicit function theorem plays a central role. Both Catastrophe Theory and Bifurcation Theory belong to the 300-year-old theory of singularities.

Russell D. Larsen, *University of Michigan*

Speciality Inorganic Chemicals. Edited by R. Thompson (Borax Consolidated, Ltd.). Royal Society of Chemistry, London. 1981. viii + 497 pp. $18.00.

"Speciality Inorganic Chemicals" is taken from a symposium held at the University of Salford (September 1980), a sequel to one held in 1977 titled The Modern Inorganic Chemicals Industry. This publication reviews some of the industrially important inorganic chemicals that were not included previously.

A selection of industrial chemicals was made and with it authors from Great Britain, Germany, and the United States who are known authorities, mainly from industry, on the chosen topic. The treatment of the subject was representative and spans the periodic table.

The text begins with a general description of speciality chemicals and their marketing position in the chemical industry. This includes the size of the speciality market and assessments for best growth prospects. The subsequent chapters deal with individual chemicals or groups of chemicals derived from a particular element. These include sodium borohydride, the dithionites, phosphorus, lithium, magnesium, aluminum, silica, titanium, zirconium, tin, chromium, molybdenum, and nickel. In addition there are chapters on the rare earths and precious metals and on high purity chemicals.

The format used in each of the papers follows more or less along the following lines: a short history and introduction to the chemical or element of interest; a section dealing with chemical, physical, and thermodynamic properties; methods of industrial preparations, reaction chemistry, and utility; assessments of markets; and a general bibliography. Papers dealing with the transition elements also include sections on their catalytic application to industrial processes.

"Speciality Inorganic Chemicals" is a useful text for technical business persons, scientists, and engineers since it contains considerable quantities of general information. It could also be utilized as a supplementary or primary source for educators.

J. D. Fellmann, *Dow Chemical USA, New England Laboratory*

Handbook of Enzyme Inhibitors (1965–1977). By M. K. Kim (University of Delaware). John Wiley & Sons, New York. 1982. ix + 447 pp. $100.00.

This is a compilation, a "general-purpose list for non-experts", made by one man and presented in dictionary form. About four-fifths of the book consists of an alphabetical list of compounds responsible for enzyme inhibition. For each is given the enzyme process inhibited, the source of the enzyme, the type of inhibition, the inhibition constant, and a reference. In many cases, a short amplifying statement is included. Many cross-index entries help one cope with the problem of variable nomenclature. The remainder of the book is an index of enzymes, wherein one can locate the inhibitors that have been reported for each. A merciful boon is a list of acronyms with their explanation.

Venomous Animals and Their Toxins. By G. G. Habermehl (Tierärztliche Hochschule Hannover). Springer-Verlag, New York and Heidleberg. 1981. ix + 195 pp. $15.50.

This book is based on the translation of the second German edition (1977). It covers its subject with a good balance of chemistry, biology, medicine, and geography, thereby putting all aspects in a proper perspective. Seven of its eight chapters take up the subject according to type of venomous creature, ranging from coelenterates to reptiles. For the chemist, there is given the structure of every toxin that has been determined along with identification of other components of the poisonous excretions. The number of snake venom toxins whose sequence of amino acids has been determined is surprisingly large, and five pages of tabulation are required to record them. The last chapter deals with therapeutic uses of animal venoms.

Encyclopedia of Chemical Technology. Third Edition. Volume 18. Edited by M. Grayson and D. Eckroth. John Wiley & Sons, New York. 1982. xxvi + 950 pp. $165.00.

This volume includes essays on subjects from "Plant-growth substances" to "Potassium compounds". In between come a large number of important subjects beginning with "poly-", three on plastics and plasticizers, three on plants (chemical), and others on platinum-group metals, plutonium, potassium, poisons, and polishes. An indication of the scope of information provided is the fact that the first article contains a seven-page table of plant-growth regulators, giving chemical, common, and trade names, structure, uses, and toxicity. In the sections on plati-

num are found outlines of the involved chemistry used in separating the platinum metals from their ores, tables of physical properties of the metals and their components, utility as catalysts, toxicity, etc. The "polyamide" section identifies six structural types of nylon and gives information on production, prices, manufacturers, trade names, etc. A substantial (33 pages) section titled (Polyhydroxy)benzenes gives a useful review of the chemistry and uses of pyrogallol, hydroxyhydroquinone, and phloroglucinol and their derivatives and is rich in the chemistry of natural products. Chemistry and technology are presented throughout in good balance.

Quinolines. Part II. Edited by Gurnos Jones. John Wiley & Sons, New York. 1982. xi + 685 pp. $166.00.

This book is a volume in the series "The Chemistry of Heterocyclic Compounds" under the overall editorship of Arnold Weissberger and Edward C. Taylor. Part I was published in 1977. Part II consists of three chapters: Alkylquinolines and Arylquinolines, by P. A. Claret and A. G. Osborne; Reissert Compounds and Related *N*-Acylquinolines, by F. D. Popp; and Quinoline *N*-Oxides, by G. Jones and D. J. Baty. The comprehensive, virtually encyclopedic character of this series is maintained in this volume. One finds preparative methods, physical properties (including spectroscopic), biological properties and applications, analytical methods, separation, and chemical reactions all set out in satisfying detail, with numerous tables and exhaustive documentation (the first chapter alone has 2375 references!).

This is an important volume because of the wide variety of uses of quinoline derivatives as pharamaceuticals, agricultural chemicals, etc., and because of their natural occurrence as alkaloids, constituents of petroleum, coal, etc. The authors have performed an outstanding service to chemists working in these areas.

The Stratospheric Aerosol Layer. Edited by R. C. Whitten (NASA—Ames Research Center). Springer-Verlag, Berlin, Heidelberg, New York. 1982. ix + 152 pp. $25.00.

With the El Chichon volcano recently (March–April 1982) spewing more debris into the statosphere than any volcano since Mt. Katmai in 1912, the publication of this monograph becomes very timely. The reader will recognize some of the twelve authors of this book as the "authorities" being quoted in the popular press regarding the effects of the El Chichon eruption on the climate.

How and why are stratospheric aerosols involved? As most chemists know, the statosphere is a region where there is a permanent temperature inversion and hence the turbulence and precipitation common to the troposphere are absent. Consequently, the lifetimes of materials trapped in this layer can be very long (years rather than days:). As far as statospheric aerosols are concerned the picture that is emerging from the research described in this book is the following. Just below the ozone layer (which peaks at about 25 km) in the statosphere there is a permanent layer of particles with radii up to a few microns in size and with concentrations of a few particles per cubic centimeter. These particles appear to be basically 75% aqueous solutions of sulfuric acid, usually with a solid granular nucleus...a sort of vestigial Venus atmosphere. These particles scatter radiation from the sun and can therefore affect the Earth's radiation balance. When volcanic gases and debris are propelled into the statosphere the concentration of these aerosol particles greatly increases for a period of a year or two. This can and apparently has significantly changed the average earth temperature for that period leading to crop failures and years "without a summer".

The whole phenonmenon is much more complex than the simple analysis given above might suggest. What is the source of the H_2SO_4 in aerosols? The evidence presented in this book suggests that in "non-volcanic" periods it is the oxidation of tropospheric OCS. When volcanos erupt into the stratosphere it would appear that SO_2 is the H_2SO_4 precursor. All these and numerous other questions about the formation, nature, and effects of the aerosol layer are extensively discussed in this book, giving us a feeling for some of the experimental and theoretical difficulties encountered during the relatively brief period (since 1961) in which this complex natural phenomenon has been studied. For example, after one volcanic eruption, direct radiation from the sun was attenuated by 25%. However, at the same time diffuse skylight doubled, leading to an insignificant net diminution of the total light reaching the Earth.

The book is divided into five sections: (I) an historical introduction written by Whitten and Hamill, (II) an experimental section by Inn, Farlaw, Russel, McCormick, and Chu, (III) a kinetic analysis by Kees and Castleman, (IV) computer models described by Turco, and (V) a climatic impact assessment by Toon and Pollack. The writing in all five chapters of this review is consistently good, but it is not significantly different from the average scientific paper on the subject. (One chapter does use the work "scientists" in place of "earlier workers" conventionally used in scientific publications.) The book is therefore more suitable for, and in fact was intended for, "those who are engaged or interested in studying statospheric aerosols" rather than those simply wishing to broaden their knowledge about an interesting natural phenomenon. For the atmospheric aerosol scientist or an educator who is concerned with the development of this field, the book provides a useful collection of historical background, theoretical models, experimental techniques, and data.

E. A. Ogryzlo, *University of British Columbia*

Sulfur in Organic and Inorganic Chemistry. Volume 4. By A. Senning (Aarhus University). Marcel Dekker, Inc., New York, New York. 1982. xii + 440 pp. $75.

This is the fourth volume is a series edited by Senning with the aim of reviewing both organic and inorganic sulfur chemistry on a regular basis. This fourth volume duplicates most of the chapters that were published in Volume 1 ten years ago. The chapters in this volume include: (1) The Sulfur–Silicon Bond by A. Haas and R. Hitze; (2) The Sulfur–Nitrogen Bond by H. W. Roesky; (3) The Sulfur–Phosphorus Bond by L. Almasi; (4) The Sulfur–Fluorine Bond by J. M Shreeve; (5) The Sulfur–Chlorine Bond by W. R. Hardstaff and R. F. Langler; (6) The Sulfur–Bromine Bond by P. S. Magee; and (7) The Sulfur–Iodine Bond by L. Field and C. M. Lukehart. All of these chapters represent updates of the literature from chapters in Volume 1 with the same titles; Chapters 1, 2, 3, and 4 are written by the same author(s) that wrote the similar chapter in Volume 1.

The emphasis in this series is primarily on the synthesis of various types of specialized sulfur compounds with some structural chemistry and bonding conclusions given as well. There is little mechanistic discussion. This book is essential for workers in the field, with its up-to-date and very expert review of the synthetic routes to these sulfur compounds, many of which find use as intermediates in industrial, pharmaceutical, and agricultural chemistry. The index, which is an especially elaborate listing of all of the compounds reviewed, is noteworthy and useful.

William A. Pryor, *Louisiana State University*

Theoretical Chemistry. Theory of Scattering: Papers in Honor of Henry Eyring. Volume 6. Part A. Edited by Douglas Henderson. Academic Press, New York. 1981. xiii + 299 pp. $45.00.

Reviewing a collection of extensive survey articles such as this one is a troublesome task, because the purpose of each chapter is variously dictated by the personal choice of the author(s) of that chapter. There are only four articles in this installment of the "Theoretical Chemistry" series, and they vary widely in their scope and in the extent to which they concentrate on methodology or formal theory as opposed to numerical results. Taken as a whole this collection will make a valuable addition to the libraries of most theorists or experimentalists in the area of atomic and molecular collisions and should prove particularly useful to anyone beginning to perform calculations on the specific kinds of problems discussed in this volume. Since the chapters differ so greatly they deserve separate comment.

The first chapter, Applications of Classical Trajectory Techniques to Reactive Scattering, is by James T. Muckerman who has chosen to bypass questions of methodology almost completely in favor of the discussion of numerical results. The bulk of this article is devoted to the analysis of classical trajectory studies by various workers on the $F + H_2$ system and its isotopic variants. The central issue which Muckerman addresses is the effect of features of the potential surface on the trajectory results for cross sections and product distributions. By treating one physical system exhaustively (23 potential surfaces are discussed to some extent) Muckerman is able to give a clear picture of the utility of classical trajectory calculations for evaluating the accuracy of potential energy surfaces from various sources. At the same time the physical features peculiar to this well-studied reaction, such as product vibrational and rotational energy distributions, propensity rules, etc., are discussed in detail.

Aron Kuppermann's chapter on Accurate Quantum Calculations of Reactive Systems reviews the coupled channels formalism for collinear and three-dimensional reactive triatomic systems in addition to discussing computational results. The selection of the coordinate system, basis states, and integration procedure are treated in sufficient detail to serve as a good introduction to practical computation. The results of calculations by several workers on the $H + H_2$ reaction in one, two, and three dimensions are discussed with emphasis on those of Schatz and Kuppermann. Of particular interest is the detailed comparison of results in various dimensions and the discussion of propensity rules for reaction with various polarizations of the rotational angular momentum of the target molecule. Results for collinear $F + H_2$ and electronically nonadiabatic reactions are also presented. This chapter provides an introduction to quantum reactive scattering which is quite a bit more readable than the more detailed original papers.

The chapter on Coupling of Electronically Adiabatic States in Atomic and Molecular Collisions by Bruce C. Garrett and Donald G. Truhlar differs from the two articles discussed above in that it presents a number of new formal theoretical results but no computational results. In brief, this article raises the following question. The usual definition of Born-Oppenheimer adiabatic electronic states involves referencing the electronic coordinates to an origin chosen as the center of mass of the nuclei, and that point is translating as the molecular fragments approach from, or recede to, the asymptotic region. The derivative coupling matrices therefore do not vanish at large separations. How then does one properly set up scattering equations and boundary conditions with the standard quantum chemical definitions of adiabatic states and couplings as the starting point?

The article by Donald A. McQuarrie and Joel E. Keizer on Fluctuations in Chemically Reacting Systems (which actually appears as the third chapter) is somewhat out of place in this volume. Far from dealing with binary collisions in the gas phase, it treats both equilibrium and nonequilibrium fluctuations in reactant and product species with time–correlation function formalism. Some description of experimental observations of chemical fluctuations is given, for example the voltage fluctuation determination of the dissociation constant of beryllium sulfate in aqueous solution and the fluorescence measurement of fluctuations in the reversible binding of ethidium bromide to DNA. Most of the discussion of nonequilibrium fluctuations centers on Keizer's fluctuation theory which provides the basis for a complete statistical theory of macroscopic variables. An interesting discussion of equilibrium systems which can exist in several stationary states under the same conditions (e.g., the Belousov–Zhabotinsky reaction) is also given.

This volume makes a useful extension of the "Theoretical Chemistry" series and adds collision theory to the broad range of topics addressed in the first five volumes of the series.

C. William McCurdy, *The Ohio State University*

Jacob Berzelius: The Emergence of His Chemical System. By Evan M. Melhado (University of Illinois, Urbana). The University of Wisconsin Press, Madison, Wisconsin. 1982. 357 pp. $40.00.

My ninth edition of the *Britannica* tells that when Berzelius was a boy his stepfather said "Jakob, I think you will tread in the footsteps of Linnaeus, or be another Cartouche!"—prophetic words to the boy. As the great systemetizer in chemistry, his path was closer to that of the Swedish founder of systematic botany than to the French robber who was drawn alive in 1721. Berzelius met no such spectacular end but was he also a robber, an appropriator rather than an innovator?

Late nineteenth century studies of Berzelius's work, primarily by Herman Kopp, Ernst von Meyer, and H. G. Söderbaum, present a common theme: that Berzelius was the best spokesman for the Lavoisier revolution; that his own work was heavily based on precedents set by Lavoisier; and that he was not an original thinker. these judgments have persisted to the present time. To Melhado, the immense prestige and influence of Berzelius seemed incongruous with a denial of his originality and the dismissal of his achievements as transient phenomena. Melhado's opinion is that the assessments were mainly reflections of hindsight: the characteristic ideas of Berzelius were not adaptable for the newer chemistry revolution beginning in the first third of the nineteenth century.

To solve the problem, Melhado selected a genetic approach: to observe the construction of Berzelius's science by following its development rather than dissecting the finished system. He examines the role of precedent and contemporary belief in shaping Berzelius's science. His analysis yields full justification for the view that the science of Berzelius was novel and original and that his achievements were not transient phenomena. He concludes that Lavoisier's ideas are manifest in the work of Berzelius (how could they not be if advances were to be made?), but that his most important contributions depart significantly from just those aspects of Lavoisier's chemistry that were not revolutionary.

The book offers more than a revision of assessments of Berzelius: it superbly elucidates the history of ideas in chemistry during the eighteenth and first two decades of the nineteenth century. Melhado's preface indicates that the manuscript was completed in 1979—a fitting commemoration for the bicentennial year of the birth of Berzelius.

David H. Volman, *University of California, Davis*

Triplet State ODMR Spectroscopy. Edited by Richard H. Clarke (Boston University). John Wiley and Sons, Inc., New York. 1982. x + 566 pp. $59.00.

Almost every chemist now knows that the first excited electronic state of most molecules is a metastable triplet that can be populated by the absorption of light in the singlet manifold. This important fact about molecules and chemical bonding was first elucidated by Gilbert N. Lewis during 1944–1945 shortly before his death. An additional important fact about this excited triplet state is that these three spin states are not uniformly populated during the radiationless singlet to triplet change, and any variation in their population gives substantial intensity changes in the phosphorescent decay to the ground-state singlet. The detection of such intensity changes is called optically detected magnetic resonance (ODMR), and this book is an excellent summary of this field of research.

The book contains eleven chapters, each with different authors and each devoted to a different aspect of ODMR. In these chapters the definition of ODMR is taken rather broadly. There is a chapter devoted to zero-field phosphorescence detection (I. Y. Chan), one on high-field studies using substituted benzophenones as examples (D. W. Pratt), and one on ENDOR spectroscopy (K. P. Dinse and C. J. Winscom). These chapters, for example, give both experimental and theoretical details along with selected data. There is also a chapter on zero-field nonphosphorescence detection (R. H. Clarke), and even one about the magnetic field effects on reaction-yields involving radical and triplet pairs (E. L. Frankevich and S. I. Kubarev). The interesting ODMR coherence effects using pulse techniques are also well presented (H. C. Brenner).

The book is subtitled, "Techniques and Applications to Biophysical Systems", and the last five chapters are devoted to ODMR applications to systems of biological interest. These are chapters on porphyrins (R. E. Connors and W. R. Leenstra), chlorophyll triplet state (T. J. Schaafsma), reaction center triplet in photosynthetic bacteria (A. J. Hoff), polypeptides and proteins (A. L. Kwiram), and nucleic acids (A. H. Maki). These later chapters clearly show how ODMR can have very broad applications.

This volume should be most valuable to any worker wanting to learn more about the experimental methods, theory, or practical results of ODMR. The editor and authors are to be congratulated for this timely and informative book.

Rollie J. Myers, *University of California, Berkeley*

Mass Spectrometry. Volume 6. A Specialist Periodical Report. Edited by R. A. W. Johnstone (University of Liverpool). The Royal Society of Chemistry, London. 1982. xiii + 354 pp. $88.00.

"Specialist Periodical Reports" aim to provide systematic and detailed review coverage of progress in the major areas of chemical research. This volume reviews the mass spectrometry literature published between July 1978 and June 1980. It covers both the analytical applications, where the emphasis is on molecular structural information and identification of compounds available only in small quantities, and the underlying principles, which relate to the detailed understanding of ion chemistry.

In the former category there are contributed chapters on developments and trends in instrumentation (by A. McCormick); applications of computers and microprocessors (by R. D. Sedgwick); GC–MS and HPLC–MS (by F. A. Mellon); natural products (by D. E. Games); drugs and metabolites (by L. E. Martin); and organometallic, coordination, and inorganic compounds (by R. H. Cragg).

In the area of ion chemistry, six chapters cover a wide variety of topics including theory and energetics (by T. Baer), with emphasis on work toward the ultimate goal of predicting the behavior of energized ions; structures and reactions of gas-phase organic ions (by I. Howe); reactions of organic negative ions in the gas phase (by J. H. Bowie, V. C. Trenerry, and G. Klass); gas-phase ion mobilities, ion–molecule reactions, and interaction potentials and how they are studied by means of drift tube techniques (by L. A. Viehland); the spectroscopy of ions including work on optical absorption and emission, laser-induced fluorescence, multiphoton processes, and microwave absorption (by R. C. Dunbar); and secondary ion emission which focuses on the study of ions sputtered from surfaces (by A. R. Krauss and V. E. Krohn).

An extensive and detailed Table of Contents and a complete Author Index are included making this a most useful and handy reference volume.

David L. McFadden, *Boston College*

Palladium Catalyzed Oxidation of Hydrocarbons. By P. M. Henry (University of Guelph). D. Reidel Publishing Company, Dordrecht, Holland. 1980. xiii + 407 pp + indexes. $65.00.

With the continued growth in the development and use of palladium complexes in organic chemistry, this book should appeal to a wide audience. Its title is somewhat deceptive for, although it is mainly concerned with Wacker oxidation and related acetoxylation of olefins, it covers in some detail most of the reactions of organic substrates with palladium(II) salts that result in reduction of the palladium to the zerovalent state. The coverage is more current than Maitlis' two-volume set on the organic chemistry of palladium. It treats the subject in much greater depth (although less breadth) than does Tsuji's recent monograph.

The book opens with an enlightening introductory chapter that includes procedures for the synthesis of palladium(II) acetate and a thorough discussion of the complex equilibria in which palladium(II)

participates with chloride and acetate ions, and which are at least partly responsible for the extreme difficulty encountered in interpreting kinetic data for reactions involving these salts. The discussion of insertion processes is somewhat confusing because no distinction is made between nucleophilic attack on complexed olefins without prior coordination of the nucleophile and nucleophilic attack on the metal followed by cis insertion. The drawings of the σ–π complexes resulting from nucleophilic attack on dienepalladium complexes are confusing, since many incorrectly still contain both double bonds.

The second chapter (virtually one quarter of the book in length) deals with the "oxidation" of monoolefins, including hydroxylation, acetoxylation, carboxylation, alkylation, amination, and other miscellaneous reactions of olefins. Its main value lies in the fact that it collects and organizes in a coherent fashion the vast and confusing mechanistic literature dealing with the Wacker oxidation and related acetoxylation reactions of monoolefins. This area has been subjected to intense study over many years, yet the complexity of the systems has led to confusion and controversy, much of which remains unresolved. This chapter discusses in detail the various sets of data acquired and presents alternative interpretations of these data. The author of this book is responsible for much of the primary research in this area and his personal interpretation of much of the controversial experimental work stands out clearly in the discussion of this complex topic. This is not a chapter to capture and hold the attention of dilettantes.

The remainder of the book deals, in a more superficial manner, with palladium(II) assisted reactions of dienes and polyenes, acetylenes, aromatic compounds, and miscellaneous reactions. Much important chemistry, particularly involving π-allylpalladium complexes, has been developed since the coverage of this book. The literature through 1976 is completely covered, while references to 1977 are few and those to 1978 and beyond are virtually absent.

Louis S. Hegedus, *Colorado State University*

The Oxide Handbook. Second Edition. Edited by G. V. Samsonov (translated by R. K. Johnson). IFI/Plenum Press, New York. 1982. xvii + 463 pp. $75.00.

This text is a compilation of data describing a wide variety of physical properties of metal oxides. The original Russian version was published in 1978 and represented a considerably updated edition of the original effort (published in 1969). The present text contains an incredible wealth of information presented in tabular form and clearly will be valuable to any worker even remotely connected with studies on metal oxides.

The book is divided into 10 chapters, each of which compiles the available data for a particular class of properties. The chapter titles are: (1) General Data, Stoichiometry, and Crystal-Chemical Properties, (2) Thermodynamic and Thermal Properties, (3) Molecular Properties, (4) Mechanical Properties, (5) Electrical and Magnetic Properties, (6) Optical Properties, (7) Nuclear Properties and Radiation Effects, (8) Chemical and Catalytic Properties, (9) Refractory Properties, and (10) Phase Diagrams of Binary Element/Oxygen Systems. Most of the chapters are subdivided into a multitude of tables of specific properties.

The data compilation is backed up by 640 references, many of which are taken from the Russian literature. The authors have endeavored to critically review the physical constants they have provided, and therefore have listed what they consider to be the most reliable value for a particular property. Where it did not prove possible to select a single most reliable variable, several values were given.

A very useful feature of the compilation is a listing of each element's oxide and its location in the tables. Thus, if a particular worker needed to research a given metal oxide, a quick check of the elemental index would provide him with the information needed. This text should be placed in the reference section of all scientific libraries, and workers heavily involved with metal oxides might consider the compilation for their personal library.

Harry G. Brittain, *Seton Hall University*

Chemical Feedstocks from Coal. Edited by Jürgen Falbe (Ruhrchemie A. G., Obserhausen, West Germany). John Wiley and Sons Inc., New York. 1982. xii + 647 pp. $85.00. (English translation by Alexander Mullen, originally published in 1977 as "Chemierohstoffe aus Kohle".)

The book provides an excellent overview of many of the processes available for obtaining chemical precursors from coal. The book is divided into 12 chapters, each written by an expert in the area covered: (1) A Brief Introduction, describing the availability, state of the art, and future of coal chemistry, (2) Carbonization and Coking, (3) Acetylene from Calcium Carbide, (4) Hydrogenation of Coal, (5) Gasification of Coal, (6) Methane-Substituted Natural Gas, (7) Production of Gases Utilizing Nuclear Heat, (8) Fischer-Tropsch Process, (9) Methanol from Synthesis Gas, (10) Higher Alcohols from Synthesis Gas, (11) Polymethylene from Synthesis Gas, and (12) Economic Possibilities. The authors should be commended for summarizing a wide variety of different processes into a very readable book. The information should be valuable primarily to engineers because much of the information is concerned with plant design and systems of operation. Chemists will find the survey useful and informative. The authors objective with this text was to present a survey, for both experts and the layman, of the current possibilities of producing organic chemicals from coal and to show where future development should occur.

Throughout, discussion focuses on the important chemical reactions and engineering features for plant scale operation. Sufficient detail is provided to allow the reader to compare one process with another. I found chapter four very interesting in comparing the German work of the thirties and forties on coal liquefaction with the recent American efforts. Because the text is primarily a survey of state of the art, there probably is not enough detail on any one process for an expert in a particular field. Ample references are provided for more detailed information. This book is highly recommended for those interested in the subject of the development of alternative energy and chemical feedstock sources.

Richard J. Baltisberger, *University of North Dakota*

Advances in Inorganic Biochemistry. Volume 3. Metal Ions in Genetic Information Transfer. Edited by Gunther L. Eichhorn (NIH Gerontology Research Center) and Luigi G. Marzilli (Emory University). Elsevier/North Holland, New York. 1981. xviii + 340 pp. $47.95.

This is a highly specialized addition to the series on inorganic biochemistry, focusing on the role of metals in nucleic acid synthesis and utilization. The editors lead off with reviews of the chemistry of metal interactions with nucleic acids and with nucleotides and their derivatives. These are sufficiently detailed to satisfy the experts in the field, while still remaining readable for the less informed bioinorganic researchers. They are followed by a review by Bryan of metal interactions in cell nuclei under in vivo and in vitro conditions. Two chapters by Mildvan and Loeb and a chapter by Wu and Wu focus on the role of bound metals in the enzymic functioning of DNA and RNA polymerases. The functional requirement for Zn^{2+} by these enzymes has only recently been widely recognized. These chapters are excellent in their mechanistic and functional detail. Olson catalogues the effects of metal ions on nuclear protein kinases and phosphatases with their consequent effects on chromatin structure. Grunberg-Manago et al. detail the effects of cations, including metals, on ribosome structure and the various stages of polypeptide synthesis. They emphasize the large polyanionic nature of the ribosome complex and the influence of neutralizing cations on its structure and function. Rich et al. contribute an excellent review of the interactions of metals, and other cations, with t-RNA, complete with multicolored, space-filling models. The book concludes with a long and comprehensive review by Roberts on the mechanism of action of antitumor platinum compounds. Overall, this book will be useful for researchers and graduate students as a compendium and interpretor of the current details of metal–nucleic acid interactions.

Frank O. Brady, *University of South Dakota*

Computational Chemistry: An Introduction to Numerical Methods. By A. C. Norris (Porthmouth Polytechnic). John Wiley & Sons, New York. 1981. xiv + 454 pp. $46.95.

The accelerating production of numerical data by computerized instrumentation forces the modern chemist to utilize the best analytical techniques to make sense of the flood. This book is intended to provide these techniques in the format of an undergraduate text. The title is somewhat unfortunate in that it might be confused with quantum mechanical calculations, but the subtitle clarifies this issue. Basic knowledge of algebra and calculus, but not numerical analysis, is assumed. A reasonable amount of text is used for describing the mathematics of various methods of numerical analysis, including possibilities and pitfalls in the techniques.

The first three chapters deal with problem formulation and computational and experimental errors. Succeeding chapters treat nonlinear equations, simultaneous linear equations, numerical integration, numerical solutions of ordinary differential equations, and interpolation and approximation. The author has chosen to omit any treatment of eigenvalue problems, an omission which this reviewer finds unfortunate. Evidently factor analysis was not deemed sufficiently important to warrant inclusion.

Practical applications are emphasized throughout the text. Problems considered include the calculation of a gas-phase equilibrium constant, the determination of activation energy from non-isothermal kinetics, and the determination of the critical solution temperatures of binary liquid mixtures. FORTRAN programs and subprogram packages are provided in an appendix as computer listings. Also included are conventions for program coding and documentation as well as a discussion of program

design for the various minicomputers which might be employed. A number of exercises are provided, most of which require the computer programs for solution, along with answers and discussion.

A considerable amount of thought and effort has been expended on this text as shown in the fine organization. It will be an excellent reference work for anyone needing to process data and might serve as a supplemental textbook for an undergraduate course if the substantial price can be absorbed.

M. L. Ellzey, Jr., *The University of Texas at El Paso*

Phytoalexins. Edited by John A. Bailey (Faculty of Agriculture and Horticulture, University of Bristol) and John W. Mansfield (Wye College, University of London). John Wiley and Sons, New York. 1982. x + 334 pp. $75.95.

It is only in recent years that the existence of natural antibiotics (phytoalexins) in plants has been confirmed experimentally. Plant pathologists, plant biochemists, and natural product chemists should find the extensive information compiled in this book useful. Following an introduction, chapters are devoted to various plant families that produce phytoalexins, their biosynthesis, metabolism, and toxicity, as well as the roll of phytoalexins in disease resistance, and mechanisms of accumulation. The final chapter is devoted to current problems and future prospects. Extensive references and an index are included.

M. C. W. Smith, *Ann Arbor, Michigan*

A Biographical Dictionary of Scientists. Third Edition. Edited by T. I. Williams. Halstead Press, John Wiley & Sons, New York. 1982. xiv + 674 pp. $42.95.

The considerable amount of interest in the subject of this book is shown by the fact that the second edition, published only eight months ago, has gone out of print. In this new edition, some 40 scientists who died since the compilation of the previous edition have been added. In addition, footnotes have been brought up to date, the table of anniversaries has been expanded (it now spans the years from 624 B.C. to 1974 A.D.), and a subject index has been added. The last feature is particularly helpful, for it allows one to locate discoverers or important contributors when one does not know the name. Thus the entry "phase rule" leads one to Gibbs and Roozeboom, "saccharin" to Remsen, and "chlorophyll" to Karrer, Tswett, and Willstätter (Robert Woodwoard, strangely, is not included, even though the book apparently went to press long after his death).

The main text of the previous edition has been reproduced without revision, unfortunately, and thus the shortcomings have been retained. The selection of biographies could be improved by judicious pruning and augmentation.

Ozonation in Organic Chemistry. By P. S. Bailey (University of Texas, Austin). Academic Press, New York. 1982. xix + 497 pp. $69.50.

For the past seven years, Professor P. S. Bailey has devoted himself to a monumental task: the critical review of the entire organic literature on ozonation. This volume continues the work be begun with Volume I (Academic Press, 1978), a volume that reviewed the reaction of ozone with olefins. In Volume II, Bailey takes up the reactions of ozone with acetylenic compounds; aromatic compounds; heterocyclics; nucleophiles; compounds with carbon–nitrogen, carbon–sulfur, and carbon–oxygen double bonds; alkanes and other saturated compounds; and miscellaneous compounds. This volume also contains a final chapter in which the reactions of ozone with olefins are updated from the publication of the first volume. (It is a tribute to this area that this updating chapter is itself over 50 pages long.)

Ozone must surely be classified as one of the most interesting molecules extant, with something for almost everybody. It can react as an electrophile or as a nucleophile, it can undergo cycloaddition reactions, and it can react with many types of molecules, including olefins, to form free radicals. It reacts with many species at rates that are extremely rapid even at dry ice temperatures; it even reacts with alkanes in reactions that are reasonably fast at room temperature. It occurs in the stratosphere and protects us earthlings from being fried by the sun's rays. It occurs in smog and challenges us to mechanize an industrial society without the lethal effects of smog.

Ozone has been used for many years by organic chemists to cleave large molecules into smaller parts. Studies of the mechanism of this reaction began with the publications of Harries in 1903 and culminated in Criegee's brilliant publications in the 1940's and 1950's. Ozone reacts with virtually every functional group, and a fantastic variety of papers has been published on these reactions as well. Bailey himself has contributed importantly to our understanding of the reactions of many functional groups.

The literature review in these volumes is exhaustive. Bailey's Volume I has nearly 800 references and Volume II adds more than 1200 further references. These books are primarily a review of the organic chemistry of ozone. The atmospheric chemistry of ozone, the chemistry of smog, and the biological effects of ozone are covered here only briefly and with references to other reviews. Nevertheless, these volumes are important source books for persons interested in any of these topics.

Persons studying ozone chemistry for years to come will praise Phil Bailey for the job he has done. Although the mechanisms reviewed here may not always agree with those the reader might prefer, the literature review is gratifyingly complete, and these books have been produced with great dedication and thoroughness. The price of Volume II may enforce somewhat limited sales, but no one studying ozone can afford to be without both books in this series. All such persons will undoubtedly join me in their praise of both Phil Bailey and Academic Press for bringing this venture to fruition.

William A. Pryor, *Louisiana State University*

Inositol Phosphates, Their Chemistry, Biochemistry and Physiology. By D. J. Cosgrove (CSIRO, Canberra, Australia). Elsevier Scientific Publishing Co., New York. 1980. XI + 191 pp. $46.25.

This book contains a summary of literature information (to about 1979) on some limited aspects of the various phosphates of inositol. Almost half the book summarizes the chemistry of this group of compounds and incudes a discussion of nomenclature, stereoisomerism, conformation, and analytical methods, as well as separate chapters on the hexakis, pentakis, tetrakis, tris, bis, and monophosphates. Biochemical aspects are summarized in chapters on phytase (written by G. C. J. Irving), biosynthesis, and inositol phosphates in soils and sediments. The book concludes with a brief discussion of physiological, nutritional, dental and medical aspects of the inositol phosphates.

In many respects the title of the book promises more than it delivers because, by almost any standards, some of the most interesting and exciting recent biochemical and physiological aspects of this group of compounds concern the function and metabolism of phospholipids that contain inositol phosphates, and these are not covered at all. The emphasis of the book is on inositol phosphates from plants and soil and their gross effects on animals when ingested. Aside from a brief discussion of possible intestinal phytase activity, there is virtually no discussion of inositol phosphate metabolism in animals and of its importance. As such, the book will only be of general utility to a limited audience; to most of those interested in biological aspects of inositol phosphates its main use will be as a convenient reference source to literature on the chemistry of these compounds published since the appearance of T. Posternak's classic work ("The Cyclitols") in 1965. Since the book is rather brief, and was reproduced by photo-offset of regular double-space typescript, it also seems to be overpriced.

G. A. Hamilton, *Pennsylvania State University*

Industrial Organic Chemicals In Perspective. Part One: Raw Materials And Manufacture. By Harold A. Wittcoff (Koor Chemicalss Ltd.) and Bryan G. Reuben (Polytechnic of the South Bank). John Wiley & Sons, New York. 1980. xviii + 297 pp.

The up-to-date perspective this book brings is welcome in a volume on organic-chemical raw materials. Aside from being timely and current, the prose is carefully constructed and the style readable. Such a book as this could well form the basis for a useful industrial chemistry course, more of which have been recommended by the American Chemical Society for undergraduate and graduate curricula.

The first and last chapters should be particularly useful and broadening for chemistry students in that they present many socioeconomic aspects of chemistry seldom discussed in the modern classroom. Chapter 1 considers, for example, growth, competition, capital intensity and economy of scale, obsolescence, market forces, national economies, and international trade. The last chapter takes up the interchangability of raw materials, feedstock switching, energy and energy crises, captial requirements and shortages, overcapacity, and of course toxicity, pollution, and safety.

The longest chapter is devoted to natural gas and petroleum as raw materials and it covers the routes and reactions used to manufacture the major petrochemicals. A separate chapter considers chemicals made from other raw materials. Another chapter treats the synthetic chemistry and properties of industrial organic polymers. Yet another chapter reviews important aspects of industrial catalysts. Also useful is an introductory chapter (numbered zero) that serves as a guide and discusses important source materials including books, journals, encyclopedias, patents, audiovisual aids, case studies, and the like.

A major lack I found in this book is the absence of process flow diagrams and the failure to discuss industrial reactors and separation schemes. Such omissions are notable in view of the authors' discussion of the importance of continuous processes and their frequent referral to fluidized beds. I would recommend that users of the book supplement

it with process flow diagrams from other sources such as those mentioned in the introductory chapter. Finally, it is not unexpected that some errors would creep into a book that covers as broad a scope as this one does. Some I found include the simplistic explanation of lower octane numbers of normal octanes in terms of their resistance to oxidation (p 42) and the implication on p 49 that steam cracking of naphtha makes use of a catalyst susceptible to coking (or has the author confused catalytic cracking to make gasoline as the major product with steam cracking to make primarily olefins).

Robert W. Coughlin, *University of Connecticut*

Trace Chemistry of Aqueous Solutions, General Chemistry and Radiochemistry. Monograph 18. Topics in Inorganic and General Chemistry. By P. Beněs and V. Majer (Technical University of Prague). Elsevier Scientific Publishing Company, Amsterdam and New York. 1980. 252 pp. $56.00.

The emphasis in this book is on the physicochemical properties and behavior of trace-level substances in aqueous solutions. The book is divided into three distinct sections. The introduction section deals with basic concepts and definitions associated with trace substances, a review of elementary solution chemistry, and a brief history of "trace chemistry" that is defined by the authors as a special branch of general or physical chemistry that deals with the unique properties of the "trace state of matter". The second section details the methodology for the determination of the ionic/molecular forms and the oxidation states of trace elements in aqueous solution. This section concludes with an extensive discussion of the nature and conditions of formation of "trace colloids" at concentration levels well below 10^{-5} M, as distinct from "macro colloids" with more regularly defined properties at higher concentration levels. Also included in this section is an extensive and quite useful table listing the experimental conditions under which the trace colloidal properties of various elements have been studied, experimental methods used, and references to the original studies. The third section of the book is devoted to a discussion of macroheterogeneous systems with a lengthy discussion of coprecipitation phenomena. An index and 1006 references to 1976 are included. The use of the term radiochemistry in the title is perhaps a bit misleading. Although radiochemical techniques are commonly referenced, the material presented is most likely to be of greatest interest to physical chemists interested in colloid properties. The references reflect a heavy reliance on Russian and European literature in the field. The book is a useful addition to an institutional library in that few other books have addressed this rather specialized field. Due to its specialized nature, it is unlikely that it will be widely used as a text in graduate programs in the United States.

William D. Ehmann, *University of Kentucky*

Introduction to Bioinstrumentation: With Biological, Environmental and Medical Applications. By Clifford D. Ferris (University of Wyoming). The Humana Press, Clifton, N.J. 1978. xiv + 330 pp. $29.50 hardcover; $14.50 softcover.

This survey of bioinstrumentation principles and devices could be used as an undergraduate text for biomedical and environmental students or a handy reference for biologists, biomedical and environmental engineers, medical technicians, etc. It assumes knowledge of basic physics and electronics, as well as differential equations. The book is divided into six sections with a total of 12 chapters, 20 problems, and an appendix on overall system response. Several outstanding features of the book are notable: a clear, readable style; basic electronics and magnetism equations provided at medium-level difficulty for most topics; many graphs, circuit diagrams, and photos; and much practical information on selection of equipment. This latter is almost never found in texts.

The sections include: General Systems; Transducers; Amplifiers and Signal Conditioning; Recording and Display; Telemetry Systems; and Practical Matters.

I conclude this to be an interesting, well-presented, and useful book for practitioners who must deal with the fine points of making instruments work.

Ronald G. Barile, *Florida Institute of Technology*

Characterization of Catalysts. Edited by J. M. Thomas and R. M. Lambert (Cambridge University). John Wiley & Sons, New York. 1981. xiv + 283 pp. $49.00.

This volume represents a collection of papers presented at an appreciation course on catalyst characterization organized at King's College, Cambridge, in the summer of 1979 The volume consists of 17 contributions in the form of up-to-date critical reviews from British experts working in the field of catalysis and catalyst characterization.

The book starts with a review article on Recent Trends in Surface Science and Their Impact on Catalyst Characterization by one of the editors (J. M. Thomas) and ends with concluding remarks—one by a chemical engineer (C. N. Kenney) and the other by a physical chemist (R. M. Lambert). In most of the other articles, an attempt has been made to cover newer methods of catalyst characterization such as neutron scattering, extended X-ray absorption fine structure (EXAFS), Mossbauer and other types of spectroscopy, electron microscopy, and cyclic voltammetry. However, there are contributions on the older and more established techniques such as radioisotope exchange and surface area and pore volume determinations. In addition, three contributions present practice of catalyst characterization from the point of view of industry. The book attempts to evaluate and assess the newer techniques for in situ characterization of catalysts.

The book will be of interest to all those interested in the theory and practice of heterogeneous catalysis.

N. N. Bakhshi, *University of Saskatchewan*

Characterization of Porous Solids. Edited by S. J. Gregg (Exeter University), K. S. W. Sing (Brunel University), and H. F. Stoeckli (Institut de chimie, Neuchâtel). The Society of Chemical Industry, London. 1979. xiii + 392 pp. £21.00 ($45.00).

This volume represents Proceedings of a symposium held at the Universite de Neuchâtel, Switzerland, July 9–12, 1978. The volume contains reports from three plenary lectures and 30 invited papers. This symposium was a follow-up of an earlier symposium on The Structure and Properties of Porous Materials held in Bristol in 1958. The subjects of pleanary lectures include the following: Microporous Structures of Carbonaceous Adsorbents by Academician M. M. Dubinin, Diffusion and Flow in Porous Zeolite, Carbon or Ceramic Media by Professor R. M. Barrer, and Capillary Condensation by Professor D. H. Everett. The papers are grouped in 5 sessions. Though no titles have been assigned to the sessions, sessions one (8 papers) and two (4 papers) contain mostly papers on porous structures and adsorption, session three (6 papers) contains papers on kinetics and diffusion aspects of sorption in beds of micro- and mesoporous powders and pellets, session four (8 papers) contains papers on capillary condensation phenomena and their application to the understanding of adsorption phenomena in porous solids, and session five (7 papers) contains papers of applied nature.

This volume reports recent work on the characterization of porous solids. Such studies are of great interest in the understanding of the surface phenomena taking place in porous solids. When one considers the role of catalysts in energy-related processes (e.g., coal gasification, desulfurisation of coal/coke, and a wide variety of catalytic processes in the hydrocarbons industry), the importance of these Proceedings becomes quite obvious. This volume will be of interest to surface scientists and especially to investigators in the field of heterogeneous catalysis.

N. N. Bakhshi, *University of Saskatchewan*

Rheology. Volumes I–III. Edited by G. Astorita, G. Marucci, and L. Nicolais. Plenum Press, New York and London. 1980. 1883 pp. $160.00.

These volumes contain the invited lectures and contributed papers presented at the 8th International Congress on Rheology held in Naples, Italy in September 1980. The subjects covered have been grouped into eleven areas, covering theory, fluid dynamics, rheometry, polymer solutions, polymer processing, rubber, polymer melts, suspensions, polymeric solids, biorheology, and general or miscellaneous topics.

Much like the volumes of earlier ICR meetings, these volumes contain a wealth of up-to-date rheological information and should prove to be invaluable reference sources for both theoretical and practical rrheologists. As an example, some 30 papers center on the theoretical and practical aspects of elongational flow—a topic of current high research interest and practical significance.

E. A. Collins, *Case Western Reserve University*

Corrosion of Stainless Steel. By A. John Sedriks (INCO Research and Development Center). John Wiley & Sons, Inc., New York. 1979. xv + 282 pp. $28.95.

Throughout his book, Dr. Sedriks has continually emphasized a basic understanding of the metallurgy of stainless steels and its influence on many aspects of their corrosion behavior. He covers in excellent detail all the classes of stainless steel (austenitic, ferritic, martensitic, duplexed, precipitation hardened, superferritics, etc.) in both wrought and cast product forms. The interrelated roles of alloy chemistry, heat treatment, surface condition, and environment on the phase stability, mechanical properties, and corrosion behavior are clearly illustrated with phase diagrams, equivalence equations, and many figures. In addition, there are abundant tables of information on the chemistries, mechanical properties, and corrosion data on all the AISI and many of the proprietary grades of stainless steel. An excellent chapter provides an introduction into the electrochemical theory of corrosion behavior, including simple theoretical concepts and experimental details of measurement techniques. Individual

chapters are also presented on the subjects of Pitting, Crevice Corrosion, Intergranular Corrosion, and Stress Corrosion Cracking. A good balance has been kept between a description of these phenomena from an electrochemical viewpoint and the results of classical corrosion testing. The chapter on Stress Corrosion Cracking deserves special comment as Dr. Sedriks has nicely tied together the areas dealing with chloride cracking, caustic cracking, oxygen cracking, and hydrogen embrittlement. Other topics that have been competently covered, but in lesser detail, are corrosion fatigue, galvanic corrosion, erosion–corrosion, cavitation damage, general acid and alkali corrosion, and corrosion by hot gases and molten compounds. Considerable corrosion data have been included in this book along with the current theories or models to explain their causes and cures. The book is well organized, has a large number of references at the end of each chapter, and has a good index. I highly recommend this book for engineers and students wishing to obtain an excellent metallurgical background of stainless steels and their corrosion behavior.

Jerry L. Arnold, *Armco Research*

Controlled Release of Pesticides and Pharmaceuticals. Edited by Danny H. Lewis. Plenum Press, New York. 1981. ix + 340 pp. $42.50.

Controlled release of chemicals has become an increasingly important area in the food, pesticide, and pharmaceutical industries, as evidenced by the recent proliferation of journal articles, books, and organizations devoted to this topic. Despite this increase in publications there is a continuing need for exchange of technical information. The present text attempts to fill this need.

"Controlled Release of Pesticides and Pharmaceuticals" is based on presentations at the 7th International Symposium on Controlled Release of Bioactive Materials held in 1980 in Ft. Lauderdale. Approximately the first 40% of the book (9 of 25 chapters and about 146 of 340 pages) is devoted to controlled release of pharmaceuticals, with the remainder concerned with pesticides. The individual presentations represent various strategies for controlled release and are unrelated to each other except, perhaps, for the common thread of controlled release. Many of the current approaches to controlled delivery of small and large molecules appear to be covered in the text.

Edited texts, especially of symposium proceedings, often tend to be uneven in thoroughness and clarity of presentation. The present text appears to be somewhat better in this regard.

Many of the presentations in this book have appeared in print elsewhere. However, there is enough newer material to make the text a useful addition to the literature. For those working in the area of controlled release of bioactive substances, this book will be an additional resource.

Joseph R. Robinson, *University of Wisconsin*

Optical Radiation Measurements. Volume 2. Color Measurement. Edited by Franc Grum and C. James Bartleson (Eastman Kodak). Academic Press, New York. 1980. xii + 372 pp. $39.50.

In the spectrum of recent books dealing with color measurement—which more often means the mathematical treatment of spectrophotometric data than how to obtain the data themselves—this book lies somewhere in the middle. There are simpler books for the beginner and more complex books directed toward the expert in a narrower range of topics. Grum and Bartleson, editing the work of four authors in addition to their own contributions, have produced a fairly even, comprehensive treatise that should satisfy the needs of most readers who are willing to put a little effort into understanding what is being said.

The book is divided reasonably well into chapters on fundamentals and on applications, though one of its weaknesses is that the applications are not treated in a practical "how to" fashion but are treated more from the side of general principles and historical development. The mandatory short introductory chapter by Bartleson should not be overlooked in this case, since it provides a lucid discussion of the meaning of the terms "color" and "measurement", separately and in juxtaposition, that sets the stage for all the treatments to follow.

Chapters 2, 3, and 5 provide the remaining fundamental material. In Chapter 2, Color Terms, Symbols, and their Usage, R. W. G. Hunt provides basic definitions for the important but still often unfamiliar concepts that must be mastered before a reader can understand adequately what color measurement is all about. Bartleson's third chapter, Colorimetry, summarizes the many internationally agreed methods of data treatment that constitute color measurement. This long (115 pages) chapter is an excellent, detailed summary of the field. Chapter 5, Color Order, by F. T. Simon, concludes the fundamental set by describing the interrelations among colors resulting from different types of color mixing and different objectives in creating orderly arrays of color.

The more applied chapters do not come off quite as well, in comparison. Simon's Chapter 4, titled Modern Illuminants, really talks about light sources (the term illuminant being reserved in color science for their spectral power distributions, treated in Chapter 3), is short, and contributes little to the main stream. Grum's Chapter 6, Colorimetry of Fluorescent Materials, is a complete and detailed treatment of what for this book is really a side issue; its inclusion is all the more surprising since the next volume in Grum's "Optical Radiation" series is devoted entirely to the measurement of fluorescence and phosphorescence.

Of the two major applications of color measurement (in the reviewer's opinion), color differences and color tolerances are not given a separate chapter—a major shortcoming of the book—and color matching is treated in E. Allen's Chapter 7, Colorant Formulation and Shading. Although Allen presents well the mathematical background for computer-aided color matching, there are no practical examples, and the reader does not get a useful feeling of what can and what cannot be done with the technique. The same criticism applies to the last chapter (Chapter 8), Modern Color-Measuring Instruments, by M. Pearson, probably the weakest in the book.

Despite these shortcomings, which reflect to some extent the reviewer's concern that readers of this journal will be more interested in how color measurement can be applied to their problem than in its mathematical development, this is an excellent book overall that fully deserves to be in every university and company library and on every colorist's bookshelf.

Fred W. Billmeyer, Jr., *Rensselaer Polytechnic Institute*

Roger Adams: Scientist and Statesman. By D. S. and A. T. Tarbel (Vanderbilt University). American Chemical Society, Washington, DC. 1981. vi + 240 pp. $13.95.

This is an admiring biography of one of the great men of American chemistry, written by chemists and directed principally to an audience of chemists. Roger Adams was one of the great classical organic chemists of the first part of the 20th century, but he was a great deal more than that. As an educator he helped raise the chemistry department at the University of Illinois to international eminence, and as a scientific politician he contributed to American policy and scientific organizations through two world wars. Organic chemists everywhere are indebted to him not only for his serendipitous discovery of Adams' catalyst but also for his leadership in the development of "Organic Syntheses" and "Organic Reactions".

The biography covers Adams' family background, his education, and his professional contributions including some discussion of his chemical researches. Chapters relating to his work during both world wars are particularly interesting. Chemists who have had some association with the chemistry department of the University of Illinois should also find much to interest them. Finally, younger students of chemistry might be intrigued to see how someone who started his career in chemistry by accumulating 4 C's and 2 D's in his first year at Harvard rose to a position of such eminence in organic chemistry that he would turn down the offer of an endowed chair at his alma mater!

Elliot N. Marvell, *Oregon State University*

Comprehensive Treatise of Electrochemistry. Volume 2. Electrochemical Processing. Edited by J. O'M. Bockris, Brian E. Conway, Ernest Yeager, and Ralph E. White. Plenum Press, New York and London. 1981. 616 pp. $57.50.

The aims of the multivolume treatise "Comprehensive Treatise of Electrochemistry" include presentation of a mature statement about the present position of the interdisciplinary field of electrochemistry. In Volume 2, the statement is focused on processing operations, and the volume may reasonably be expected to serve the needs of research workers as well as electrochemical engineering students for an up-to-date review of electrochemical applications. The first two chapters on the electrolytic production of hydrogen and chlorine meet these needs admirably. For hydrogen production, mass and energy balances around the electrolyzer, plant flow sheets, and kinetic parameters on a range of electrodes including alloys are presented. Commerical and novel cells are described and the economics of hydrogen production are summarized. The chapter on chlorine production is thorough, concentrating on components of cell voltage and efficiencies before giving a detailed review of electrodes, separators, and diaphragm and membrane cells. The inorganic electrosynthesis chapter continues in this vein and treats a number of industrial chemical products. The section on sodium chlorate is particularly good. The tone of the volume shifts somewhat in the chapter on electroorganic synthesis, with more emphasis on chemistry and mechanism and a brief mention of technical synthesis.

The next three chapters deal with electrometallurgy. Aluminum production is described with details on reactions, current efficiencies, and energy considerations. Heat balances and electromagnetic effects are dealt with rather summarily. Molten salt processes are otherwise ignored in this book as the following chapter on refining and winning of metals deals solely with aqueous electrolytes. This section is more descriptive and less quantitative than other parts of the book and includes production

statistics and plant flow sheets for common nonferrous metals. Electroplating is given a brief qualitative description, which is probably justified by the presence in the literature of other handbooks. By contrast, electrochemical machining is covered in depth with some 120 pages of detail on corrosion fundamentals, electropolishing, jet etching, electrochemical grinding, and analytical treatment of electrochemical machining. This chapter stands on its own as a small book. Electrodeposition of paint is treated from its transport and mechanistic aspects with applications to both anodic and cathodic processes in a very readable fashion. The final brief chapter on mineral flotation seems almost out of place in this volume, and the treatment given here can only scratch the surface of this broad topic.

This book has disadvantages common to any other treatise written by a series of authors, such as uneven quality and depth of coverage. Due to its breadth of subject matter, it definitely belongs on the reference book shelf, but it will be the rare reader who will find use for all of the material presented here. It does bring together much valuable material in the area of technical electrochemical processing and will be a welcome addition to the shelves of research workers and university teachers alike.

A. P. Watkinson, *The University of British Columbia*

Springer Tracts in Modern Physics. Volume 91. Structural Studies of Surfaces. By K. Heinz and K. Müller (Universität Erlangen), T. Engel (University of Washington at Seattle), and K. H. Rieder (I.B.M. Zurich Research Laboratory). Springer-Verlag, New York. 1982. 180 pp. $29.50.

This book consists of two parts: LEED Intensities—Experimental Progress and New Possibilities of Surface Structure Determination and Structural Studies of Surfaces with Atomic and Molecular Beam Diffraction. The first part is a comprehensive review of the experimental details of collecting accurate low-energy electron-diffraction (LEED) intensity data. Particular emphasis is given to statistical considerations, sources of experimental error, and improved and faster methods for data collection. There is no discussion of theoretical models for fitting such data, but the methods for comparing theoretical spectra to experimental spectra are reviewed in detail. Very few example LEED studies are presented.

The second part of this book is an excellent review of both the experimental and theoretical aspects of studying surface structures with atomic and molecular beam diffraction. It is complete in presenting and evaluating various theoretical methods and approximations for calculating diffraction intensities. It presents a very detailed discussion of experimental design and procedures. Finally, it reviews numerous illustrative examples of surface structural investigations on ionic crystals, semiconductors, metals, and adsorbates. This is an invaluable reference guide for anyone working in the field of atomic and molecular beam scattering at surfaces (experimental or theoretical).

I would have been happier with a more specific title for this book, since the present title is of very broad scope although many aspects of structural studies of surfaces have not been mentioned in the book.

Charles T. Campbell, *Los Alamos National Laboratory*

Intermolecular Forces. Their Origin and Determination. By. G. C. Maitland (University of London), M. Rigby (University of London), E. B. Smith (Oxford University), and W. A. Wakeham (University of London). Clarendon Press, Oxford University Press, Oxford. 1981. xiv + 616 pp. $74.00.

This excellent book is, in part, an update and extension of material found in Part III of "Molecular Theory of Gases and Liquids" by J. O. Hirschfelder et al. The book is user oriented and lacks the mathematical detail of some recent books on intermolecular forces, for instance, "Intermolecular Interactions from Diatomics to Biopolymers" edited by B. Pullman. However, Maitland et al. have included enough detail so that a reader familiar with the topic of intermolecular forces can follow the arguments leading to the mathematical results.

Chapter one gives an overview of the subject. Chapter two contains an interesting discussion of theoretical calculations of intermolecular forces. Chapter three treats the relationship between virial coefficients and intermolecular forces. The elements of elastic and inelastic scattering are discussed in chapter four, which contains a very nice treatment of various scattering approximation methods. Chapters five and six deal with intermolecular forces as they relate to transport properties. The authors' discussion of the kinetic theory of polyatomic molecules is an excellent attempt to give physical meaning to a large number of mathematical results obtained by many different research workers.

Chapter seven deals with spectroscopic measurements, concentrating on van der Waals molecules, especially the inert gas dimers and H_2–inert gas interactions. Condensed phases are treated in chapter eight, including a discussion of intermolecular forces in liquids. Chapter nine is an assessment of the present "state-of-the-art" with respect to intermolecular forces. Again, the rare gases are emphasized but other interactions are also considered. The reliability of various combining rules is also discussed in this chapter. The authors conclude that none of them are very reliable.

The book contains 13 appendices. Included are a list of many of the frequently used intermolecular potentials, a correlation of thermophysical properties according to a "universal" potential, and computer programs for the evaluation of second virial coefficients and transport collision integrals.

This book will be a valuable addition to the library of any research worker interested in the general area of chemical physics. The authors provide many physical insights about intermolecular forces which should provoke the interest of even those who may be expert in this field and which should stimulate new work and fresh insights.

Louis Biolsi, *University of Missouri—Rolla*

Modern Physics in Chemistry. Volume 2. Edited by E. Fluck (Institut für Anorganische Chemie der Universität, Stuttgart, West Germany) and V. I. Goldanskii (Institute of Chemical Physics, Academy of Sciences of the USSR, Moscow). Academic Press, New York. 1979. xiv + 638 pp. $85.50.

Increasingly today there is a diminishing difference between the analytical chemist and the applied physicist. The distinctions that may have once existed between them are becoming blurred, and many chemists are now doing research in areas that were once the exclusive domain of the physicist. Volume 2 of "Modern Physics in Chemistry" highlights this overlap very successfully.

This volume of "Modern Physics in Chemistry" is intended to supplement the first volume by the same editors published in 1976. That volume included subjects such as chemical effects in X-ray spectroscopy, electron paramagnetic resonance, nuclear quadrupole resonance, chemically induced dynamic nuclear polarization, Mössbauer double resonances, and positronium and mesic chemistry. The topics presented in Volume 2 are X-ray photoelectron spectroscopy, neutron diffraction, secondary ion-mass spectrometry, Mössbauer spectrometry, and nuclear magnetic resonance spectroscopy. A separate chapter is devoted to each of these subjects. The authors of the chapters mainly stem from western Europe and Russia.

Each chapter gives a very clear and complete coverage of a subject. Generally, the presentation begins by briefly citing the historical development and by previewing the chief advantages of the technique. This is followed by a review of the underlying theory, descriptions of apparatus and experimental methods, and, most importantly, a thorough exposition of applications, with examples and data taken from actual measurements. The latter discussions were found to be particularly valuable. The authors also do a fine job of showing the connections of a subject with other, complementary techniques. Extensive references are given in each chapter so that each area can be followed up in greater detail. The treatments are up-to-date and should be of value to all applied scientists, including biologists. This volume and the first one would make excellent references for graduate students too. Enough mathematical detail is given to understand the development of the formulas that are intrinsic to the applications emphasized in the book.

Sam J. Cipolla, *Creighton University*

Topics in Nucleic Acid Structure. Edited by Stephen Neidle (University of London King's College). Halsted Press (A Division of Wiley), New York. 1981. x + 211 pp. $59.95.

For those scientists interested in the study of nucleic acid structure and that of its components, this text will be a useful addition. This concise treatise is a blend of experimental crystallographic and NMR studies and methodologies and theoretical approaches concerning various aspects of nucleic acid structure.

In the first chapter, H. M. Berman discusses the nomenclature and definitions used in the description of nucleic acid structure, the conventions to be used throughout this book, and the various conformational conventions used by different spectroscopists.

Chapters 2 (H. M. Berman and H.-S. Shieh) and 3 (R. H. Sarma and M. W. Dhingra) examine crystallographic and NMR studies of DNA and RNA fragments, respectively. Chapter 2 includes X-ray crystallographic data of the three classes of dinucleoside phosphates; this structural information is used in discussing base stacking and model building of larger fragments. The theme is carried through into Chapter 3 which discusses these topics and other stereochemical features with use of existing NMR data. In addition, Sarma and Dhingra discuss the sensitivity of the glycosyl torsion angles (χ_i) and mode of sugar ring pucker in different fragments, how these and other stereochemical properties control the conformation of single stranded and base-paired oligonucleotide fragments in solution, and the rigid nucleotide concept.

In Chapter 4, S. Arnott covers secondary structures of polynucleotide

chains on the basis of fiber diffraction analyses. There is also a fascinating section on the morphology of polynucleotide duplexes.

Chapters 5 and 6 examine the crystal structure and NMR solution data on transfer RNA. Like Chapters 2 and 3, these two chapters are complementary. S.-H. Kim (Chapter 5) focuses on the L-shaped crystalline structure of yeast $tRNA^{Phe}$ and uses this structure as a model to explain data obtained on other tRNAs. The overall structure of tRNAs is discussed, even the possible biological significance of "conserved presence" and "conserved absence" of certain bases. B. R. Reid (Chapter 6) offers an informative discussion on the solution conformation and dynamics of tRNA derived from NMR studies. He concentrates on the low field ring NH hydrogen bond NMR data of tRNAs and their respective fragments. Such data can be viewed as a measure of the three-dimensional folding and tertiary interactions of tRNAs. A small detraction is the manner in which Reid expresses the chemical shift data as minus values. The standard nomenclature for such data recommends assigning the TMS peak as 0 and then increasing the scale as positive values in a downfield direction. A full range of spectroscopic data on eukaryotic chromatin and its major components, e.g., the core particle and histone core is presented in Chapter 7 by D. M. J. Lilley. This chapter brings to light the immense complexity involved in deciphering structural information on such macromolecular components as the nucleosome and chromatin.

In Chapter 8, S. Neidle examines the different structural models for intercalation in light of X-ray crystallographic data obtained from various drug–dinucleoside phosphate complexes. He discusses the influence of the C5′–O5′ angle, the $\chi(3')$ torsion angle, and sugar puckering at the intercalation site. One fault of this chapter is that certain structures of drugs or agents used in forming the complexes are not provided; however, some are found in the following chapter. The same topic is covered in Chapter 9 (T. R. Krugh), making use of ^1H NMR data. A detailed discussion on the actinomycin D, ethidium bromide, and 9-aminoacridine complexes is provided, and an interesting section on the geometry of the helix at the intercalation site is given.

Overall, the entire text is well worth reading. The presentation is clear and concise, and the coverage of the literature appears to be thorough. Each chapter contains a bibliography and the text is indexed by subject. As Lilley and Neidle point out, however, the shelf life of this text is limited because of the rapid advancement in this field. The cost is high for a personal collection, but the book should be a part of interested research library collections.

Raymond P. Panzica, *University of Rhode Island*

Statistical Mechanics and Dynamics. Second Edition. By Henry Eyring, Douglas Henderson, Betsy Jones Stover, and Edward M. Eyring. John Wiley and Sons, New York. 1982. xiv + 784 pp. $28.

This volume is a second edition of the author's earlier statistical mechanics text. New to this edition are a discussion of the mean spherical model, a brief treatment of scaling and renormalization group methods in critical phenomena, the Barker potential for argon, and the Percus–Yevick theory of hard spheres. Of great interest to the general reader will be extensive treatments of the author's own substantial contributions to statistical mechanics, most notably on the theory of significant structures and on the use of three-phase partition functions. This is, as a whole, a well-written book. The publishers should be complimented for its relatively low price, which ought to encourage broad ownership. The absence of homework problems may discourage adoption of the volume as the main text for a course.

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

Catalysis and Chemical Processes. Edited by R. Pearce (I.C.I.) and W. R. Patterson (I.C.I.). John Wiley and Sons, New York. 1981. XIX + 348 pp. $69.95.

This treatise is an excellent piece of work emphasizing the importance of catalysis in the chemical industry. Whereas previous attempts to write such a book have been heavily slanted toward specific areas of chemistry or engineering, this volume has achieved an excellent balance of the two.

Catalyst development, for instance, is discussed from three directions; minor changes to an existing process, major changes to an existing process, and radically new processes.

The "catalyst" is examined in chapters concerned with preparation and characterization, engineering processes, and economic aspects. Raw materials (oil, coal, natural gas) are then scrutinized in terms of which are suitable under what economic conditions for what potential upgrading. The next 200 pages cover most every commodity chemical in a very enlightening way. Rather than a compilation of industrial routes to these chemicals, the authors compare potential routes and discuss why a certain route would be chosen by a certain company having its own unique raw material position.

The perspective given on industrial catalysis in this book has been missing from all "catalysis" courses given in academic institutions that I am aware of. I highly recommend this volume as a reference book for industiral chemists, a source book for academic chemists trying to become "relevant", and, above all, a text for a graduate course in industrial chemistry.

P. E. Garrou, *Dow Chemical–New England Laboratory*

The Phytochemistry of Cell Recognition and Cell Surface Interactions. By Frank A. Loewus and Clarence A. Ryan (Washington State University). Plenum Press, NY. 1981. x + 277 pp. $37.50.

Mechanisms of cell recognition and cell surface interactions as encountered primarily in plants are discussed. Those include molecular aspects of interactions with pathogens, pollen–stigma interactions, and cell–cell content. The book begins with a review of the structure and biosynthesis of bacterial lipopolysaccharides and glycoproteins, the major interacting molecules in most biological systems. The rapidly expanding fields of lectin and phytohemagglutinin research are reviewed and brought up to date in subsequent chapters. Separate chapters are devoted to glycoproteins from plant tissue and lipoglycopeptides in penicillin tissue. The rather extensive research that has taken place on plant glycoproteins in recent years becomes apparent on reading this book.

The bewildering variety of complex polysaccharides that comprise the plant cell wall do not constitute the static support system that is still presented in many texts. These macromolecules provide unique and specific interacting sites and play a complex regulatory role. The book should be a valuable addition to anyone wishing to bring himself up to date in this field that has so many potentially important economic and biological implications.

Philip Nordin, *Kansas State University*

Spectrometric Techniques. Volume II. Edited by G. A. Vanasse (Air Force Geophysics Laboratory). Academic Press, New York. 1981. xi + 303 pp. $43.00.

In terms of principles, techniques, and applications, spectroscopy is probably the most diverse and expansive of all scientific subdisciplines. The treatise under review consists of five chapters, three of which deal with specific aspects of Fourier transform spectroscopy, namely, first-order optical designs for spectrometers, distortions in Fourier spectra and their diagnoses, and effects of drive nonlinearities. The other two chapters are devoted to applications of tunable lasers in infrared spectroscopy and absolute photon counting techniques in the ultraviolet spectral region. Written by knowledgeable experts in the respective areas, the articles are essentially of review type based on materials gleaned mostly from the literature of the seventies. The stress in general has been on modern instrumental aspects along with mathematical principles and analyses involved as well as suitable applications wherever relevant.

Although presented serially in the first three chapters, the articles related with FTS are totally independent of one another. This is understandable in view of the specialized nature of the topics dealt with in great detail. Each of the three articles bears the mark of authoritative scientific writing, particularly in the manner in which the topics or items have been arranged. Although there are brief introductory discussions on interferometry, the reader expected to derive maximal benefit would be the one having a fair amount of fimiliarity with the principles of optics. In spite of the technical nature of the presentations, commendable efforts have been made in a few places to improve comprehensiveness. A specimen in this regard is as follows: "At a scale of the order of the wavelength of visible light, the entire world is in continuous motion. Fringe sampling stabilities of the order of one millifringe or about 6.3×10^{-9} m are required to achieve a good signal-to-noise ratio in the red. A block which appears rigid to the eye becomes a quivering block of jello when viewed with a system whose sensitivity is of the order of the wavelength of light." (Breckinridge and Schindler, p 81.)

Articles 4 and 5 on tunable lasers in IR spectroscopy and absolute UV photon counters, respectively, differ sharply in both contents and style from the above articles concerning FTS-related principles and designs. The former offers brief descriptions of various tunable laser sources that are currently available and the IR spectroscopic methods based on them. A large number of examples from the literature have been presented to illustrate the applications. A general reader with a minimal knowledge of laser operations would find reading this article very rewarding. The last article discusses specifically the operation of several types of photomultipliers and gas-flow counters as used for photon counting in the spectral region 30–3500 Å, including radiometric calibration of photon counters and light sources available for radiometric calibration (excluding synchrotron radiation). The presentation appears to be sufficiently exhaustive.

Overall, the book should prove to be very useful and informative to the spectroscopic community at large, applied physicists, analytical chemists, and students/researchers in the area of spectrometric instru-

mentation and design.

P. K. Das, *University of Notre Dame*

Oxygen and Oxy-Radicals in Chemistry and Biology. Edited by M. A. J. Rodgers and E. L. Powers (University of Texas at Austin). Academic Press, New York. 1981. xxx + 808 pp. $54.00.

This book presents papers contributed at the second Conference on Oxygen and Oxy-Radicals in Chemistry and Biology held in Austin, Texas, in 1980. This excellent conference attended by more than 160 of the most prominent scientists working in various areas of oxygen chemistry and its effects in biology covers a wide range of topics. The organization of this book is commendable in that up-to-date reviews of various important subjects form the basis of subsequent relevant current research topics. For example, a detailed article by Donald Sawyer and Edward Nanni, Jr., on Redox Chemistry of Dioxygen Species and Their Chemical Reactivity is found early in the book. This format makes this book useful to advanced students and beginning researchers as well as to those already actively performing research in these areas.

A detailed debate between Irwin Fridovich and James Fee on the role and toxicity of superoxide in cellular systems, followed by a panel discussion, clearly delineates and discusses the important issues in this hotly contested field. The questions of what superoxide can and cannot react with and the evidence for the possible role of superoxide dismutase are presented and discussed openly. Superoxide has been under intense research over the past 12 years and much has been learned about it and superoxide dismutases. However, their actual and direct metabolic role(s) have never been clearly demonstrated. Nevertheless, research has shown that oxygen toxicity can be mediated by some chemical events triggered or promoted by superoxide. Numerous papers in this volume document this as well as the possible role of superoxide dismutase in moderating these toxic effects.

Five papers are devoted to the singlet oxygen-"ene" reaction with olefins. Mechanistic considerations and numerous examples are discussed. These are important current contributions to this field. Numerous other subjects dealing with oxygen are also covered, although in less detail. Among them are included studies on (a) the chemistry of oxygen radicals including peroxy and phenoxy radicals, (b) the role of oxygen in cellular radiation effects, and (c) photochemistry involving oxygen.

This volume is an important work and will be useful to anyone wishing to sample some of the flavor of what ongoing research there is on the many aspects of oxygen chemistry. Subjects not covered in detail include oxygenases, oxygen binding molecules, respiratory systems, and peroxidases. However, these topics are amply covered in numerous other books. The subjects presented are timely and generally by the most appropriate authors.

David P. Ballou, *University of Michigan*

Drinking Water and Health. Volume 4. By the Safe Drinking Water Committee, Board on Toxicology and Environmental Health Hazards. National Academy Press, Washington, DC 1982. ix + 299 pp. $15.95.

This book will be of interest to anyone who is concerned about the quality of drinking water. It should be required reading for professionals working in areas of construction and maintenance of drinking water systems. Epidemiologists will also find it useful. Among the subjects covered are elements of public water supplies, chemical quality of water in the distribution system, biological quality of water in the distribution system, health implications of distribution system deficiencies, and the toxicity of inorganic and organic contaminants in drinking water. Extensive references and an index are included.

M. C. W. Smith, *Ann Arbor, Michigan*

Progress in Electrochemistry. Edited by D. A. J. Rand (CSIRO Division of Mineral Chemistry) and G. P. Power and I. M. Ritchie (University of Western Australia). Elsevier Scientific Publishing Company, Amsterdam and New York. 1981. xiv + 472 pp. $102.50.

"Progress in Electrochemistry" is the 15th in the series: "Studies in Physical and Theoretical Chemistry" and contains the proceedings of the Fifth Australian Electrochemistry Conference which was held in Perth, Australia, on August 18–22, 1980.

There are a total of 35 separate papers presented with an average length of about 13 pages each. The papers are divided into 8 chapters: The Bruno Breyer Memorial Lecture, The R. H. Stokes Lecture, Energy Conversion, Energy Storage, Metal Conservation, Mineral Processing and Electrometallurgy, Advances in Electroanalytical Techniques, and General Electrochemistry. The papers range from a general nature, such as The Energy Crisis: an electrochemical viewpoint, to specific papers, such as The Electrical Analogue of an n-SnO_2/NaOH/Pt Cell or The Corrosion of Dental Alloys in the Oral Environment.

The papers are limited in their scope and depth because of their length and the intent of the papers is subjective. Some of the papers are reviews, some are reviews of reviews, and some present new results. Many sections present optimistic overviews and justifications for entire areas of research which would be of general interest while other sections quickly focus on what are believed to be critical analysis of theory or results.

The book has a wide range of topics without completely covering any one particular area. Hence, the book is "must" reading for no one and yet there is bound to be something for everyone from high school to research specialist. At a price of $102.50, the book is only suited for large library collections of general usage.

Paul A. Kohl, *Bell Laboratories*

Hans Krebs, Reminiscences and Reflections. By Hans Krebs and Anne Martin. Oxford University Press, Oxford. 1981. 298 pp. $19.95.

We are fortunate that Hans Krebs was persuaded by the Oxford University Press to set down these reflections in what proved to be the final years of his life and not merely to publish, as he had first proposed, a collection of personal documents from his files—documents that now speak better to us through his efforts and Anne Martin's help to record the context in which they were written or received.

Krebs has I think succeeded in addressing a general audience in this autobiography. Even readers who must skip over the occasional sequences of structural formulas will follow and appreciate the clear and straightforward account of his work. Despite the tragedies of fear and prejudice that drove him from his native land, his testimony is rather how fortunate he himself was in life. By no means a weeping philosopher and at no pains to appear a universal scholar, he has achieved here a short autobiography that will stand as an important chapter in the history of science in our century. His appreciation to F. Gowland Hopkins and to England is abundantly stated. His leadership was rewarded by a remarkably loyal group of associates over astonishingly long time intervals, including his transfer from Sheffield to Oxford and subsequently from the Department of Biochemistry to that of Medicine at Oxford.

Krebs' greatest contributions as a biochemist are so classical and well known, the cycles of course, even the concept of the metabolic cycle, that it might now seem hard to present them other than clearly. Yet how they came about yields fascinating reading. To me it is remarkable how his interest in the whole organismal picture persisted throughout, during a time when biochemistry had provisionally sacrificed scope for reductionist triumphs.

Elements of his account that hold special interest include his personal story of the Nazi rise, of the international efforts to secure opportunities for refugee scientists, and of his struggle with ancient Oxford to secure equal opportunities for strong science researchers.

H. N. Christensen, *University of Michigan*

Terpenoids and Steroids. Volume 10. Senior Reporter J. R. Hanson (University of Sussex). The Royal Society of Chemistry, London. 1981. xi + 284 pp. $115.00 ($45.00 member's price).

The terpenoid literature for the period September 1978 to August (or November) 1979is covered with the comprehensiveness that one has come to expect of this excellent series. The customery chapter on monoterpenes is absent, with the resulting organization being the following. Part I: Chapter I, Sesquiterpenoids (reported by J. S. Roberts); Chapter II, Diterpenoids (by J. R. Hanson); Chapter III, Triterpenoids (by J. D. Connolly); and Chapter IV, Carotenoids and Polyterpenoids (by G. Britton). Par II: Steroids. Chapter I, Physical Methods (by D. N. Kird); Chapter II, Steroid Reactions and Partial Syntheses (by B. A. Marples). Spot checks of the original liteature reveal that the volume is essentially free of citation and structural trnascripiion errors. As has often been the case, the literature has been critically reviewed; what appears in the volume is not just a recitation of the published results of the period. Significant correlations and disagreements are noted and the reporters show good judgement with respect to the data and interpretations that are mentioned only peripherally or are considered as questionable. This feature and the comprehensiveness of the volume make it essential reading for all active terpenoid chemists even though the publication schedule results in more than a 16-month lag in coverage. With the continuing phenomenal rate of discovery and structure elucidation of sesquiterpenes this particular report continues to provide an essential service. This year's account includes a useful compilation of germacranolide structures. Since steroid synthesis and interconversion continues to be an active field the Steroid Reactions section provides an alternative view of the developments in synthesis methodology. The polyfunctional setting inherent in most steroid studies establishes which new methods have versatility and uncovers neighboring group participation and stereoelectronic factors that are not evident in the initial reports on new methods which utilize simple monofunctional examples.

This volume is an essential purchase for all chemistry libraries and well worth the members price for individual researchers in natural product

chemistry.

Niels H. Andersen, *University of Washington*

Lipid–Protein Interactions. Volumes 1 and 2. Edited by P. C. Jost and O. H. Griffith (University of Oregon). John Wiley and Sons, Inc., New York. 1982. Volume 1: xi + 338 pp. $75.00. Volume 2: xi + 307 pp. $70.00.

Since major advances have been made in the research of protein–lipid systems in the last decade, this first comprehensive series of reviews on structural and dynamic aspects of lipid–protein interactions is a very timely contribution.

Volume 1 examines in depth six water-soluble protein systems that contain specific binding sites or domains for lipid interactions. Some of these proteins have, in addition, the capacity to interact reversibly with lipid interfaces. Chapter 1 by B. W. Matthews describes the high-resolution three-dimensional structure of a chlorophyll binding protein in which seven phytol chains are localized in the interior of the folded protein shell. In Chapter 2, J. R. Brown and P. Shockley review the amino acid sequence of serum albumin and propose three-dimensional models that include fatty acid and other ligand binding sites. In Chapter 3, J. J. Volwerk and G. H. de Haas examine the properties of pancreatic phospholipase A_2 as a model for other lipolytic enzymes. Chapter 4 by K. W. A. Wirtz describes the intracellular phospholipid transport proteins, their use as membrane probes, and their possible physiological roles. L. J. Banaszak, J. M. Ross, and R. F. Wrenn, in Chapter 5, review the three-dimensional structure of a yolk lipoprotein, lipovitellin, which contains phospholipid domains. In Chapter 6, A. M. Scanu, C. Edelstein, and B. W. Shen describe the general properties of serum lipoproteins, particularly the high-density class, and detail the interactions of isolated apolipoproteins with lipids.

Volume 2 is dedicated mainly to the review of membrane-bound proteins. With the exception of the myelin membrane system described in Chapter 1 by J. M. Boggs, M. A. Moscarello, and D. Papahadjopoulos, the emphasis in this volume is on methodology as applied to a variety of integral membrane proteins. In Chapter 2, D. Marsh and A. Watts discuss the applications of spin probes in the investigation of lipid–protein interactions. Chapter 3, by J. Seelig, A. Seelig, and L. Tamm, is dedicated to the use of NMR methods. Chapter 4, by R. J. Robson, R. Radhakrishnan, A. H. Ross, Y. Takagaki, and H. G. Khorana, describes the synthesis and applications of photochemical cross-linking probes in studies of lipid–protein interactions. J. A. Reynolds reviews the interactions between proteins and amphiphiles by equilibrium binding methods in Chapter 5. Chapter 6, by O. H. Griffith, J. R. Brotherus, and P. C. Jost, describes the measurement of binding parameters for lipid–protein interactions in membranes using spin-label data. Several of the chapters in Volume 2 have appendices with information on synthetic and analytical methods. Chapter 7 by J. R. Silvius is a compendium of thermotropic phase transition data for phospholipid bilayers in the absence and in the presence of interacting proteins.

The careful selection of topics in these two volumes covers the majority of lipid–protein interaction modes recognized to date, in a logical progression from soluble proteins with a limited number of binding sites for lipids, to lipoproteins which are lipid micelles solubilized by protein, to integral membrane proteins immersed in lipid bilayers. Each system or method has been reviewed in depth by leading experts, in well-organized chapters with numerous tables, illustrations, extensive references, and sometimes appendices. The result is an excellent book that will be very useful to experts as a reference, and to those entering this general field of research, as a comprehensive overview of current knowledge. Even some didactic use of this book can be anticipated.

Ana Jonas, *University of Illinois, Urbana*

Structural Crystallography in Chemistry and Biology. By J. P. Glusker (Institute for Cancer Research). Academic Press, Inc., New York. 1981. xviii + 421 pp. $50.00.

This book is part of a series of benchmark papers in physical and chemical physics. It contains a collection of 61 papers from 1912 to the present, covering the field of crystal structure analysis using X-ray and neutron diffraction as well as electron microscopy. Most are complete reproductions of the original papers, though some have parts that have been deleted and others shortened by the authors. The papers were chosen by the editor "so as to describe the power of this method (i.e., crystallography) in the understanding of science rather than delving into the technical details of the method".

The book is divided into four parts and each part is comprised of several sections, prefaced by a brief editorial comment, followed by one or more closely related papers. It also contains a short introduction written by the editor. The four major parts are as follows.

(a) Early History of Structure Determination by Diffraction: This part covers the period from 1912 to 1923. It includes an historical introduction by von Laue, kinematic theory of diffraction, dynamical theory of diffraction, and a collection of four early structural determinations.

(b) Methods of Determining the Structure from the Measured Diffraction Pattern: The section includes papers from 1943 to 1966, with an original article written by J. A. Prins specifically for this book. There are six subsections that cover optical analogues, the Patterson synthesis and its application, isomorphous replacement methods, direct methods of phase determination, anomalous dispersion, and structural refinement.

(c) The Role of X-ray Structure Determination in Chemistry: This part shows mainly the many problems in chemistry in which this method has been successfully applied; it also contains some papers on neutron diffraction and on electron microscopy.

(d) The Role of X-ray Structure Determination in Biochemistry and Biology: This section shows the many applications and the success this method has had in biochemistry and biology and could just as well have been entitled Macromolecular Crystallography, since all the papers included are on the structure of macromolecules or on the biological implications of the knowledge of such structure.

This volume is more than just a collection of papers. In the introduction, as well as in the editorial comments, Dr. Glusker tries to give the reader an understanding of the physical phenomena which form the basis for this technique, the various methods developed for the analysis, the historical significance of each paper, and the role each played in the evolution of a clearly powerful analytical method. She achieves this in clear and understandable language that is neither too technical nor jargon-bound.

In considering which papers to include, the editors chose those that in most cases opened up more vistas. Clearly this task is formidable when one considers the vastness of the crytallographic literature. Still, there are some areas that the reviewer feels could have been incuded, such as molecular replacement methods which are more commonly being used in protein work and which could have been included in the section on Patterson methods. The editor could perhaps have included only one, rather than two papers on the structure of t-RNA, since they both described the same species. Nevertheless, the collection of papers found in this volume does in fact achieve the rational for the book and help crystallographers become more aware of their rich heritage.

Jaime E. Abola, *University of Pittsburgh*

Chlorine Dioxide. By W. J. Masschelein (Brussels Intercommunal Water Co.); edited by R. G. Rice (Jacobs Engineering Group). Ann Arbor Science Publishers, P.O. Box 1425, Ann Arbor, MI. 1979. ix + 190 pp. $27.00.

This work is a systematic review of chlorine dioxide, with chapters on laboratory and industrial preparation, structure, properties, thermal and photolytic decomposition, reactions (including those with organic compounds), analysis and detection, and industrial applications. The point of view is pragmatic, with a concern for applications and environmental implications of its use, especially as a substitute for chlorine in purification of water.

Mixing and Excess Thermodynamic Properties: A Literature Source Book. Supplement 1. By J. Wisniak and A. Tamir (Ben Gurion University of the Negev). Elsevier Scientific Publishing Co., New York and Amsterdam. 1982. x + 724 pp. $151.00.

This is the first supplement to the work published in 1978, and it covers the literature that appeared between 1977 and 1981. Like the original work, it consists entirely of tables, reproduced in computer printout form. The entries are arranged by formula index and give only the reference numbers. The references themselves are collected at the end; they number no less than 2519! As an organized source of reference, this volume is obviously a valuable resource.

Photochemistry. Volume 12. Edited by D. Bryce-Smith (University of Reading). The Royal Society of Chemistry, London, England. 1982. xiii + 587 pp. $70.00.

This annual review surveys literature published from July 1979 to June 1980. Chapters include Photophysical Processes in Condensed Phases by R. B. Cundall and M. W. Jones; Gas Phase Photoprocesses by G. Hancock; The Photochemistry of Transition-metal Complexes by A. Cox; The Photochemistry of Transition-metal Organometallic Compounds, Carbonyls and Low-oxidation State Compounds by J. M. Kelly and C. Long; Photochemistry of Compounds of the Main Group Elements by J. M. Kelly and C. Long; Photolysis of Carbonyl Compounds by W. M. Horspool; Errone Cycloadditions and Reordonzements: Photoreactions of Dienes and Quinones by W. M. Horspool; Photochemistry of Olefins, Acetylenes and Related Compounds by W. M. Horspool; Photochemistry of Aromatic Compounds by J. D. Coyle, Photoreduction and Oxidation by A. Cox; Photoreactions of Compounds Containing Heteroatoms Other

than Oxygen by S. T. Reid; Photoelimination by S. T. Reid; Polymer Photochemistry by N. S. Allen; and Photochemical Aspects of Solar Energy Conversion by L. W. Peter.

The coverage of this volume, like others in the series, is extremely broad. The thoroughness of the individual sections is superb, however, and the volume reviews about 3600 individual papers and many more patent citations as well. Literature results are generally cited in a single sentence and little room exists for analysis or critical comment. Nevertheless, this volume is well worth the price for professionals in photochemistry and is a must for librarys. It is the most thorough general literature review in photochemistry, and likely the only such review available.

D. C. Neckers, *Bowling Green State University*

Chemie der Pflanzenschutz—und Schädlingsbekämpfungsmittel. Volume 8. Edited by R. Wegler. Springer-Verlag, Heidleberg and New York. 1982. vii + 455 pp. DM 248 (ca. $115.00).

The subtitle for this volume is "Special Chemistry of Herbicides. Applications and Mechanisms". The first two chapters are in English: Phenoxyphenoxypropionic Acid Derivatives and Related Compounds (H. J. Nestler) and Wild Oat Herbicides (E. Haddock and R. G. Turner). The remaining chapter, which constitutes nine-tenths of the volume, is a schematic review of patents on new herbicides, a continuation of the review that appeared in Volume 5. The text part of the review occupies 72 pages; it is in German, but so abundantly supplied with structural formulas that there should be little barrier to understanding for those whose German is feeble. The rest of the chapter is a tabulation of patents from 1976 to November 1980. The entries consist of structural formulas, patent numbers, and assignees, with an occasional phrase of amplification, such as "Sekektiv gegen Gräser". There is a subject index for this volume alone, allowing it to be used independently.

Critical Stability Constants. Volume 5. First Supplement. By A. E. Martell and R. M. Smith (Texas A&M University). Plenum Press, New York and London. 1982. xvii + 604 pp. $69.50.

This volume is a compilation of equilibrium constants in which published values have been compared critically and those of greatest reliability selected. The reactions concerned are protonation or formation of complexes with metal ions. The substances covered are mostly organic, and include all varieties of nitrogen, oxygen, sulfur, and phosphorous compounds, but a 32-page section is devoted to inorganic species, from hydroxide ion to iodic acid. The tables give values for log K, ΔH, and ΔS and the references. Data through 1979 are included. Arrangement is by structural type (i.e., "amines", "carboxylic acids", etc.). (There is an unfortunate choice of name for one section, which is headed "Azines", but in fact includes no azines, which are hydrazine derivatives of aldehydes and ketones, but instead is concerned with six-membered rings containing nitrogen.) This should be a very useful work, much more so than the sometimes frustrating compilations that report collections of widely divergent values without evaluation.

Structure and Bonding in Crystals. Edited by M. O'Keeffe and A. Navrotsky (Arizona State University). Academic Press, New York. 1981. xviii + 327 pp. $48.00.

This volume and its companion, Volume 2, are the outcome of a meeting sponsored by NSF and the Center for Solid State Science, Arizona State University, at which solid state physicists, chemists, metallurgists, and geochemists presented some 26 papers of common interest (Volume 1 contains the first 13 papers). As the Editors state in the Preface: "... the papers presented reflect the renaissance in interest in structure and bonding in solids which has taken place since Pauling's "Nature of the Chemical Bond". The first paper is by Pauling, but this is mainly reminiscences about early efforts by himself and his associates to solve crystal structures; structural theory as such is not discussed. [His account of protein structure determination has been exorcized by the Editors, presumably for straying too far into foreign territory!]

A potential hazard of "conference proceedings" is that a group of contributors, loosely allied by common interests, plow their own fields largely without reference to other contributors. It is thus a pleasure to see that here most authors relate their own topics to those of other contributors and also, at every opportunity, put the subject in perspective.

The sequence of papers is, roughly, from the ab initio, quantum mechanical, through the semiempirical to the empirical. The most significant advance since Pauling has been the advent of pseudopotential theory, pseudopotentials being those felt by the valence electrons in a solid. (The core electrons are considered unaffected by chemical bonding.) Papers 2 through 5 deal with this topic (2, J. C. Phillips; 3, Marvin L. Cohen; 4, A. N. Bloch and G. C. Schatteman; 5, A. Zunger). Pseudopotential theory has yielded a rich crop of results in structure theory and a useful set of transferrable parameters ("core" and "orbital" radii) to correlate with crystal structure, heat of formation, band structure, dielectric properties, electron density, and electronegativity.

Following two papers concerned with semiempirical calculations (6, W. A. Harrison; 7, L. Brewer) there are two devoted to more specialized problems: the disiloxy group (8, M. D. Newton) and length and angle variations in minerals (other inorganic solids are briefly considered; 9, G. V. Gibbs, E. P. Meagher, M. D. Newton, and D. K. Swanson). These two papers, which will be of considerable interest to geochemists, could profitably have been given as one, since the approach, notation, etc. is the same in both. In paper 8 there is a minor lapse from the otherwise excellent cross-referencing in this volume. Reference should specifically have been made to paper 10 which deals at length with nonbonded Si···Si interactions in the disiloxy group. [The authors of paper 10, M. O'Keeffe and B. G. Hyde, are cited in a 1978 reference; there is another citation, O'Keeffe et al., 1980, but this is missing from the list of references.]

Paper 11 [J. K. Burdett] follows the Woodward–Hofmann approach to symmetry, orbital overlap, and perturbation theory, which will be familiar to readers of his monograph, "Molecular Shapes". Paper 12 on charge density (R. F. Stewart and M. A. Spackman) treats an aspect of solid-state theory and practice which could not usefully have been discussed by Pauling 40 years ago. The advent of accurate X-ray and neutron-scattering measurements has made this possible. This paper gives a good perspective of the current position and dire warnings about paying undue regard to density maps "which appeal to our fantasies". (It is a pity that a line or so of print is missing on p 280, just where symbols are being defined.)

The last paper (13, M. O'Keeffe) critically reviews the "ionic" model to explain crystal structure. It is shown how this model can be good at explaining lattice energies but has poor crystal-structure predictive value.

This volume illustrates well a dilemma permeating much of current physical and chemical theory: are we to pursue highly detailed, accurate (and expensive) calculations for each individual case of interest, thus loosing generality, or are we to pursue more approximate but more widely applicable methods? Doubtless both lines will continue to be pursued. But clearly, structure and bonding in crystals is going to be a daunting assignment for anyone contemplating writing a successor to The Nature of the Chemical Bond.

S. C. Nyburg, *University of Toronto*