Book Reviews*

Ion–Molecule Reactions. Parts I and II. Edited by J. L. Franklin. Dowden, Hutchinson and Ross, Inc., Stroudsburg, PA. 1979. Part I: 399 pp. Part II: 378 pp. $59.00 each; $109.00 a pair.

These two books, focussing on the rapidly growing field of ion–molecule reactions, are part of the Benchmark Series in Physical Chemistry and Chemical Physics which is designed to "make accessible to the reader the highlights of the evolution of the field by presenting carefully selected significant publications that have led to the development of the various disciplines along with a critical evaluation of the significance of the various papers". Franklin has masterfully accomplished this goal in two volumes, which have been divided into investigations of (1) the nature of the collisions and reactions of ions with molecules and (2) the effects of elevated pressures and/or long reaction times on ion–molecule chemistry. Each book consists of 41 key papers in the area which provide a balanced and reasonably complete summary of the field. Of particular value are the editorial comments provided by Franklin throughout both volumes which bring a perspective of the work indicative of his 25 active years in the field, as well as emphasize the excitement in the area. The books will not only be a valuable source for experts and appropriate as textbooks for a course on the subject, but they will also provide the uninitiated with a good overview of the history and future of this current and vital field.

B. S. Freiser, *Purdue University*

Geometrical and Structural Crystallography. By Joseph V. Smith (University of Chicago). John Wiley & Sons, New York. 1982. xii + 450 pp. $30.50.

Professor Smith finds magic in the geometrical designs of mineral structures. For example: "I find the spinel structure to be a beautiful and elegant solution to the packing of an MT_2O_4 compound"; "The neatness of the ways in which atoms and molecules fit together can help to provide assurance that there is some sense to this world". He wishes to share the magic, and the result is this book: a painstakingly detailed description of structural motifs and of the space group concepts that govern them. It is designed as a textbook, with numerous excercises at the end of each chapter; however, there is far more detail than most courses in crystallographic mineralogy would find appropriate. For example, of the 235 exercises, at least 204 ask the reader to construct models, either two or three dimensional. If one were to complete all the exercises, he would have a large museum of mineral structures.

The book is based entirely on structural results; there is no discussion of experimental techniques. No mathematics beyond trigonometry is needed, although there are a few vector manipulations. Space groups are developed in a rather haphazard fashion, as accompaniments to descriptions of structural motifs; band groups, rod groups, and antisymmetrical space groups are also discussed. Chemists will surely cringe to find the carbonate ion described, with only minor apology, as three O^{2-} ions of radius 1.35 Å surrounding a C^{4+} ion of radius −0.08 Å. But mineralogists who are interested in fully understanding the features and principles of crystallography, and who are willing to "use their leisure to read this book instead of solving mathematical games or crossword puzzles", will find it a delight. The formula for appreciating it can be abstracted from a quotation from the preface: "Most geometrical exercises require only paper, cardboard, drawing instruments, and some balls".

Richard E. Marsh, *California Institute of Technology*

Relativistic Effects in Atoms, Molecules, and Solids. Edited by G. L. Malli (Simon Fraser University). Plenum Press, New York. 1983. x + 543 pp. $69.50.

This book consists of the proceedings of the NATO Advanced Institute on Relativistic Effects in Atoms, Molecules, and Solids held in 1981 at the University of British Columbia. According to the preface, the 19 articles in this book represent the main invited lectures by experts in the various areas of research covered by this Advanced Study Institute. These articles occupy 500 pages. Twenty-six pages are devoted to abstracts of contributed papers and a list of the participants. In addition, there is a 17-page index.

The areas of research represented include the formal theory of relativistic effects in many-electron systems, calculations of relativistic effects in atomic physics, relativistic effects in solid-state physics, and the effects of relativity on molecular structure. The book begins with an article by Joseph Sucher on the foundations of the relativistic quantum theory for many-electron systems, including a discussion of the "Brown–Ravenhall disease".

The contributions of greatest interest to chemists are most likely to be those concerned with the influence of relativistic effects in molecules. Relativistic self-consistent field theory for molecules is treated in articles by J. H. Detrich and C. C. J. Roothaan, by G. L. Malli, and by J. P. Desclaux. The application of relativistic effective core potentials to calculations of molecular structure and spectra is treated in articles by P. J. Hay and K. S. Pitzer, and T. Ziegler presents results based on the relativistic Hartree–Fock–Slater approximation. The roll of relativistic effects in solid-state physics is presented by D. D. Koelling and A. H. MacDonald.

The articles which are concerned with the influence of relativistic effects in molecules tend to emphasize the contributions of relativistic effects to molecular geometries and the energies of electronic states. Very little is to be found on the relativistic effects on molecular spectra and dynamics. Some topics, such as the relativistic random phase approximation and relativistic effects in semiempirical theories of molecular structure, are mentioned only in the abstracts of contributed papers.

The pages of this book were reproduced directly from the manuscripts submitted by the authors. In two of the articles, the mathematical equations have been written with a heavy hand. In most cases, however, the manuscripts have been well prepared.

This book and the NATO Advanced Study Institute it represents reflect the growing awareness of the contributions of relativistic effects to molecular structure. Research in this area is advancing rapidly, and portions of this book are already out of date. Nevertheless, this book contains much information which may be helpful to a chemist who wants to know what are the relativistic effects in molecules, how important are these effects, and how can they be treated.

William L. Luken, *Mississippi State University*

Rodd's Chemistry of Carbon Compounds. 2nd Edition. Supplement to Volume I, Part E. Edited by M. F. Ansell. Elsevier Scientific Publishing Co., Amsterdam and New York. 1983. xvi + 510 pp. $130.75 (Dfl 340.00).

In the nearly 20 years since the publication of Volume I, so much water has flowed over the dam that supplements are not only justified but urgently needed. The present volume contains supplements to Unsaturated Acyclic Hydrocarbons (Chapter 2), by D. R. Taylor, Trihydric Alcohols (Chapters 18, 19, and 20), by B. J. Coffin, and Phospholipides and Glycolipds (Chapter 21), by R. H. Gigg. The succinct style of the original work has been maintained, with references incorporated in the text, enough critical discussion to facilitate the flow of ideas, and substantial supply of equations and structures. The treatment is useful to the specialist, but not so abstruse as to exclude the non-specialist who wishes to keep abreast of related fields. The contributions fulfill their purpose well, but it would have been helpful if they had contained a statement of the termination date of the literature coverage.

Like the previous supplementary volumes, this one has been prepared by direct reproduction of the authors' typescripts. The editor states that he is "confident that readers will find this presentation acceptable", but that confidence is not well founded. The resulting book is unnecessarily ugly and is not suitable to be part of a major reference work. Three different typefaces are used in the body of the text, and the index is printed in a fourth one. In these days of wide availability of typewriters with interchangeable type elements, it would have been almost effortless to specify that the three contributors use the same type. Furthermore, in the major part of the volume, all the non-standard characters, such as Greek letters, have simply been handwritten, with a blunt, heavy hand. Structural formulas have been handled differently from author to author, and a large proportion of them have been drawn with fuzzy, even blotted, lines and imprecise placing of symbols and bonds, resulting in a quality that would not be acceptable in journals, such as *Tetrahedron Letters*, for example, that also reproduce manuscripts directly from typescript. These shortcomings seem to be more the result of insufficient editorial control rather than any saving of costs. They principally affect the esthetics and elegance of the presentation, but in a number of cases, the chemical meaning is also interfered with.

There is a thorough index, but it is rendered less useful by the fact that the numerous names of compounds are entered in uninverted form, with erratic, non-alphabetic ordering of substituents (e.g., "2,2-Dimethyl-4-

*Unsigned book reviews are by the Book Review Editor.

methoxy-4-(2,5-dichlorophenyl)-1,3-dioxolane" instead of "1,3-Dioxolane, 4-(2,5-dichlorophenyl)-2,2-dimethyl-4-methoxy").

The Strength and Stiffness of Polymers. Edited by A. E. Zachariades (IBM-San Jose) and R. S. Porter (University of Massachusetts). Marcel Dekker, Inc, New York. 1983. x + 382 pp. $55.00.

The main theme of this book is the preparation, processing, characterization, and utilization of high-strength thermally-stable polymeric materials, particularly in the form of fibers. The desired properties mentioned require that the polymer chains making up the material be highly extended and well aligned into densely packed structures that are either crystalline or liquid-crystalline. In the case of conventional, flexible polymer chains, this can be achieved rather simply by solid-state extrusion or drawing, or by crystallization from highly sheared solutions. The shortcoming of these materials is their relatively low melting points, which result from the relatively high entropy of fusion associated with chains of this type. The alternative technique uses polymer chains of such high intrinsic rigidity that they have unusually high melting points and spontaneously align into the desired anisotropic phases. The molecular rigidity is generally obtained from aromatic structures, which has the advantage of giving excellent thermal stability. These materials, however, have the disadvantage of intractability; most cannot be melt-processed and their rigidity so suppresses the entropy of mixing that they resist dissolution in almost all common solvents. Nonetheless, both of these techniques are extremely useful and are covered in great detail in the present volume.

The book consists of nine chapters: Solid-State Extrusion of Thermoplastics; Polyethylene and Poly(Ethylene Terephthalate) Fibers Prepared by Flow Crystallization in Convergent Die Geometry; Mechanical and Transport Properties of Drawn Semicrystalline Polymers; Ultradrawing of Semicrystalline Polymers—Morphological Changes and Mechanical Properties; Rheo-Optical Studies on Alpha and Beta Mechanical Dispersions of High-Density Polyethylene; The Strophon Theory of Deformation of Glassy Amorphous Polymers—Application to Small Deformations; Structure and Properties of Aromatic Polyesters of *p*-Hydroxybenzoic Acid; Aramid Fibers—Structure, Properties and Applications; and Structure–Property Relations in Poly(*p*-phenylene benzobisthiazole) Fibers. There is a very brief subject index but no author index.

Most of the articles are well written, informative, and provocative. It is therefore a pleasure to recommend them to anyone interested in high-performance polymeric materials.

J. E. Mark, *University of Cincinnati*

Biosynthesis of Indole Alkaloids. By Atta-ur-Rahman and A. Basha. Clarendon Press/Oxford University Press, New York. 1983. 270 pp. $49.00.

Iff you want to find out what has been done in the field of indole alkaloid biosynthesis, this is the book for you. All types of indole alkaloids are covered in a seven-chapter review that is comprehensive, detailed, and relatively up to date (references into 1981). Two further chapters, which amount to appendices, tabulate incorporation data (alkaloid/precursor/organism/incorporation/reference) and the distribution of the alkaloids (by type) in nature. The last of these was, to this reviewer, the least satisfactory section of the book and could have been made much more informative. However, this is largely peripheral to the main thrust of the discourse. The book is in general well produced (including an adequate subject index) and, with the proviso noted at the outset, is recommended for personal or institutional libraries.

M. H. Benn, *University of Calgary*

Horizons in Biochemistry and Biophysics. Volume 6. Hormone Receptors. Edited by L. D. Kohn. John Wiley and Sons, New York. 1982. xi + 392 pp. $67.95.

This volume comprises 15 chapters, each by different author(s) active in the field. The authors of the first chapter utilize the thyrotropin receptor as a vehicle for introduction of concepts of modern receptor theory and for providing insights into problems attendant to biochemical/biophysical study of in vivo receptors. This well-written chapter provides much food for thought for chemists, biochemists, biologists, and others involved in receptor research.

Topics included in subsequent chapters are the following: steady-state relations between hormone binding and elicited response; monoclonal antibodies in receptor research; biosynthesis of membrane proteins; membrane lipids; interferon purification and characterization; mechanisms of action of interferons; synthetic inducers of interferons; carbohydrates and receptor recognition; receptor mediated alteration in membrane potential and internal pH; aspects of receptor-related calcium transport; and GTP-dependent stimulation and inhibition of adenylate cyclase. These topics seem appropriate selections from a very wide field. The narrative material provides a review of the topic plus considerable comment and evaluation by the authors, which is frequently thought provoking.

Overall, the chapters are well written and timely. The literature through 1980 is included in most chapters. Only a few examples of inadequate proof reading were noted.

The volume is recommended especially for biochemists and medicinal chemists involved in drug design. It should be of interest to others involved in the study of hormone physiology.

Joseph G. Cannon, *The University of Iowa*

Heat-Resistant Polymers—Technologically Useful Materials. By J. P. Critchley, G. J. Knight, and W. W. Wright (Royal Aircraft Establishment). Plenum Press, New York. 1983. xiv + 462 pp. $59.50.

This welcome book has nine chapters which cover common (thermosets and silicones) and uncommon, commercially available, thermally stable polymers. The introductory chapter is an excellent presentation of need, structures, and thermal stability criteria. The last chapter discusses several materials and ideas that have promise for commercial exploitation.

In general this book is a much needed guide for the applications chemist and engineer and provides a valuable practical perspective; yet there is a wealth of information on historical background and synthesis for the basic research chemist.

Polymers included by chapter are thermosets, fluorine-containing polymers, aromatic rings in backbones, heterocyclic rings in the chain, silicones, carboranes, and phosphazenes. Some rather pedestrian materials are included which are of marginal interest to such a work: phenol–formaldehyde resins, melamine–formaldehyde resins, polyesters (non-aromatic), epoxy resins, furan resins, vinyl esters, and silicones. Other materials that were not included or which could have been given more coverage were the following: aramids, polyphenylene oxides, and polyphenylene sulfides (owing to the rather strong interest, especially European, and many fabricated parts available now). These minor weaknesses certainly do not detract from the value of the book. Especially noteworthy for thoroughness are the chapters on fluorine-containing polymers and heterocyclic rings (imides and benzimidazoles) in the chain.

The organization of the chapters makes the book easy to use and adds greatly to its utility. Generally, each chapter includes sections on historical development, synthesis, elevated temperature properties, fabrication, physical characterization, and formulation. Additional strong points in each topic are the many graphs, data tables, and details of formulations and effects of composition on performance.

A helpful comprehensive trade name index is included, but company names are not in this index. An author index would have been welcome also.

In summary, this is a very thorough and comprehensive book, valuable for the academic or industrial chemist or engineer who is at all interested in modern polymer development or application.

Patrick E. Cassidy, *Southwest Texas State University*

Quantum Chemistry. By Donald A. McQuarrie (University of California, Davis). University Science Books, Mill Valley, CA. 1983. x + 517 pp. $25.00.

The teaching of quantum chemistry exerts substantial demands on both students and professor. The subject matter demands a level of mathematical sophistication rarely found in the average chemistry student. Many students not only are unknowledgeable of but also are intimidated by mathematics. The year or three semesters of calculus which chemistry students study is very often the *only* mathematics most chemists ever encounter. By the time an undergraduate student begins study of quantum chemistry in the junior or senior year, his or her skills will be rusty from lack of use. The professor must attempt to teach the physics and chemistry while also reviewing the calculus and introducing those topics in differential equations, probability, and linear algebra and matrices needed to discuss the subject adequately.

McQuarrie's text recognizes these problems and deals with them early. The needed mathematics is developed as required. For instance, the chapter on the classical wave equation is a valuable addition to the usual sequence of topics in quantum chemistry; it is included in just the right place. The fact that the mathematics is developed as needed does not absolve the student from effort. Fortunately, there are many examples and problem exercises for the student to work on and study.

The historical photographs are a pleasant feature. Their inclusion shows that the physics and mathematics are the results of human endeavor.

The text has a liberal distribution of solved examples that are integrated into the discussion. Students should find them of value. The tables and formulae are printed in the inside covers both front and back.

The section titles are complete sentences thereby establishing the main learning objective of the section quite explicitly.

The focus of the text is on basic principles with emphasis on model systems and atoms and small molecules. If the professor wished to emphasize applications involving larger molecules, e.g., Hueckel theory, semi-empirical methods, etc., this would not be the appropriate text.

If I were to use this text, I would probably not need to lecture much. The theoretical development is all in the book, and it is written very well. I would probably use class time to discuss problems that amplify and extend the development in the text. Problems at the end of the chapter that perform precisely those tasks are clearly indicated in the discussion.

The problems at the end of the chapters can also be used for presenting new topics such as symmetry properties of particle-in-a-box solutions, angular momentum commutation relations, the quantum mechanical virial theorem, the hydrogen-like ion wave functions, perturbation theory through second order, the perturbation theory study of the helium atom, and the Born–Oppenheimer approximation. Assignment of these problems to students will require that the students exercise imagination, initiative, and library skills (since all of these problems have been solved in other texts or reviews). The problems provide excellent learning opportunities.

The price of the text is remarkably low. Since the market for texts in quantum chemistry is not large, it is surprising that the publishers could produce and sell a hard-bound text for the price asked. This text is a bargain in more ways than one.

Anthony J. Duben, *Southeast Missouri State University*

Electrochemistry: A Reformulation of the Basic Principles. By H. G. Hertz (University of Karlsruhe). Springer-Verlag, New York. 1980. x + 254 pp. $24.80.

This volume exemplifies very well the intended prupose of the "Lecture Notes in Chemistry" series, of which it forms part. It presents a new angle on the classical field of electrolyte solutions. The treatment presented is more general than the classical one and is able to predict the correct answers to most problems in electrochemistry and to give physical explanations to some problems where the classical theory fails, such as the effectiveness of the salt bridge. The book is divided into 13 chapters, the first 7 devoted to the development of the new theory and the last 6 to applications of the model to specific situations. Although written in a rigorous mathematical way (a total of 400 equations appear sequentially), it is not difficult to follow. However, it is clearly not intended for general audiences and is primarily written for people concerned with rigorous theoretical treatment of electrolyte solutions and for those involved in the most basic aspects of electrochemical theory.

The new treatment starts with a description of multicomponent electrolyte solutions under equilibrium and nonequilibrium situations. Diffusion is introduced in Chapter 2 and later described in the presence of an electric current in Chapter 3. The resulting equations for the excess mass fluxes in the presence of an electric current define the + and − signs which characterize the two classes of constituents present in all electrolyte solutions and normally associated with charged ions in the conventional theory. The treatment presented here is more general and obviates the need to define the concept of ions. Electrical charge and electrical field have no fundamental significance in the present treatment and consequently are not used.

After a discussion of the diffusion processes at the electrode in Chapter 5 and energy changes in Chapter 6, a comparison between the conventional treatment of electrolyte diffusion and the one developed is given in Chapter 7. This comparison is extended to Chapter 8, where the electromotive force of a galvanic cell is presented. In Chapters 9–13 the theory is applied to various galvanic cells and to the problem of the salt bridge. In all cases the method is shown to yield the results that are known from experiments and/or from classical theory.

Luis Echegoyen, *University of Miami*

Progress in Inorganic Chemistry. An Appreciation of Henry Taube. Volume 30. Edited by S. J. Lippard (Massachusetts Institute of Technology). John Wiley and Sons, Inc., New York. 1983. xii + 528 pp. $65.00.

The publication of this volume could not have been better timed. Devoting a volume of this series to show an appreciation of Henry Taube's work and influence on inorganic chemistry is in itself a great tribute to a great chemist. But to have this volume appear at the same time as the announcement of Professor Taube's selection as the recipient of the 1983 Nobel Prize in chemistry is an outstanding coincidence. The foundations for much of the work described by the nine reviews in this volume were laid by Henry Taube, and thus the volume shows clearly why he was so honored.

Electron-transfer reactions are treated specifically in five of the reviews. A. Haim provides an overview of the mechanisms of electron-transfer reactions from their initial conception in the early work of Professor Taube to the present (1982), treating in detail the activated bridge complex. The theoretical aspects of electron-transfer reactions are discussed by N. Sutin. Inner- and outer-sphere electron-transfer processes are compared in the chapter by J. F. Endicott, K. Kumar, T. Ramasami, and F. P. Rotzinger. C. Creutz considers the relationship of the mixed valence complexes to the electron-transfer process, while T. J. Meyer relates the electron-transfer process with the photochemical process.

The other chapters include one by P. C. Ford, D. Wink, and J. Dibenedetto on the photosubstitution and photoisomerization of d^6 complexes. J. H. Espenson in his review of the reactivity of organochromium complexes and J. P. Hunt and H. L. Friedman in their review of aquo metal complexes point out Professor Taube's early contributions to each of these areas. E. Deutsch, K. Libson, S. Jurisson, and L. F. Lindoy provide a unique chapter on the chemistry of technetium and technetium radio-pharmaceuticals.

The editor is to be congratulated for having arranged for the dedication of this 30th volume in this distinguished series and for selecting the authors to be included in it. Each chapter is well-written and each gives a clear, concise overview of the subject. This volume by its quality shows the esteem that the authors hold for Professor Taube.

James C. Fanning, *Clemson University*

Polymer Degradation. Principles and Practical Applications. By Wolfram Schnabel (Hahn-Meitner-Institut, Berlin). Hanser International, Munich, and Macmillan Publishing Co., New York. 1981. 227 pp. $32.00.

Schnabel's book is a well-organized, commented, exhaustive review of the literature on polymer degradation through 1979. There are 577 references.

After the introductory chapter the book is organized into chapters according to degradation modes. These are as follows: thermal, including heat effects in biopolymers; mechanical, including ultrasonic and stress induced disruption; photochemical, especially ultraviolet initiated photooxidation but including also degradation by high-energy radiation; biological, including enzymatic and microbial modes; and finally, chemical degradation by solvolysis, reactions of olefinic bonds, reaction with atmospheric oxygen, and ionic processes.

Useful applications of degradation reactions are covered in the appropriate chapters. For example, there are references to papers on and reviews of the use of electron beam and synchrotron radiation to make resist masks such as those used to produce integrated circuits. Among other applications briefly discussed are synthesis of biodegradable polymers, surface modification in plasmas, laser pyrolysis, and synthesis of polymers with predictable lifetimes.

Although the jacket states that the book is based on a lecture course, it is not a textbook in the traditional sense. There is only meager explanatory detail, and there are no suggested exercises or problems for the reader.

The printing, illustrations, and layout are of the highest quality.

The book can be recommended as a thorough review and entry point to the literature.

Newton C. Fawcett, *University of Southern Mississippi*

Survey of Drug Research in Immunologic Disease. Volume 1. Aliphatic Derivatives. Volume 2. Noncondensed Aromatic Derivatives (Part 1). By V. St. Georgiev (Rochester, NY) and S. Karger (Basel). Series Editor: V. St. Georgiev. 1983. Volume 1: x + 542 pp. $293.50. Volume 2: xii + 656 pp. $293.50.

The publisher describes these volumes as the first and second of a projected multivolume reference work for consolidating and organizing the extensive accumulated drug research relevant to diseases of immunological origin. These comprehensive volumes represent a review of the past 20 years' literature—a review that is biologically oriented and chemically focused.

The author has consolidated in these reference sources a summary of biologically active compounds described by chemical functional groups and families. Volume 1 contains eight chapters: (I) Unsaturated Aliphatic Compounds; (II) Alcohols and Ethers; (III) Carbonyl Compounds; (IV) Halides; (V) Nitrogen-Containing Compounds; (VI) Organosulfur Compounds; (VII) Organophosphorous Compounds; and (VIII) Organometallic Compounds. Volume 2 contains four chapters: (I) Unsaturated Aromatic Compounds; (II) Aromatic Alcohols and Phenols; (III) Aromatic Aminoalcohols; and (IV) Ether Compounds. Within each section is a synopsis of relevant structure activity relationships for a given chemical series, detail on chemical synthesis, a summary of biological activity, and pertinent references, including patents.

The reference value of these volumes is enhanced by three indices that are organized by author, chemical subject, and biological subject. In

addition, the author summarizes patent information for each chemical series to provide "a full acount of the available patent literature".

There is no doubt in this reviewer's mind that the extensive information provided will be valuable for determining new research directions. Scientists involved in design, synthesis, or testing of drugs will find useful, albeit diffuse, information included within both volumes. A key strength of these volumes rests with the extensive information provided. The relative ease (or difficulty) of synthesizing a new series of compounds can be initially estimated on the basis of the prior literature. The volumes thus also serve as a compendium for selected organic syntheses.

A key weakness of these books is the absence of any consolidated evaluation of immunological mechanisms of action. The author has chosen to include antihistaminic, bronchodilating, and mucolytic drugs within the "immunological" context while arbitrarily eliminating other "non-allergic response compounds" that also could be rationalized for inclusion. No judgements are made by the author as to the merit of the literature cited—thus any report of "activity" has been included in this compendium.

In view of the complexity of the area under review, the ultimate value of this series remains to be established. Chemical and pharmaceutical libraries and scientists with an interest in expanding their access to detailed information on immunologically active drugs and their syntheses should find this series of particular interest.

Neil J. Lewis, *Muscular Dystrophy Association*

The Structure and Properties of Solids. An Introduction to Materials Science. By B. Chalmers. Heyden & Son Ltd., London-Philadelphia-Rheine. 1982. vii + 155 pp. $21.95.

The book is a good undergraduate level introduction to materials science. Since no mathematics is used in the text, the presentation has to be pictorial. This is achieved by use of a large number of clear figures, many of which depict solid-state structures central to materials science. The book properly puts emphasis on the electronic origin of most chemical, optical, electrical, magnetic, and thermal properties of solids. It is a pity that none of the 104 figures depicts an energy band scheme, and consequently the verbal explanations of the functioning of the transistor or the optical properties of solids are more difficult to follows. On the other hand, the presentation of defects is more successful. Hopefully, this well-balanced introduction to elementary topics in materials science will awake the appetite of students for further studies in the exciting area of materials science.

Miklos Kertesz, *Georgetown University*

Heat and Thermodynamics. By M. W. Zemansky (The City College of the City University of New York) and R. H. Dittman (University of Wisconsin—Milwaukee). McGraw-Hill Book Co., New York. 1981. xv + 543 pp. $22.95.

This is the sixth edition of a tried-and-true textbook that first appeared in 1937. While it is written by physicists for students majoring in physics, it has much to recommend it to the serious student of thermodynamics, regardless of orientation. Zemansky's pedagogy continues to adhere to the spirit of thermodynamics; i.e., he discusses topics from an experimental point of view, frequently including a description of how the property just discussed (e.g., heat capacity, vapor pressure, equilibrium constant) is measured in the laboratory, and a practical application (e.g., liquefaction of gases by the Joule–Kelvin effect, thermoelectric refrigeration, optical pyrometry).

I can remember running across an earlier edition of this text long after completion of my formal education as a chemist and feeling as though I had made an important discovery. The Joule–Kelvin experiment made complete sense to me for the first time, and Rüchardt's method of measuring the heat-capacity ratio of a gas was so intriguing I had to try it for myself. There was a point of view here that seemed to have escaped authors of textbooks of *chemical* thermodynamics.

Still, the choice of topics precludes its use as a textbook for students whose primary interest is chemistry. Non-ideal systems, for example, are not mentioned, and too much space is devoted to topics in which most chemical thermodynamicists will not be interested (e.g., thermoelectricity, ionic paramagnetism and cryogenics, nuclear magnetism).

It is an excellent investment, on the other hand, for those of us who would benefit from a much broader exposure to the fundamental, experimental side of thermodynamics than we are likely to find in a course taught by, or a book written by, a chemist.

The problems, as in earlier editions, are thought provoking and frequently extend topics discussed in the chapters.

Several typographical errors remain in this edition, none of which will cause difficulty for the serious student. There is one statement, however, that supports a misunderstanding that many textbooks in fact still encourage. In section 8-11, Entropy and Disorder, the unqualified assertion is made that "...two gases that are mixed represent a higher degree of disorder than when they are separated". The fact is, the entropy increase upon mixing two different ideal gases has absolutely nothing to do with the mixing process per se but depends only on the fact that each component is at a lower partial pressure in the mixture. Zemansky himself illustrates, some 160 pages later, that if the partial pressures do not change upon mixing, neither does the entropy.

Edwin F. Meyer, *DePaul University*

Superoxide Dismutase. Volumes I and II. Edited by L. W. Oberley (University of Iowa). CRC Press, Inc., Boca Raton, Florida. 1982. Volume I: iii + 152 pp. $55.00. Volume II: iii + 177 pp. $55.00.

The discovery of the enzymes that catalyze the dismutation of superoxide in aerobic cells is a major landmark in science. These enzymes, called superoxide dismutases (SOD), were discovered at a time when the existence of free radicals in cells was not taken very seriously (except in certain extreme circumstances as when cells are irradiated by high-energy radiation). At this time, most biochemists believed that the enzymatic reduction of oxygen occurred two electrons at a time; the SOD enzymes have allowed the demonstration that virtually all cells produce free radicals and that the univalent reduction of oxygen is a commonplace of aerobic life.

In Chapter 1 of Volume I in the volumes reviewed here, Irwin Fridovich describes the events that led, seemingly inexorably, to the discovery of SOD. The trail started in 1952 when Fridovich enrolled at Duke as a graduate student under Phillip Handler and began the study of the oxidation of sulfite to sulfate in liver. [One of the mechanisms involves xanthine oxidase (XO) and hypoxanthine, which are now known to react together to produce superoxide. It was later discovered that XO could reduce cytochrome *c*, but only in the presence of oxygen. Rather than propose superoxide as an electron carrier, since this would have been"...met by extreme skepticism, if not derision...", Fridovich and Handler suggested in 1962 that superoxide was produced but remained bound to XO and the XO–superoxide complex reduced cytochrome *c*.] The trail that ultimately led to the discovery of superoxide was followed in Fridovich's laboratory for several years, but it was not until 1968, when Joe McCord joined Fridovich as a graduate student, that the data were developed proving that superoxide was produced in free solution by XO and that $O_2^{-}\cdot$ was the electron carrier that reduced cytochrome *c*.

This discovery seemingly came at exactly the right moment and, along with the discovery of the prostaglandins and the one-electron metabolism of many xenobiotics, triggered the explosion of interest in free radical biology that is so evident today. As of 1982, there were over 6000 references to superoxide and SOD. The Third International Conference on Superoxide and SOD was held in Ellenville, New York, in October 1982; like the first two conferences, the Third Conference led to the publication of massive proceedings (in two volumes under the editorship of R. A. Greenwald and G. Cohen).

This activity clearly justifies a handbook dedicated to the chemistry and biology of these remarkable enzymes. Larry Oberley has performed a valuable service by bringing together an organized, critical account of superoxide and the SOD's by some of the most established names in the field. The topics covered include virtually all of the areas in which superoxide or SOD have been studied to date. Chapter 2 by H. Steinman, at 58 pages the longest in these two volumes, describes the structure and chemistry of the SOD's. Chapter 3, by Fridovich, describes methods for measuring the activity of SOD's. Chapter 4, again by Fridovich, describes the importance of SOD's in controlling the toxicity of oxygen in procaryotes. Chapter 5, by B. Halliwell, reports on the toxic effects of oxygen in plants. Chapter 6, by A. O. Allen and B. H. J. Bielski, completes Volume I and describes the kinetics of the disappearance of $HOO\cdot/O_2^{-}\cdot$ in aqueous solutions, a topic to which the Brookhaven workers have contributed notably.

Volume II begins with a chapter by T. G. Gabig and B. M. Babior on superoxide production by neutrophils and the involvement of superoxide in the killing of invading microbes. Chapter 2, by A. Boveris and E. Cadenas, reviews the production of superoxide and hydrogen peroxide in mitochondria. Several groups have been using chemiluminescence and other techniques to measure superoxide and hydrogen peroxide levels in cells; superoxide is reported to occur at 10^{-11} to 10^{-12} M and hydrogen peroxide at 10^{-7} to 10^{-9} M. Chapter 3, by W. Bors, M. Saran, and C. Michel, reports assays that can be used to measure (and distinguish) the various oxy-radicals that occur in the cell. This is a difficult problem in free radical biology that has not been satisfactorily solved at present, since the species that must be distinguished ($HOO\cdot$, $O_2^{-}\cdot$, $HO\cdot$, $RO\cdot$, and $ROO\cdot$) have properties, including chemical reactivities, that are related. The chapter that follows, by G. L. Buettner, describes spin trapping procedures for $HOO\cdot$ and the $OH\cdot$ radicals. The spin trap technique has proven useful for detecting the presence of superoxide in biological systems and proving its involvement (as opposed to other similar oxy-radical species); however, it remains primarily a qualitative tool and it is famous

for the artifactual results it sometimes produces. A. A. Frimer contributes a chapter, Chapter 5, on the organic chemistry of superoxide; Frimer has been a prominent contributor in this area, and this chapter, the second longest in the two volumes, reviews the reactivities of this species that can react as a base, as a nucleophile, and as a radical. The final chapter, Chapter 6 by Oberley himself, reviews the involvement of SOD and free radicals in tumor development and in cellular defenses against cancer.

These two thin volumes, structured as they are to develop the chemistry and biology of superoxide and SOD's in a systematic way, are essential reading for persons interested in free radical biology. In most cases the discussion is restricted to superoxide itself, with extensive discussion of related oxy-radicals that occur in the cell restricted (as in the chapter by Bors et al. in Volume II) to situations where it is necessary to distinguish superoxide from these related species. I found very few typographical errors, a remarkable performance in chapters as detailed and involved as these. The chapters are virtually all extremely well written and lucid, and extensive references are given with the titles of the journal articles (a great service to the reader). There is a subject index, although it is all too brief. I would have preferred that the publisher combine these two volumes into one volume (which itself would not have been over-long), but I presume the decision to bind the two volumes separately was made to keep the price per volume below $100; this appears something of a false economy, since I believe any reader interested in one of these volumes would also wish to own the other.

William A. Pryor, *Louisiana State University (Baton Rouge)*

Patents for Chemists. By Philip W. Grubb (Sandoz Ltd. of Basel). Oxford University Press, New York. 1982. x + 273 pp. $39.95.

Traditionally, patents have been relegated to the role of black sheep of the family of chemistry publications. Chemists in industry sought to acquire new patents but largely avoided the gritty details of writing patent specifications, leaving this seemingly onerous chore to the patent attorneys. Academic chemists generally had little at all to do with patenting. Few chemists sought chemical information in patents, except where no other sources of information were available.

Several recent factors are bringing about renewed interest and respect for patents. Joint ventures by business and academic institutions, and business ventures by academic chemists, have led to increased patent applications by academic chemists. Recent changes in the patent law have made patents more expensive and difficult to maintain, tending to eliminate frivolous patents. Also, recent history has shown that the courts have no patience with imprecise and inaccurate patent claims. Chemists in all areas are becoming aware of the need to better understand the basic mechanics of good patent writing.

Philip Grubb's book was written to answer this need, and it succeeds admirably. It is definitely not a dry, legalistic tome for the attorney specializing in patent law. Instead, it is a well-organized, highly-readable, informative book written by a chemist for chemists.

Mr Grubb has written the book in three parts. The first covers general principles of patents, including a history of patents (with speculations on the future). What constitutes patentable material, the process of obtaining a patent, and the means of maintaining and enforcing an existing patent are also included in this section. In the second section, the structure of patents is developed in greater detail, in the context of chemical inventions. Such concepts as sufficiency, novelty and obviousness, inventorship, and licensing are presented here. While these can be tedious subjects, their discussion in the context of specific chemical inventions allows for a more meaningful presentation. The third section discusses the politics of patents, a vitally important aspect often overlooked in treatments of patents. An interesting but all too short chapter here covers some fundamental conflicts in the patent system. The book has an index and a glossary of patent terms and jargon but no reference list, although references are given in the text.

Understandably, the book covers European patent law extensively. However, it is no less thorough in discussing U.S. patent law and even touches on the law in Third World and communist countries. This can be quite valuable, since requirements differ between the U.S. and other nations. A particularly important instance of this occurs when a researcher considers publication of his research results prior to filing for a patent. In the U.S., the author has a year after publication in which to file a patent. He has no such grace period in Europe, however, and by publishing would immediately forfeit patent opportunities.

Mr Grubb makes excellent use of the practice of leading chapters with quotations from great works. One may perhaps marvel at using Machiavelli to lead off Chapter 1 (the origin of patents) and Ecclesiastes to start the chapter on invalidating patents, but they work well. Shakespeare and Shaw, among other worthies, are represented. Another example, used to precede the chapter of licensing chemical patents is the following: "In France, British duds falling behind German lines bore the tiny stamp KPz 96/04, 1896 being the year Vickers first licensed Krupp's fuse patent and 1904 the year the agreement was renewed." (From William Manchester's The Arms of Krupp).

In short, I found this book not only informative and current but quite entertaining. I recommend it highly to anyone who has even a slight interest in patents.

M. A. Shippey, *Chevron Research Company*

Detergent Analysis. A Handbook for Cost-effective Quality Control. By B. M. Milwidsky and D. M. Gabriel (Unilever Ltd.). John Wiley & Sons, New York. 1982. xi + 291 pp. $57.95.

This is a reference book for the specialist who is concerned with the chemistry of detergents. It is basically a collection of nearly two-hundred procedures, primarily titrations, that are commonly used in the detergent industry in the course of synthesis and process quality control. The methods described are well established, the authors admitting to "[at least] ...ten to fifteen years of use" in the industry. Many procedures are far older.

The book is not written at an advanced or sophisticated level. For example, three full pages are devoted to repetitious description of the preparation of standard acid and base solutions. It appears that the authors had in mind industry technicians, who will in many cases be called upon to carry out the described procedures. The descriptions provided are detailed and simple enough that they can be used in cookbook fashion by laboratory assistants and technicians.

A reader looking for general information about detergent chemistry would not find this book helpful. Virtually no chemistry is presented outside the standard inorganic chemistry of the titrimetric procedures. Even the basic concept of pH is poorly explained. Of course, since very little information presented is of recent origin, the book will not help a reader to stay current in the field. The book does contain references at the end of each chapter, but these are mostly 10 years old or earlier.

In sum, this book is not likely to be read cover to cover by a broad audience. It is strictly a reference text, for those concerned with the field of industrial detergent chemistry. Within that narrow context, it is a useful book, for it gathers under one cover a large collection of useful procedures, described in great detail. Beyond those specialists, however, the prospects for this book are limited.

M. A. Shippey, *Chevron Research Company*

Methods in Industrial Microbiology. By Bohumil Sikyta (Institute of Microbiology, Czechoslovak Academy of Sciences, Prague). John Wiley & Sons, New York. 1983. 349 pp.

Anyone looking for a comprehensive presentation of industrial microbiology need look no further. This excellent book will be of interest to microbiologists, biochemists, and engineers. It could also serve very well as a college text. The first five chapters include an introduction followed by precise descriptions of culture equipment, sterilization of media and air, aeration and mixing, and substrates for microbial processes. Included in the chapter on kinetics of microbial processes are discussions of microbial growth and its measurement, batch and continuous culture, and kinetic models. The last four chapters are devoted to genetics of industrial microorganisms, development of microbial processes, measurement and control of microbial processes, and isolation of microbial products. Each topic is covered in great detail and is well illustrated. An index and references are included.

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

Classical Thermodynamics of Non Electrolyte Solutions with Applications to Phase Equilibria. By Hendrick C. Van Ness and Michael M. Abbott (Rensselaer Polytechnic Institute). McGraw-Hill, Inc., New York. 1982. xiv + 482 pp. $39.50.

This book is a graduate level text devoted to the limited topic of the thermodynamics of fluids of nonelectrolytes. The focus is on the properties and phase equilibria of nonideal multicomponent systems. Practical methods of data reduction are sprinkled throughout, and the text also serves as a reference for the professional chemist seeking effective methods from the literature for correlating thermodynamic data.

The text is efficiently and logically organized. Even so the reader will encounter difficulty in digesting the detail in one example after another. The format is inevitable for an exposition which is simultaneously advanced, complete, and useful. The notation required to describe real multicomponent systems is complicated and the authors have done a clean job.

The principles of thermodynamics are introduced from the standpoint of postulating state functions with appropriate properties. This development is rigorous and complete but does not provide much physical feel for the formalism. However, the reader is presumed to have seen the more lively developments found in undergraduate physical chemistry texts which treat the operation of impossible engines, simplified model systems

which do not exist, and other exotica.

The applications in Chapters Four, Five, and Six are the core of the book.

Chapter Four deals with real fluids and provides a comparative analysis of equations of state for both single-component and multicomponent systems.

Chapter Five treats mixing functions and excess properties. Methods for obtaining partial molar properties from experimental data are shown. Some model functions are described.

Chapter Six is very extensive and deals with the conditions for phase equilibria and computation of the relations between state variables describing vapor–liquid equilibrium (and some other fluid equilibria). Numerous real examples are given and classified as to the nature of the data used to construct the diagram with chosen constrained variables.

The practical value of the subject treated by this book is obvious and numerous references to recent literature appear in an appendix.

A collection of problems for each chapter appears in an appendix. A solutions manual is available ($20.00).

Worth E. Vaughan, *University of Wisconsin—Madison*

Methods in Enzymology. Volume 94. Polyamines. Edited by H. Tabor and C. W. Tabor (National Institutes of Health). Academic Press, New York. 1983. xxx + 497 pp. $55.00.

This volume contains 81 contributions concerning analytical, preparative, and enzymological techniques used in polyamine biochemistry. The book is organized into 12 major sections. The first two sections are devoted to analytical methods for amines and adenosyl-sulfur compounds related to polyamine biosynthesis. The third is one of the more interesting, albeit brief sections, which concerns genetic techniques for screening bacteria with mutant biosynthetic pathways and for overproduction of enzymes in the biosynthetic pathway of polyamines. Following this there are six sections on the enzymes of polyamine synthesis and degradation. Three of these sections covering the ornithine, arginine, and lysine decarboxylases, adenosylmethionine synthetase and decarboxylase, and the spermidine and spermine synthetases, respectively, include excellent contributions on assay and preparation of these enzymes as well as the design and synthesis of inhibitors. The other three sections on the enzymology of polyamines and related topics are less complete. The volume concludes with a section devoted to a rather interesting array of analogues and derivatives of polyamines.

In general, the individual contributions are of high quality, but brief to the point of being terse. There is clearly an advantage in having a large number of short contributions in a book meant to be a collection of techniques, namely, a volume of manageable size. However, in this case the brevity tends to detract from the readability of the book and leaves the reader with little feeling for more general advances in the strategies and methodologies for the study of polyamines. The sharp focus on recipe biochemistry will probably make this volume of limited interest to most readers. The weakest sections are the contributions on analytical methods some of which appear dated to say the least. The strength of the volume rests in the chapters on the enzymology of polyamines. Taken together the volume is a fine contribution to the "Methods in Enzymology" series and to the field of polyamine biochemistry.

Richard N. Armstrong, *University of Maryland*

Isotopeneffekte bei Chemischen Reaktionen. By A. V. Willi. Georg Thieme Verlag, Stuttgart and New York. 1983. x + 180 pp. DM 80.00.

This is an outstanding book. Author Willi wrote it "to fill a gap in the German literature". It is also a great review of kinetic (KIE) and equilibrium [GIE, G for Gleichgewicht] isotope effects in chemical reactions. Section A begins with the standard treatment of theory—based on Eyring's transition-state equation—as developed by Bigeleisen, Bigeleisen-Mayer, Wolfsberg, and Stern, including tunnel effects (Wigner and Bell), the temperature-independent and -dependent factors, and the methods of calculating both light- and heavy-atom KIE's. Section B is devoted to isotope effects during chemical equilibria (GIE), beginning with the work of Bonhoeffer on deuterium exchange between HDO and D_2 and continuing through several examples of heavy-atom (nitrogen, oxygen, and carbon) isotope exchange. Included is an $^{22}Na/^{24}Na$ GIE during an equilibrium of sodium ions between crown ethers and amino polyethers; solvent GIE in D_2O and acid–base equilibria in light and heavy water are also reviewed. Acid–base equilibria in aprotic solvents and primary and secondary GIE in protic and aprotic solvents round out Section B.

Section C is devoted to the relation of the KIE to the reaction mechanism. It begins with Melander's original work on electrophilic aromatic substitution and includes Bender's results on aliphatic nucleophilic substitution as well as more recent data on the isotope effect criterion for S_N1 and S_N2 reactions. The results of Ando, Yukawa, and others on $^{12}k/^{14}k$ and neighboring group participation are briefly reviewed. One also finds E1, E2, and E1cb, addition–eliminations, and, in fact, approximately 55 different examples of the relation between KIE's and the reaction mechanism.

The final section, D, concerns the use of primary and secondary KIE's (both experimental and calculated by means of force constants) for the purpose of drawing conclusions about transition states in reactions whose mechanisms are reasonably well known. Included are KIE's for different isotopes during the same reaction, a technique usefully employed by Arthur Fry and co-workers; transition states for proton transfer, azo coupling, S_N2, and E2 reactions are touched upon. Mention is also made of computer applications in this field.

There are two appendices. The first has to do with W. Saunders' recent research on tunnel effects, and the second with the contributions of Henry Shine and Harold Kwart to the mechanism of the benzidine rearrangement as clarified by ^{13}C, ^{14}C, ^{15}N, and α-D KIE's.

There are 40 tables, crammed with information, and 443 references, some multiple. Surprising is not what has been left out—and there are some notable omissions (e.g., the origin of β-deuterium KIE's)—but how much has been included in a book with only 165 pages of text.

The style is easy and unencumbered and the writing is informative and—within the limits allowed by the small size of the book—critical. The only thing I did not like was the small print used for the numbers in the reference section.

If you like isotope effects and cannot read German, buy the book anyway. The references (bring a magnifying glass for the numbers) and the Tables alone are worth the price.

Clair J. Collins, *The University of Tennessee*

Molecular Quantum Mechanics. Second Edition. By P. W. Atkins. Oxford University Press, New York. 1983. xiii + 471 pp. $45.00 cloth; $27.95 paper. Solutions Manual: 204 pp. $14.95.

The second edition of "Molecular Quantum Mechanics" is much welcomed. Designed for undergraduate studies, the book is divided into foundations 1 and 2, applications, and advanced applications. Foundation 1 starts with the historical background, introduces the Schrödinger equation, and explains the translation, vibration, and rotation motions. Foundation 2 discusses the operators, the angular momentum, and the group theory and finishes with the techniques of approximation. The first set of applications is the one needed at the undergraduate level: atomic spectra, atomic structure, molecular structures, and molecular electronic transitions. In the more advanced application section, one can find the electric and magnetic properties of molecules.

As in the first edition, the book is successful in giving mathematical and qualitative explanations for the quantum mechanical concepts. Numerous graphs and drawings illustrate in an efficient way the qualitative discussion. Many problems are found in the text. In a pedagogical approach, the solution starts with a description of the method to solve it before giving the detailed mathematical points. Some comments terminate each problem. This works very efficiently in the learning process. Additional problems are to be found at the end of each chapter. Clear detailed solutions are given in the solutions manual. It is clear that these two books will meet considerable success among students and professors.

O. Eisenstein, *The University of Michigan*

Problems in Molecular Structure. Edited by G. J. Bullen and D. J. Greenolade. Piar Limited, London. 1983. 466 pp. $32.00.

This is a very interesting book that is going to find an audience among advanced undergraduate and beginning graduate students. Via problems the reader will learn how to understand the various technqiues involved in the elucidation of a molecular structure. Each problem refers to one technique related to symmetry, diffraction, vibration–rotation spectroscopy, electronic properties, nuclear spectroscopy, mass spectrometry, structure, and energy. Each problem has been prepared by a different author specialized in the field in question. The late C. A. Coulson provided the problem on wave functions and bonding. The solutions are very detailed and can be viewed as lectures. An additional interest of the book is that problems are related to real facts and that references are given. This book will be of considerable help for the students.

O. Eisenstein, *The University of Michigan*

Topics in Phosphorus Chemistry. Volume 11. Edited by Martin Grayson (Cos Cob, Connecticut) and Edward J. Griffith (Monsanto Co., St. Louis, Missouri). John Wiley and Sons, New York. 1983. 451 pp. $85.00

The latest volume of "Topics in Phosphorus Chemistry" admirably upholds the purpose of providing "the general scientific reader as well as the specialist in phosphorus chemistry with a series of critical evaluations and reviews of progress in the diverse special areas of the science written by scientists actively engaged in the work in the field."

The first chapter is a brief treatment of The Chemistry of ATP by

Joseph Feder of the Monsanto Co. In 13 pages of text, material that has been reported over a period of 55 years in 152 references is covered in almost a "telegraphed" fashion. Topics include structure, some physical chemical properties, metal ion complexes, synthetic approaches and nonenzymatic hydrolysis, and phosphate transfer.

In the second chapter (46 pages) Yoshihiro Abe of Nagoya Institute of Technology in Japan presents a thorough review of Condensed Alkaline Earth Phosphates. These glasses may or may not be crystalline depending upon conditions, and studies on such crystallization conditions are a major part of this chapter. Studies on structural composition, effects of the presence of water in the glasses, and various physical and spectral properties are also reviewed.

The third chapter (116 pages), entitled Phosphoryl Coordination Chemistry: The Period 1975–1981, by M.W.G. deBolster, Free University, Amsterdam, is larger than all of the other chapters in the book combined. In Volume 8 of this series, deBolster and W. L. Gronevald published a review of the ligand properties of neutral monodentate and polydentate compounds, covering the period 1854–1975. All isolated compounds were listed in which a ≡PO group coordinated via the oxygen atom to a central atom is present. This chapter updates this listing to 1981. Significantly, more papers about phosphoryl coordination chemistry have been published in these seven years than in the period 1854–1975! The chapter lists compounds whose structures have been determined, along with references. Then in a massive table covering 138 pages a complete list of the recently isolated phosphoryl complexes is presented with references to physical and spectral properties, when available. This is a very useful tabulation and a splendid service to those working in the field.

The fourth chapter (41 pages) is entitled Biology of Alkylphosphonic Acids: A Review of the Distribution, Metabolism, and Structure of Naturally Occurring Alkylphosphonic Acids, by Richard L. Hilderbrand, Wright-Patterson Air Force Base, Jean Curley-Joseph, Michael Reese Hospital, and Harry J. Lubansky and Thomas O. Henderson, both of the University of Illinois Medical Center. These compounds, which contain a phosphorus–carbon bond, have been discovered in a wide range of life forms, from bacteria to mammals, including humans. This chapter provides a valuable account of research done in this intriguing area.

The fifth and last chapter (96 pages) is a thorough and thoughtful review of Quasi-Phosphonium Intermediates and Compounds, by Harry R. Hudson, The Polytechnic of North London. As defined by the author, the term "quasi-phosphonium" describes "any species that can be formally described by a phosphonium structure but in which one or more of the atoms directly bonded to phosphorus is neither carbon nor hydrogen." A typical example is the intermediate $(RO)_3P^+-R'$, X^- in the Michaelis–Arbusov reaction of a trialkyl phosphite $[(RO)_3P:]$ with an alkyl halide (R'–X). Both four-coordinate (phosphonium) and five-coordinate (phosphorane) structures are possible. This chapter is restricted to those types in which at least one alkoxy or aryloxy group is attached to the phosphorus.

George L. Kenyon, *University of California, San Francisco*

Progress in Solid State Chemistry. Volume 14. Edited by G. M. Rosenblatt and W. L. Worrell. Pergamon Press, Oxford and New York. 1983. 312 pp. $120.00.

This book contains in hard-bound form the four reviews which are the contents of Volume 14, Numbers 1 to 4 (1982), of the periodicals having the same title, together with a subject index.

Inorganic Chemistry: A Unified Approach. By W. W. Porterfield (Hampden-Sydney College). Addison-Wesley Publishing Company, Reading, MA. 1984. 688 pp. $33.95.

This text is well written and is specifically designed for the junior and senior level, physical chemistry being a prerequisite. The "Unified Approach" subtitle refers to the author's organization of the descriptive material that is based on bonding and thermodynamic arguments rather than on reaction types based on the periodic table. The chapter sequence dwells on both main-group and transition-metal reactivities and it is adequately based on previously developed bonding concepts. The author has succeeded well in integrating theory and descriptive chemistry, a fact that should be appreciated by the serious students of inorganic chemistry. Some of the topics covered in the course are as follows: bonding theory, a very good treatment of ionic interactions, acid–base concepts and behavior, and a well-presented discussion of metal complexes and current theories on clusters. The last two chapters of the book deal with ligand reactions and catalytic mechanisms and also photochemical reactions of transition metals. Bioinorganic mechanisms, a current topic of inorganic chemistry, are well presented. Each chapter contains in the end very useful descriptive and numerical questions.

An occasional apparent error (molybdenum disulfide sublimes at 450 °C, p 15) can be found in the book. Otherwise, this book is recommended as a very good textbook at the junior/senior level.

George A. Tsigdinos, *Michigan State University*

A Guide to the Chemical Basis of Drug Design. By Alfred Burger (University of Virginia). John Wiley and Sons, New York. 1983. x + 300 pp. $45.00.

The author of this enjoyable and informative book has devoted his career to medicinal chemistry and is a famed expert, responsible for the classic treatise on the subject, "Medical Chemistry", now in its fourth edition. The present volume is less formal and is the distillation of his great experience. He begins by tracing the history of medicinal chemistry, which he develops in such a way that the reader can appreciate the evolution of the concept, the ideas, and the techniques. It is an excellent introduction for anyone who wants to acquire a good orientation to the subject. Another chapter is devoted to recent research and takes up several major classes of pharmaceutical agents before dealing with the general problem of design of drugs and relating activity to structure. This is followed by a chapter of selected examples of the design of new drugs. This chapter is half the book and gives almost an encyclopedic coverage, with 21 clinical classes of drugs (anticoagulants, local anesthetics, anthelmintics, etc.) and a closing section on "orphan drugs". The whole is presented from the standpoint of the chemist, although synthetic chemistry is not emphasized. There is an impressive bibliography of no less than 1512 references, itself a valuable resource. There is also a good subject index. This is a book that can be recommended for personal ownership; it can be read with pleasure and consulted with profit.

Bimetallic Catalysts: Discoveries, Concepts and Applications. By John H. Sinfelt (Corporate Research Science Laboratories—Exxon). John Wiley & Sons, New York, NY. 1983. xi + 164 pp. $32.50.

This Exxon monograph is an excellent presentation of the subject of bimetallic catalysts and is primarily based on the work in this area carried out by the author and his group during the last 20 years. The material deals with the elucidation of the bimetallic cluster concept only as developed at Exxon. Consequently, bimetallic catalyst research developed by Yermakov and Kuznetsov, for example, is not included.

The presentation of the work is excellent and it is based on the validation and elucidation of the bimetallic cluster concept with use of techniques such as chemisorption and reaction kinetics and also the use of physical probes such as Mössbauer and EXAFS. The bimetallic systems examined in detail are the following: Ni–Cu, Ru–Cu, Ru–Os, Pt–Ir, and Pt–Re. The importance of this research is concluded with an excellent chapter on reforming with use of bimetallic catalysts. Each chapter is abundantly documented with appropriate references at the end. This book will be found useful by researchers already in this area of catalysis and also by those planning research in this field. It is also highly recommended for use in courses in heterogeneous catalysis.

George A. Tsigdinos, *Michigan State University*