

## Book Reviews\*

**Chemistry and Chemical Engineering of Catalytic Processes.** Edited by R. Prins (Eindhoven University of Technology) and G. A. Schuit (University of Delaware). Sitjhoff and Noordhoff, Netherlands. 1980. xviii + 660 pp. \$75.00.

This book represents the collected lectures of the NATO Advanced Study Institute on "Chemistry and Chemical Engineering of Catalytic Processes" which was held in Noordwijkerhooft, Netherlands, in August 1979. The stated objective of the meeting was to present an integrated series of state of the art lectures which would narrow the communication gap between chemists, physicists, and engineers involved in catalysis. A prerequisite M.Sc. in Chemistry or Chemical Engineering was required. In most aspects this volume serves to achieve that goal.

After introductory sections on chemical kinetics, mass transfer, and fixed bed reactors (directed at chemists), the lectures are organized under the five major headings of catalytic cracking, reforming, homogeneous catalysis, selective oxidation, and coal conversion processes. The introductory sections contain excellent compilations of references for those requiring a more extensive or more introductory coverage of these basic principles.

The individual lectures flow in an orderly fashion, bringing the reader up to date on the latest progress in such areas as the Fischer-Tropsch reaction, conversion of methanol to hydrocarbons by ZSM-5, fluidization, cracking catalysts, chemisorption, surface spectroscopic techniques, alloy catalysts, metal oxide chemistry and catalysts (including zeolites), the acrylonitrile process, and many more. The section on chemical bonding which details wave function calculations for  $H_2^+$  (12 pages) appears particularly out of place in the presence of the overwhelming majority of other useful sections such as the one on surface electron spectroscopy which serves to acquaint both the chemist and chemical engineer with the how and why of state of the art electronic spectroscopic techniques.

Overall this book is a welcome addition to the catalytic literature and could serve as an excellent auxiliary text for a graduate level course in catalysis. Those with an interest in catalysis will be sure to find some aspects of interest to them within this volume.

P. E. Garrou, *Dow Chemical Co.*

**Rearrangements in Ground and Excited States. Volume 2.** Edited by P. de Mayo (The University of Western Ontario). Academic Press, New York. 1980. x + 431 pp. \$77.00.

This timely book forcefully reminds the reader of the fluxional or transient nature of many seemingly stolid molecular structures. It consists of six essays which include discussions, supported by considerable tabulated data and almost 1200 references, of organic, organometallic, and inorganic species. The initial essay (actually essay 7 in this three-volume set) is entitled *Rearrangements: A Theoretical Approach* (N. Epiotis, S. Shaik, and W. Zander). After a brief and useful "history and evolution of the qualitative theory of reactivity", the authors introduce and illustrate their approach, termed the "linear combination of fragment configurations (LCFC) method". The approach involves construction of potential energy surfaces connecting reactants and products and is applied to a continuum of reactions including those which are usually viewed as nonpolar, diradical, and polar in nature. These reviewers were not able to employ the LCFC method after careful reading of the essay and found the distinction between qualitative and quantitative (i.e., calculational) considerations required for predictions unclear. That is to say, it is important to assign relative contributions to influences, e.g., the relative importance of the  $\sigma$  and  $\pi$  effects of a substituent on an energy surface or the appropriate numerical values of relevant ionization potentials and electron affinities (see p 26 for the authors' discussion of the 120 kcal/mol spread in the Coulombic term for  $CH_3F$ ), in order to make predictions. It would seem that calculations remain often required.

The next two essays are of particular interest to synthetic organic chemists. *Rearrangements Involving Boron* (A. Pelter) includes discussion of thermal and photochemical rearrangements of organoboranes (saturated and unsaturated). The nature of synthetically useful reactions of organoboranes, e.g., reaction with carbon monoxide, is covered as is the rearrangement chemistry of tetracoordinate organoborates. Insertion and oxidation reactions are also considered. *Molecular Rearrangements of Organosilicon Compounds* (A. G. Brook and A. R. Bassindale) is an essay of current relevance because of the use of these compounds as synthons and blocking agents as well as for the similarities and differences between the isovalent silicon and carbon. It takes the view that most of the rearrangements discussed involve pentacoordinate (rather than tet-

ra-coordinate) silicon. This and other similarities with phosphorus (e.g., a tendency toward migration to oxygen, also manifested by boron) leads naturally to the next essay, *The Polytopal Rearrangement at Phosphorus* (F. H. Westheimer). Its major focus is pentavalent, pentacoordinate phosphorus where the Berry pseudorotation mechanism is supported and the "turnstile mechanism" dismissed as (relative to the Berry mechanism) "indistinguishable within the limits set by the Uncertainty Principle". The essay includes considerable discussion of enzymatic displacements at phosphorus in natural and synthetic phosphate esters. *Essay 11, Rearrangement in Coordination Complexes* (W. G. Jackson and A. M. Sargeson), successfully accomplishes the challenging task of contrasting the rearrangement chemistries of a wide variety of free (uncomplexed) molecules including those containing tricoordinate N, P, and As as well as a number of coordination numbers and oxidation states of sulfur with those of the corresponding coordinating ligands. Stereochemical changes in metal complexes, most generally the nonlabile Co(III), and discussions of linkage isomerizations (e.g.,  $M-SCN \rightleftharpoons M-NCS$ ) are also included in this essay. The final essay in this volume, *Fluxional Molecules: Reversible Thermal Intramolecular Rearrangements of Metal Carbonyls* (F. A. Cotton and B. E. Hanson) includes discussion of the governing principles for mononuclear carbonyls such as  $Fe(CO)_5$ , whose pseudorotation is reminiscent of that of phosphorus as well as structurally diverse multinuclear species in which ligands change centers as well as positions on a single center. This essay includes many variable-temperature NMR spectra, the interpretation of which forms the basis of these fascinating migration mechanisms. Current interest in metal cluster chemistry aimed at better understanding of catalysis mechanisms gives this essay its timeliness.

In summary, the collection of essays in this book are encouragingly well related to each other and illustrate the decreasing distinction between organic and inorganic chemistry. It is a valuable institutional purchase, but even the 3-volume discount will not make it accessible to most chemists.

Arthur Greenberg, *New Jersey Institute of Technology*  
Joel F. Liebman, *University of Maryland Baltimore County*

**Catalysis in Organic Syntheses.** Edited by William H. Jones. Academic Press, New York. 1980. ix + 314 pp. \$29.50.

This book contains the proceedings of the Seventh Conference on Catalysis in Organic Syntheses, Chicago, June 1978. Chapters vary markedly in quality of presentation, content, and scope. Only seven chapters are concerned with newer developments in catalyzed organic reactions (the area of coverage that one might expect from the title), while a dozen other chapters present a hodgepodge of literature reviews, progress reports of limited success, descriptions of high-pressure industrial facilities, and studies of catalysts per se. Catalytic hydrogenation and hydrogenolysis constitute the main theme of the book (over 60% of the pages and 6 of the chapters on new chemical developments).

Synthetic organic chemists can find useful hints on methodology for selective hydrogenation of the carbonyl group in unsaturated aldehydes and the nitro group in halonitrobenzenes, reductive alkylation of aniline with cycloalkanones and of acid hydrazides with aldehydes, hydrogenolysis of benzyl ester groups from resin-bound peptides, dimerization of phenol to dibenzofuran and 2-phenylphenol, and Pd(II)-catalyzed condensations among vinylic halides, alkenes (and their derivatives), and amines. In general, however, the contents of this volume are disappointing and a few chapters have so many typographical errors as to make intelligible reading difficult.

LeRoy H. Klemm, *University of Oregon*

**Methods for Determining Metal Ion Environments in Proteins: Structure and Function of Metalloproteins.** Edited by Dennis W. Darnall and Ralph G. Wilkins (New Mexico State University). Elsevier North Holland, Inc., Amsterdam and New York. 1980. xi + 324 pp. \$29.50.

The rapid growth in our understanding of inorganic biochemistry over the past several years has been dominantly due to the application of spectroscopic techniques to metalloprotein systems. Darnall and Wilkins have assembled a series of contributions based on lectures presented at a conference dealing with the determination of metal ion environments in metalloproteins held at New Mexico State University in January of 1979. The authors of the individual chapters have contributed significantly to the recent bioinorganic literature and provide, in general, an interesting and readable account of the highlights of advances made with

\* Unsigned book reviews are by the Book Review Editor.

the use of varied spectroscopic techniques in studying metalloprotein systems.

The basic format of each of the eleven chapters provides a brief introduction to the method being discussed followed by several examples of how the method has been applied to metalloprotein systems. A number of spectroscopic methods (electronic absorption, circular dichroism, magnetic circular dichroism, fluorescence, infrared, Raman, nuclear magnetic resonance, electron paramagnetic resonance, X-ray diffraction, and EXAFS) are discussed along with one chapter concerning the use of kinetics in studying metalloprotein functions. While some of the discussions of the spectroscopic methods are quite brief, most provide the reader with enough information to appreciate the conclusions concerning metal ion environments made based on the applications of a given method. Further, the chapter on CD and MCD by Vallee and Holmquist and several other chapters provide rather in-depth accounts of the methods and their applications to metalloproteins.

This book is the second in the "Advances in Inorganic Biochemistry" series and is a welcome addition to the literature. While the survey presented would mainly be recommended for workers in the field, readers with some knowledge of protein chemistry and inorganic chemistry will find it interesting.

Richard S. Himmelwright, *Polaroid Corporation*

**The Lewis Acid-Base Concepts. An Overview.** By William B. Jensen (University of Wisconsin—Madison). John Wiley & Sons, New York, 1980. ix + 364 pp. \$32.50.

This book is derived from Jensen's earlier review article [*Chem. Rev.*, 78, 1 (1978)] to which considerable depth and breadth has been added. The topic of acids and bases is fundamental (if not basic) to chemistry and Jensen has courageously and sagaciously made applications to inorganic chemistry, organic chemistry, analytical chemistry, geochemistry, and biochemistry. The topic and treatment are of sufficient diversity and strength that the reviewer believes an error was made in entitling the book: I believe a more appropriate and accurate title would be "The Acid-Base Concepts. An Overview." Lewis does not deserve the total credit Jensen implies nor should Jensen be denied the audience he deserves by implying too narrow a subject area. Jensen has divided his book into three parts: historical perspectives (72 pages!), systematics, and reactivity, and then adds on three appendices. The book contains an interesting blend of etymology, scientific philosophy, "classical" chemistry, and both qualitative and more formal quantum chemistry and thermodynamics. It is this last component that provides my sole faulting of this book. The author makes heavy use of formal quantum chemistry to justify many of the qualitative assertions and rationalizations of chemical phenomena. This is not to say that the science is wrong, or as a theoretical chemist I am displeased to see numerous applications of my discipline. Rather, I sense too many chemists will be intimidated by the mathematical formalism, especially on a brief perusal, and so conclude not to read this book. For example, upon opening to a random page of theory, one of our best students gave an immediate one word book review: "HELP!" Does one really need explicit writing of Slater determinants (p 91) and a discussion of self-consistent-field theory (p 92) to rationalize the tangent sphere model (pp 95-102)? I think not. More appendices would have been useful to incorporate this formalism and so leave the text less encumbered. However, the reviewer cannot ask the author to rewrite his book. The reviewer can, however, suggest to the reader to read this book. Despite the above quite painful, if not major, problem, I believe this book should be read by proponents of all the disciplines Jensen relies and expounds on. I believe so doing will aid in one's teaching, research, and generally learning about the practice, practitioners, and phenomena of chemistry.

Joel F. Liebman, *University of Maryland Baltimore County*

**The Electrochemistry of Lead.** Edited by A. T. Kuhn (Eastman Institute of Dental Surgery). Academic Press Inc., London, 1979. xvii + 467 pp. \$59.00.

The book successfully brings together several pools of knowledge on the electrochemistry of lead. The chapters are an expanded form of a 1974 Symposium at the University of Salford and are weighted toward those areas of highest scientific and industrial interest. Although the electrochemistry of lead in sulfate electrolytes is the most recurring subject, many related areas are reviewed in depth.

The reactions, kinetics, and morphology of the divalent and tetravalent states are discussed in detail. Several sections are devoted to the use of lead dioxide: they include its use in primary and secondary batteries, a review of anodic reactions on PbO<sub>2</sub> and PbO<sub>2</sub> films on inert base anodes. The electroplating and electrowinning of lead and its alloys are treated separately. Other topics include the use of lead in molten salts, the electrochemistry of organo-lead compounds, and lead electrodes for hydrogen and oxygen reduction. The final chapters review corrosion and

corrosion prevention of lead and its alloys in various electrolytes.

In general, each chapter traces the significant publications of its topic, then focuses the body of the text on important scientific and industrial information, and attempts to summarize the status of the field. The book fulfills its goal of bringing together several areas of knowledge and draws on previous reviews without excessive duplication of them.

Paul A. Kohl, *Bell Laboratories*

**Progress in Inorganic Chemistry. Volume 27.** Edited by S. J. Lippard (Columbia University). John Wiley and Sons, Inc., New York. 1980. vi + 529 pp. \$45.00.

This latest volume of the series continues the tradition of providing timely reviews of active areas of inorganic chemistry. The editor has done a good job once again of providing a range of topics, of interest to most inorganic and organometallic chemists, which summarize the area for both the specialist and nonspecialist.

F. J. Brown's chapter on stoichiometric reactions of transition metal carbene complexes (113 pages, 387 references) is a very thorough, well-organized treatment of the synthesis and reactivity of isolable, mononuclear transition-metal carbene and, to a smaller extent, alkylidene complexes. Reactions catalyzed by these complexes (with the exception of the olefin metathesis reaction) and reactions in which metal carbene intermediates are postulated are not discussed. The literature coverage, through 1978, is outstanding.

Chapter 2, by G. L. Geoffroy, discusses the growing area of photochemistry of transition metal hydride complexes (26 pages, 58 references). The material, organized by photochemical reaction class, covers photoinduced reactions such as dihydrogen reductive elimination, homolysis of the metal-hydrogen bond, ligand dissociation, geometric isomerization, and other transformations. The author emphasizes mechanistic information and qualitative molecular orbital descriptions of the excited state(s) in his treatment.

The reactivity of metal ion-sulfur bonds is discussed by C. G. Kuehn and S. S. Isied in the third chapter (61 pages, 317 references). Only reactivity aspects of mononuclear and binuclear complexes with simple sulfur ligands (R<sub>2</sub>S, RSH, H<sub>2</sub>S, RS<sup>-</sup>, HS<sup>-</sup>, S<sup>2-</sup>) are examined. A section on structural types exhibited by these ligands is followed by a discussion of their reactivity and electron-mediating properties, with an emphasis on reactions (substitution, metal-ligand affinities, oxidation-reduction, electron transfer) of relevance to the biological role of these ligands.

T. N. Lockyer and R. L. Martin review the chemistry of 1,2-dithiolium salts and dithio- $\beta$ -diketone complexes of the transition metals in the fourth chapter (98 pages, 198 references). This review is divided into discussions of the synthesis, spectroscopic properties, and reactivity of 1,2-dithiolium ions, 1,2-dithiolium salts of the transition and group 2B metals, and 1,3-dithiochelates of bi- and trivalent metals.

The largest chapter, by M. C. Favas and D. L. Kepert, discusses the application of repulsion theory to the prediction of stereochemistries in four- and five-coordination. This extensive treatment (125 pages, 602 references), with a large number of tables of stereochemical parameters and of potential energy surfaces, covers various combinations of uni-, bi-, and tridentate ligands in main-group and transition-element compounds.

In the final chapter, J. Laane and J. R. Ohlson review the utility of vibrational spectroscopy in the characterization of nitrogen oxides (45 pages, 182 references). The structure and vibrational spectra (IR, Raman, resonance Raman) of each of the approximately 20 different species with various combinations of nitrogen and oxygen are described. Spectral assignments are conveniently tabulated, and at the end there is a chart depicting the absorption frequencies for all of the species.

A cumulative index for Volumes 1-27 of this series appears at the end of the book.

Louis Messerle, *University of Michigan*

**Practical NMR Spectroscopy.** By M. L. Martin, G. J. Martin (University of Nantes, France), and J.-J. Delpuech (University of Nancy, France). Heyden & Son, Inc., Philadelphia. 1980. xxxi + pp. \$60.00.

This outstanding book is a detailed account of the experimental techniques used in high resolution CW and FT NMR spectroscopy. Specific applications of NMR spectroscopy are not described, and theoretical treatments are introduced only when they are required for a better understanding of the practical concepts. The ten chapters, which are well illustrated, cover basic concepts, fundamentals of NMR instrumentation, CW spectrometer operating techniques, sampling techniques, multiple irradiation experiments, relaxation time determinations, dynamic NMR experiments, intensity measurement/quantitative analysis, and the use of shift and relaxation reagents. The treatment of Fourier transformation and of FT spectrometer fundamentals is complete and well-written. Tables throughout the book collect and summarize useful information which is currently dispersed among many references; for example, these include characteristics of some of the currently available

spectrometers, properties of NMR-active nuclei, physical properties of NMR solvents and of shift reagents,  $T_1$  and NOE values for various nuclei in different chemical environments, and characteristics of methods for  $T_1$  determination. A set of appendices, covering diverse topics including computer programs for dynamic NMR simulation and a summary of NMR literature, enhances the value of the book. The list of references to specific techniques and parameters is extensive.

All NMR spectrometer users and specialists in the field will find this book to be a valuable source of information; some of the tables alone are of the type and quality which are hung on spectrometers as references. The relatively high price of the book will limit (unfortunately) its use as a text in graduate courses on practical NMR techniques.

Louis Messerle, *University of Michigan*

**Advances in Drying. Volume 1.** Edited by Arun S. Mujumdar (McGill University). Hemisphere Publishing Corp., Washington, D.C. 1980. xi + 301 pp. \$55.00.

A serial publication designed to link theory with practice naturally must start with theory. It might draw bad reviews otherwise.

After a perfunctory opening chapter by Key devoted largely to kinetics, there follow a mathematical chapter on heat and mass transfer in porous media by Whitaker, a chapter on modeling spray drying systems by Crowe, one on heat and mass transfer with phase change in porous media by Martynenko, and one on drying theories as applied to foods and grains by Fortes. These chapters do not forge the desired linkage.

Then comes Chapter 6 on drying of foods by Bruin, the first one to do any real coupling. This well-written chapter covers food materials and ends with a listing of research areas, mainly for cost-cutting purposes. Chapter 7 on mass transfer in convective drying by van Brakel covers that limited subject in a sophisticated and well-illustrated manner. Chapter 8 on spray drying by Masters ends the volume with an elementary discourse on equipment and applications.

"Advances in Drying" is intended for individuals who deal with granular materials. Sufficient references are made to continue drying to whet the appetites of others who may wait eagerly for succeeding volumes in the series to cover polymers and coatings. The editor of Volume 1 is encouraged to widen the scope of the series in this direction.

Raymond R. Myers, *Kent State University*

**High-Performance Liquid Chromatography.** Edited by J. H. Knox (University of Edinburgh). Edinburgh University Press, Edinburgh, U.K. 1979. viii + 205 pp. \$12.00.

High-performance liquid chromatography (HPLC) is now considered by many to be the most important analytical method of the last decade, with much of its potential still to be realized. Its phenomenal growth and wide utilization have caused many scientists to write on the subject. This multiauthored, relatively thin book deals with HPLC from a somewhat different point of view than the other available books: while hardly a comprehensive treatise of the subject, the book emphasizes its most essential and practical aspects. In a brief but amazingly effective way, the theory and techniques of adsorption, partition, ion-exchange, and molecular exclusion chromatographies are adequately covered in the first seven chapters. The book is up to date on the important directions in chemically bonded stationary phases, the reversed phase HPLC, and various ion-pairing approaches. The editor of this book, Professor J. H. Knox, has long been recognized as a leader in many directions of HPLC.

The following three chapters are devoted to various aspects of the HPLC instrumentation: sampling systems, solvent delivery and gradient elution techniques, liquid chromatographic detectors, and certain auxiliary techniques. The importance of certain hardware aspects is justifiably emphasized. Various detection principles are adequately reviewed and recommendations are given concerning the use of different detectors in analytical work.

Although the applications section (Chapter 11) is not comprehensive of the major fields, numerous useful illustrations from the areas of pharmaceutical and biomedical analysis are included. Regrettably, the important field of environmental analysis with its unique and illustrative problems of sample preconcentration and selective detection is not adequately treated.

The last two chapters of this book provide particularly important practical information: how to adequately pack and test chromatographic columns, how to develop an analytical HPLC method, how to distinguish between "good" and "poor" results, and how to correct certain system deficiencies and chromatographic conditions. For this reason alone, this book can be highly recommended as a text supplementing increasingly popular short courses on chromatography; this is indeed what the book appears to have been primarily written for.

The book is written in an easily readable informal style, with a minimum number of errors. I find most figures and tables quite illustrative

and well-chosen. It is hardly noticed that the individual chapters have been contributed by different authors; overlap is minimal.

Apparently, the book is not intended for "chromatography specialists", and it may not be sufficiently theoretical for a graduate text. However, its value for analysts, technicians, industrial chemists, and engineers is unquestionable. Scientists who work in various other areas with a need for HPLC will equally benefit. The book will undoubtedly provide an excellent introduction for any beginners in this extraordinarily powerful separation method. I wish this little book by Knox and co-workers every success it so fully deserves.

M. V. Novotny, *Indiana University*

**The Physical Behavior of Macromolecules with Biological Functions.** By S. P. Spragg. John Wiley & Sons, New York. 1980. xv + 202 pp. \$40.50.

Studies of solution properties of macromolecules in solution have long emphasized determination of the limiting low-concentration value for physical parameters since these quantities may most directly be related to the size and shape of individual macromolecules in solution. In biological systems, the proteins and other large molecules may in aggregate constitute a substantial fraction (say, a quarter) of the total volume of the solution, so their low-concentration properties may not accurately represent their behavior in real systems. This volume fills a major gap in the monograph literature by examining what such physical techniques as osmotic pressure, elastic light scattering, centrifugation, and quasi-elastic light-scattering spectroscopy say about the behavior of interacting macromolecules. The volume also provides a valuable treatment—especially for graduate students who still believe almost anything if it is "statistically significant"—of the sorts of unexpected artifacts which can negate a seemingly sound experimental result. Of particular interest is the long treatment of classical efforts to determine the molecular weight of serum albumin, for which datum, as late as 1960, published results differed by up to 7%. Work which made a careful treatment of paucidispersity effects gave accurate results, less careful work gave more scattered results, but only a very close examination of the literature could have permitted winnowing the grain from the chaff. Effects due to polydispersity, to true instrumental artifacts, and to nonideality are examined separately. A final chapter treats studies of systems in which the formation of regular oligomers is biologically significant.

The measurement of diffusion parameters has recently been revived by the advent of light-scattering spectroscopy, (QELSS), a technique here treated at length. American readers should recall that the QELSS term "homodyning" (p 135) is used with the opposite meaning here and in England. The author correctly defines the European usage (which measures  $g^{(1)}(r)$ ), but does not note that the American usage refers to English "self-beating" technique. Line widths obtained, by homodyning, on opposite sides of the Atlantic therefore differ by a factor of 2. The actual treatment of concentration effects in diffusion is sound and accompanied by an ecumenical survey of the recent literature.

As a whole, this volume is cleanly written and provides a first rate introduction to the actual behavior of physical measurements on real macromolecule solutions. I would firmly recommend this volume to graduate students and researchers newly entering the field; those already aware of the topics which S. P. Spragg examines may still find his discussion broadening.

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

**Frontiers of Free Radical Chemistry.** Edited by William A. Pryor. Academic Press, New York. 1980. xiii + 385 pp. \$27.00.

This volume is a collection of papers contributed by the speakers at a Symposium held at Louisiana State University in April, 1979, in honor of the 50th anniversary of the founding of the Baton Rouge Exxon Research and Development Laboratory. According to the preface, the papers are expansions of the presentations made at the Symposium, and hence are more complete surveys of the authors' research areas than would normally be expected in a volume of this type.

The papers are divided into four groups. The first group, which deals with the theory of radical reactivity, includes four papers: The Thermochemistry and Kinetics of Gas Phase Reactions (S. W. Benson); Neutral Thermochemistry from Ionic Reactions (J. I. Brauman); Thermochemistry and Kinetics of Aromatic Radicals (D. M. Golden); and Molecular Distortions and Organic Reactivity: Additions, Cycloadditions, and Free Radical Reactions (K. N. Houk).

The second section, gas-phase reactions, pyrolysis, and cracking, includes An Exercise in Computer Modeling: The High Temperature Pyrolysis of Hydrocarbons (J. N. Bradley); Homogeneous Alkane Cracking: The Route to Quantitative Description to Very High Conversion (J. H. Purnell); Hydrogen Transfer Catalysis in Hydrocarbon Pyrolysis (C. Rebick); The Gas Phase Chemistry of Carbynes (F. C. James, H. K. J. Choi, B. Ruzsicska, O. P. Strausz, and T. N. Bell); and

The Role of Free Radicals in Atmospheric Chemistry (J. A. Kerr).

Fuel chemistry, oxidation, peroxides, and inhibition contains Free Radical Reactions Related to Fuel Research (R. N. Hazlett); Twenty Years of Peroxide Chemistry (R. R. Hiatt); and Inhibition of Hydrocarbon Autoxidation by Sulfur Containing Transition Metal Complexes (J. A. Howard).

The last section on organic processes includes Aliphatic and Aromatic Free Radical Halogenations (J. G. Traynham); Structural and Mechanistic Aspects of Metal Complexes in Free Radical Chemistry (J. K. Kochi); and The Role of Polar Effects and Bond Dissociation Energies on Radical Reactivities Based on a Study of Iodination of Toluenes (W. A. Pryor, D. F. Church, F. Tang, and R. Tang).

The book was printed by a photographic reproduction process. While the type style varies from paper to paper, the overall quality of the reproduction is very high. These minor drawbacks are more than compensated by the timeliness of publication. As its title indicates, the book presents work at the cutting edge of free-radical chemical research and will certainly be of value to specialists as well as to others wishing to keep abreast of developments in this very active field.

Richard G. Scamehorn, *Ripon College*

**The Einstein Myth and the Ives Papers.** Edited with comments by Dean Turner and Richard Hazelett. Devin-Adair, Old Greenwich, Conn. 1979. vii + 313 pp. \$22.50.

This somewhat curious volume brings together some 32 papers, mostly published but including unpublished notes, of the well-known physicist and inventor Herbert E. Ives; a memorial piece on Ives by Oliver Buckley; and a number of pieces by others designed to, in one way or another, induce skepticism regarding the work of Einstein.

The Ives papers are a mixture of straightforward pieces on experimental work regarding Michelson-Morley-type experiments, radiation from moving atomic clocks, etc., and theoretical pieces which, taken together, attempt to provide an account of the well-known phenomena usually taken to support special relativity which eschews Einstein's relativization of simultaneity and all that follows therefrom.

The remaining papers are a curious collection, ranging from C. S. Sherwin's report on Mössbauer effect tests of time dilation, to philosophical "refutations" of relativity (Dingle, Lovejoy, etc.), to a "proof" of the parallel postulate of Euclidean geometry, to pieces by one of the editors (Turner), including a 110-page introductory essay to the volume, attacking relativity from every imaginable direction. While a number of these pieces are not without interest, the degree of misunderstanding of just what relativity says exhibited by the more "philosophical" attempted refutations is sometimes astonishing. Nonetheless, no theory should be uncritically accepted as dogma, and the book, despite its sometimes "cranky" nature, does contain—especially in the papers by Ives—some thoughtful critiques of Einstein and some interesting proposals toward an alternative account of the familiar experimental data.

Lawrence Sklar, *The University of Michigan*

**Immobilized Enzymes. An Introduction and Applications in Biotechnology.** By Michael D. Trevan (The Hatfield Polytechnic). John Wiley and Sons, New York. 1980. xiv + 138 pp.

This is an introductory text and will be of interest to anyone who is seeking a treatment of the subject that is written for the "non-expert". Chapter one describes the techniques of immobilization. This is followed by chapters devoted to the effect of immobilization on enzyme activity, applications of immobilized enzymes, model systems, and immobilization methods. References and a bibliography are included.

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

**Electron and Magnetization Densities in Molecules and Crystals (NATO Study Institute, Series B, Volume 48).** Edited by P. Becker (CNRS, Paris and University of Nancy). Plenum Press, New York. 1980. xiii + 904 pp. \$75.00.

This volume represents the collection of lectures and seminars presented at the NATO Advanced Study Institute held in Arles, France, in the summer of 1978. In addition to presenting the lecture material given by some 19 lecturers, including crystallographers, theoretical chemists, and solid state physicists, during the school, many of the chapters are supplemented by sets of problems, together with their worked solutions, and this feature considerably enhances the utility of the volume to workers and others interested in this rapidly developing field of diffraction physics. The book is divided into five main sections.

Part I, consisting of six chapters, deals with the theoretical concepts involved in one-electron density functions and presents a review of their calculation and their utility in describing the ground state properties of molecules and crystals. Included in this section is a detailed discussion of the role of density functions in descriptions of chemical bonding.

Part II deals with basic diffraction physics and the experimental

problems involved in obtaining accurate X-ray, neutron, and magnetic structure factor data for the determination of electron and spin densities. The topics dealt with here include the kinematical theory of scattering, lattice dynamics and thermal diffuse scattering, the dynamical theory, and extensive discussions of the nature and treatment of extinction. In two very useful chapters directed more toward the experimentalist, in addition to treatment of extinction, aspects such as profile measurement, multiple reflection, and the estimation of experimental errors in the diffraction data are considered.

Part III is concerned with the interpretation and analysis of experimentally derived electron and spin densities in terms of physically interpretable quantities. Topics such as the partitioning of the density function, the treatment of atoms as superpositions of small sets of multipoles, and refinement of population coefficients within the framework of this model are dealt with. In addition, the important matter of the correct modelling of crystal thermal vibrations in analyses of experimental density distributions are treated, the significance of anharmonic contributions being stressed.

Part IV deals with Compton scattering and the determination of momentum density and with high energy electron scattering, while the last part mostly covers applications and the derivation of chemically significant results from experimental density measurements. It is some of the papers in this last section of the book which probably have the most to offer the chemist interested in obtaining a feel for the sort of information that this relatively new field of crystallography has to offer. Apart from this section and the additional one or two chapters (or parts of chapters) in the preceding sections, the contents are rather specialized, however, and being, for the most part, a review of the status of the art of determining electron and spin densities will probably be of only passing interest to chemists and physicists not directly involved in the field.

John S. Wood, *University of Massachusetts*

**Second Symposium on Biotechnology in Energy Production and Conservation.** Edited by Charles D. Scott (Oak Ridge National Laboratory). John Wiley and Sons, New York. 1980. vi + 353 pp. \$35.00.

This collection of papers is divided into five main sections: advanced biotechnology concepts, sources of biomass, pretreatment and chemical or thermal conversion of biomass, bioconversion of biomass, and environmental control and waste management. In addition to the usual topics found in such collections, such as ethanol or methane production, cellulases, and waste disposal, there are several papers devoted to less common topics. These are, separation of heavy metals from aqueous solutions by using "biosorbents", dry anaerobic fermentation, biomass production on sandy deserts by using highly saline water, nitrogen fixation, and others. References are included.

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

**Residue Reviews. Volumes 75 and 76.** Edited by F. A. Gunther and J. D. Gunther. Springer-Verlag, New York. 1980. Volume 75: xiv + 189 pp. Volume 76: viii + 218 pp.

Volume 75 consists of the 14 papers presented at a conference on occupational exposure to pesticides held in Tucson in February 1980. Six of the papers deal with methods for assessing exposure and are related to clinical chemistry. Two are about health effects of exposure, and six are concerned with methods for minimizing the effects of exposure on health. A 6-p section of summaries and recommendations completes this volume.

Volume 76 contains ten assorted papers, ranging from Environmental and Metabolic Transformations of Primary Aromatic Amines through Microbial Agents as Insecticides and Bioassay as a Monitoring Tool to Pesticide Residue Analysis of Water and Sediments.

Both volumes are individually indexed.

**Propylene (Propene): International Thermodynamic Tables of the Fluid State. Volume 7.** Edited by S. Angus, B. Armstrong, and K. M. de Reuck. Pergamon Press, Oxford and New York, 1980. xxiii + 420 pp. \$100.00.

This book is a result of the work of the Thermodynamic Tables Project of the IUPAC Commission on Thermodynamics. Most of it consists of two tables of single-phase properties: molar volume, entropy, enthalpy, internal energy, etc. This section is preceded by 50 pages of text reviewing experimental results and correlating equations, and an introduction to the tables. Short tables of properties on the saturation and melting curves complete the work, which has 19 figures and an almost countless quantity of valuable numbers.