(4) For a review of chemical carcinogenesis, see C. Heidelberger, *Ann. Rev. Biochem.*, **44**, 79 (1975).
(5) (a) M. Newman and S. Blum, *J. Am. Chem. Soc.*, **86**, 5598 (1964); (b) R. G. Harvey, S. Goh, and C. Cortez, *Ibid.*, **97**, 3468 (1975); (c) H. Yagi and D. M. Jerina, *Ibid.*, **97**, 3185 (1975).
(6) G. A. Hamilton, *J. Am. Chem. Soc.*, **86**, 3391 (1964); G. A. Hamilton, *Prog. Bioorg. Chem.*, **1**, 83 (1971); G. A. Hamilton, J. R. Giacin, T. M. Heilman, M. E. Snook, and J. W. Weiler, *Ann. N.Y. Acad. Sci.*, **212**, 4 (1973); G. A. Hamilton in "Molecular Mechanisms of Oxygen Activation", O. Hayaishi, Ed., Academic Press, New York, N.Y., 1974, p 405.
(7) R. E. Keay and G. A. Hamilton, *J. Am. Chem. Soc.*, **97**, 6876 (1975); **98**, 6578 (1976).
(8) S. Krishnan, D. G. Kuhn and G. A. Hamilton, *Tetrahedron Letts.*, 1369 (1977).
(9) Recently Griffin and coworkers reported the peracid epoxidation of some arenes under mild conditions: K. Ishikawa, H. Charles, and G. Griffin, *Tetrahedron Lett.*, 427 (1977).
(10) For general reviews see J. Dockx, *Synthesis*, 441 (1973); E. Dhemlow, *Angew. Chem., Int. Ed. Engl.*, **13**, 170 (1974); W. P. Weber and G. W. Gokel, "Phase Transfer Catalysis in Organic Synthesis", Springer Verlag, Berlin, 1977.
(11) E. Vogel, H. Klug, and M. Ridder, *Angew. Chem., Int. Ed. Engl.*, **15**, 229 (1976).
(12) The *N*-oxides were prepared by oxidation of the corresponding heterocycles with peroxy acids; they gave melting points and spectral data identical with those reported in the literature: J. Mlochowski and K. Kloc, *Rocz. Chem.*, **47**, 727 (1973); E. J. Corey, A. L. Borror, and T. Foglia, *J. Org. Chem.*, **30**, 288 (1965).
(13) For a discussion of the rearrangement of XIII to XIV, see E. C. Taylor and G. Spense, *Chem. Commun.*, 1037 (1968); E. C. Taylor, B. Furth, and M. Pfau, *J. Am. Chem. Soc.*, **87**, 1400 (1965).
(14) Although hypochlorite in the presence of a phase transfer catalyst has not previously been reported to carry out epoxidations, recent reports indicate the system is useful for alcohol oxidations: G. A. Lee and H. H. Freedman, *Tetrahedran Lett.*, 1641 (1976); S. Regen, *J. Org. Chem.*, **42**, 875 (1977).
(15) Preliminary results indicate that the hypochlorite–phase transfer system can be used for the epoxidation of simple alkenes as well as arenes: H, Fonouni and G. A. Hamilton, unpublished results.

S. Krishnan, David G. Kuhn, Gordon A. Hamilton*
Department of Chemistry, The Pennsylvania State University
University Park, Pennsylvania 16802
Received July 5, 1977

Book Reviews

Correction: In the review of "Stereochemistry of Heterocyclic Compounds" (W. L. F. Armarego) that appeared in this Journal [**99**, 5841 (1977)], it was erroneously stated that the book marked the beginning of a new series, "General Heterocyclic Chemistry". In fact, there are four other volumes in the same series, each of which has been reviewed here previously.

Journal of Organometallic Chemistry Library. Volume 3. Organometallic Chemistry Reviews. Edited by D. SEYFERTH (Coordinating Editor, Massachusetts Institute of Technology), A. G. DAVIES (University College, London), E. O. FISCHER (Technische Universität, München), J. F. NORMANT (Universite de Paris VI, Paris), and O. A. REUTOV (University of Moscow). Elsevier Scientific Publishing Co., Amsterdam and New York. 1977. viii + 342 pp. $41.95.

Volume 3 in this series presents seven in-depth reviews dealing with active research areas in main-group and transition-metal organometallic chemistry. Especially timely are the treatments summarizing work on alkaline earth and lanthanide/actinide organometallic compounds. The remaining reviews explore organic peroxides of main groups II and III elements, metal complexes of polypyrazolylborates, recent advances in organotitanium chemistry, and the chemistry of η-arene-η-cyclopentadienyliron cations. All contributions to this volume bear received dates of late 1975 or early 1976, and references to literature appearing in 1976 are included in several of the reviews.

The editors are to be commended for extracting the subject reviews from the *Journal of Organometallic Chemistry* and for bringing them together in separate volumes which are available to all interested chemists. In the past, it was practically impossible for workers at schools not subscribing to the Journal to keep abreast of the subject reviews. In addition, the reviews maintain the high quality which we have come to associate with the majority of original research papers published in the Journal. This volume is therefore strongly recommended to all those working in the areas mentioned.

Charles D. Schaeffer, Jr., *Elizabethtown College*

The Molecular Geometries of Coordination Compounds in the Vapour Phase. By M. HARGITTAI and I. HARGITTAI (Central Research Institute of Chemistry of the Hungarian Academy of Sciences, Budapest). Elsevier Scientific Publishing Co., New York, N.Y. 1977. 276 pp. $30.25.

This book is the English version of a Hungarian book of the same title (1974). During its translation into English it was revised and updated with some references as late as 1974. The book is restricted to a discussion of vapor phase geometries of coordination compounds and claims to be the first comprehensive survey of this field.

The first chapter (approximately 10% of the text) covers general concepts of structure determination, and the remainder is a fairly systematic review and discussion of molecular structures. Later chapters cover: addition compounds (e.g., B-N, B-P, and Al-N complexes), electron-deficient molecules (e.g., boron hydrides, carboranes, metal borohydrides), halogen bridging complexes, salts of oxyacids, polymeric oxides, hydrogen-bonded complexes (e.g., dimers of organic acids, polymeric hydrogen fluoride), and transition metal complexes (complexes of π-acceptor ligands, metallocenes).

The book contains an author and a formula index but no subject index. Because of the specialized subject matter, the book will be of interest mainly to students and researchers in structural chemistry.

Walter O. Siegl, *Ford Motor Company*

Thermal Vibrations in Crystallography. By B. T. M. WILLIS (Atomic Energy Research Establishment, Harwell) and A. W. PRYOR (Australian Atomic Energy Commission, Lucas Heights). Cambridge University Press, London. 1975. xvi + 280 pp. $27.50.

This book is replete with information concerning the nature and effects of thermal vibrations in chemical crystallography. The authors have done a commendable job in presenting a fairly difficult subject area in a clear and concise manner. This book, which encompasses Willis' article (*Acta Crystallogr., Sect. A*, 25, 277 (1969)), not only contains comprehensible mathematical derivations of the essential physics involved, but also contains an abundance of graphs and illustrations which further add clarity to the subject. The refreshingly low concentration of mathematical and typographical errors illustrates the care which the authors have taken in preparing this book.

The first three chapters (Part I) deal primarily with the basic lattice dynamics of crystals—from simple alkali halide crystals to complex molecular crystals, such as hexamethylenetetramine. The reader is given a sound understanding of the manner in which the dynamical equations of motion are solved and how crystal symmetry enters into the calculations. Several sample calculations are given, along with a variety of illustrations of Brillouin zones, various dispersion relations, etc.

Part II of this book (Chapters 4, 5, and 6) is probably of more interest to the practicing crystallographer. Some of the topics which are presented and discussed are: the general expression for the intensity of x-ray scattering by a crystal in thermal motion; the anisotropic temperature-factor coefficients and their symmetry restrictions; the Debye model for the vibrational properties of crystals; anharmonic contributions to the atomic temperature factor; "forbidden reflections"; the rigid-body model for molecular crystals; and the internal mode contribution to the temperature factors of molecular crystals.

Part III (the last three chapters of the book) deals primarily with the thermal diffuse scattering (TDS) of x-rays and with the inelastic scattering of slow neutrons. The mathematics in these chapters, as well as throughout the entire book, are developed and presented in a lucid manner. A welcome sample calculation of the contribution of first-order TDS to the Bragg intensity of a simple alkali halide crystal is given. An appendix on matrix algebra, a bibliography of books on lattice dynamics and inelastic neutron scattering, a complete list of references, and a good index conclude the book. A glossary of symbols follows the preface.

Nearly all crystallographic work reported nowadays ignores the TDS contribution to the Bragg intensities altogether, and it is only a hope, surely not always justified, that the errors introduced are negligible. The book states that thermal parameters become inaccurately small in structure refinement to compensate for the effects of TDS. Yet crystallographers often analyze such inaccurate thermal parameters to learn, with compound inaccuracy perhaps, about the motions of rigid groups within crystals. This book does not tell the crystallographer how badly the omission of a TDS correction can be expected to decrease the reliability, accuracy, and precision of his positional and thermal parameters, or to increase his error indices. Perhaps this important topic has been omitted because it is not amenable to quantitative treatment.

One of us (C.J.S.), in preparing a student seminar on thermal diffuse scattering, found this book to be the most helpful (and current, in a rapidly developing area) by far.

Charles J. Simmons, Karl Seff, *University of Hawaii*

Topics in Enzyme Fermentation and Biotechnology. Volume 1. Edited by ALAN WISEMAN (Department of Biochemistry, University of Surrey, Guildford, England). Halsted Press, a division of John Wiley & Sons, Inc., New York, London, Sydney, and Toronto. 1977. 191 pp. $25.00.

This first volume of a new series reviews specialist topics in detail. It aims to present up-to-date information on enzyme biotechnology and fermentation biotechnology with particular emphasis on the interdisciplinary nature of enzymes and their production of fermentation processes. Volume 1 begins with an introduction to topics in enzyme and fermentation technology. Chapter 2 is devoted to a discussion of regulation of enzyme synthesis in continuous culture. Foam separation of biological materials, aeration of mould and streptomycete culture fluids, enzymic alterations of penicillins and cephalosporins, patenting developments with microorganisms and their products, industrial glucose isomerase and microbial cytochromes P-450, and drug applications complete the following chapters. References are included. This series should be of particular interest to microbiologists and bioengineers working in fermentation industries.

M. C. W. Smith, *University of Michigan*

Advances in Biochemical Engineering. Volume 5. Microbial Products. Edited by T. K. GHOSE (Indian Institute of Technology), A. FIECHTER (Mikrobiologisches Institut, Zurich), and N. BLAKEBROUGH (Department of Chemical Engineering, Birmingham, England). Springer-Verlag, Berlin, Heidelberg, and New York. 1977. 145 pp. $23.80.

This series is designed for engineers, biochemists, and microbiologists involved in biochemical or biosynthetic operations. The first section is devoted to the production of cellulolytic enzymes by fungi. Among the topics discussed are the nature, properties, and mode of action of cellulases, activity determination, microbial source, and production of cellulases. Also included are cultural conditions, pilot plant investigations, induction, repression, and genetic improvement. Nucleic acid damage in thermal inactivation of vegetative microorganisms is discussed next, followed by a chapter devoted to cellular and microbial models in the investigation of mammalian metabolism of xenobiotics. The characterization of mixing in fermenters and the immobilization of whole cells complete this volume. Extensive bibliographies are included in most sections. This series fills a need in bringing together current information that is widely scattered.

M. C. W. Smith, *University of Michigan*

The Enzymes. Volume XIII. Oxidation-Reduction. Part C: Dehydrogenases (II), Oxidases (II), Hydrogen Peroxide Cleavage, Topical Subject Index. Volumes I–XIII. Edited by PAUL D. BOYER (University of California at Los Angeles). Academic Press, New York, N.Y. 1976. xxv + 542 pp. $46.50.

This final volume of the Third Edition of "The Enzymes" contains reviews of glyceraldehyde 3-phosphate dehydrogenase by J. I. Harris and M. Waters, metal-containing flavoprotein dehydrogenases by Y. Hatefi and D. L. Stiggall, flavin-containing dehydrogenases by C. H. Williams, Jr., nicotinamide nucleotide transhydrogenases by J. Rydström, J. B. Hoek, and L. Ernster, cytochrome *c* oxidase by W. S. Caughey, W. J. Wallace, J. A. Volpe, and S. Yoshikawa, cytochrome *c* peroxidase by T. Yonetani, and catalase by G. R. Schonbaum and B. Chance. The individual reviews follow the format of previous volumes in that aspects of the preparation, physical and chemical characterization, and mechanism of action of each enzyme are discussed in critical detail. The reviews provide useful discussions of the properties and mechanisms of action of these enzymes as documented in the literature through 1974 supplemented by experimentation emanating from the reviewers' laboratories or described in manuscripts supplied to the reviewers.

Since this volume completes the Third Edition, some general comments on the entire edition seem appropriate since the publisher is likely considering a Fourth Edition. Greater effort should be made to include reviews of enzymes which are the subject of contemporary research interest such as adenylate cyclase. Secondly, greater editorial supervision should be exercised perhaps using a standard format to make certain that all physical, chemical, and functional properties of each enzyme are documented since the series serve as an important reference resource, that the reviewers judgment of conflicting data be expressed, and that the reviewers area of interest or contributions not dominate the review. Thirdly, the users would greatly benefit by publication of a running cumulative index in each volume rather than delaying such an index for completion of the last volume.

Earle Stellwagen, *University of Iowa*

Ultrashort Light Pulses: Picosecond Techniques and Applications. Edited by S. L. SHAPIRO (University of California, Los Alamos Scientific Laboratory). Springer-Verlag, New York, N.Y. 1977. xii + 389 pp. $42.70.

This rather fine collection of review articles on picosecond light pulses comprises the eighteenth volume of Springer-Verlag's prolific *Topics in Applied Physics* series, which began in 1973 with F. P. Schäfer's excellent "Dye Lasers" and has continued with a wide variety of edited reviews on current laser-related topics. The appearance of "Ultrashort Light Pulses" is particularly timely, because the last five years have brought considerable fruition to experimentalists intent on unravelling the many paradoxes and controversies surrounding the generation, nonlinear optics, and applications of picosecond pulses. This volume is meticulously edited, with little overlap between chapters; the six reviews in succession form an unusually cohesive narrative of much of picosecond spectroscopy's recent evolution.

D. J. Bradley's first chapter on generation deals with the optimal designs of picosecond lasers and amplifiers, ranging from solid-state oscillators to subpicosecond mode-locked cw dye lasers. Though the topic of ultrashort pulse characterization has been alloted to E. P. Ippen and C. V. Shank's measurement techniques chapter, Bradley's own extensive development of streak camera design is wisely reserved for the first chapter. Ippen and Shank's discussion covers autocorrelation methods, Kerr shutter gates, nonlinear optical mixing gating, and several time-resolved measurement strategems peculiar to cw mode-locked lasers. Auston's superb chapter on picosecond nonlinear optics begins with perfunctory accounts of SHG and higher order optical mixing processes, followed by colorful descriptions of picosecond stimulated Raman scattering, self-focussing, and self-phase modulation; briefer sections deal with self-induced transparency, optical rectification, picosecond electrical switches, and much else. D. von der Linde's contribution on picosecond processes in condensed phases surveys Raman probing of vibrational relaxation in molecules and crystals, electronic excitation in solids, and exciton decay in semiconductors. Picosecond applications of particular interest to chemists (e.g., intermolecular energy transfer in solution, orientational relaxation in liquids, photodissociation and electron-transfer processes, internal conversion) are delegated to K. B. Eisenthal, and a final chapter on the picosecond photobiology of photosynthesis, hemoglobin, visual pigments, and DNA is added by the editor with A. J. Campillo.

The quality of organization and perspective maintained in these reviews is uniformly high, and several of the authors have succeeded

in communicating the unique excitement and flavor of picosecond spectroscopy. Auston's chapter is especially effective in contrasting experimental and theoretical picosecond nonlinear optics with their related processes on longer time scales, and von der Linde reveals admirable tutorial expertise in relating the physics of dephasing processes in liquids. As in any work of this scope, there are occasional lapses in critical assessment and literature coverage (Eisenthal's remarks concerning "pulse-stretching" in 265 nm SHG from 530 nm do not apply to the experimental conditions described on p 310, for example), but Shapiro's edition of "Ultrashort Pulses" is nonetheless one of the best available published compilations of picosecond literature references.

Walter S. Struve, *Iowa State University*

Electroanalytical Chemistry. Volume 9. Edited by ALLEN J. BARD (University of Texas). Marcel Dekker, Inc. New York, N.Y. 1976. x + 265 pp. $36.50.

The aim of this series is to review recent applications in the field of modern electroanalytical chemistry. Volume 9 is divided into two parts: "Chemisorption at Electrodes: Hydrogen and Oxygen on Noble Metals and Their Alloys", by R. W. Woods, and "Pulse Radiolysis and Polarography: Electrode Reactions of Short-lived Free Radicals", by A. Henglein.

There is much to recommend and little to criticize in Volume 9. The writing style is uniformly good and readable. Since rigorous mathematical derivations are kept to a minimum, the nonspecialist is not immediately intimidated, while the literature citations that accompany most of the fundamental equations should satisfy the specialist in the field. A large number of charts and diagrams add considerably to the usefulness of the volume. In each chapter, a moderate amount of space has been devoted to description of apparatus and experimental techniques, so that the volume will provide both theoretical background and practical know-how for graduate students undertaking research in these areas. Besides the extensive bibliographies at the end of each chapter, there are also subject and author indexes.

Chaya Venkatachelam, *University of Michigan*

Physical Properties of Textile Fibers. By W. E. MORTON and J. W. S. HEARLE (University of Manchester Institute of Science and Technology). John Wiley & Sons, Inc., New York, N.Y. 1975. xviii + 660 pp. $49.50.

This is a second and expanded edition of a classical monograph on fibers by Professors Morton and Hearle of the University of Manchester Institute of Science and Technology, first published in 1962. It treats the characterization of fiber dimensions, moisture take-up, and mechanical and electrical properties of fibers. The treatment while comprehensive is at an intermediate level, and the book is in general quite readable to both chemists and engineers. It would, except for its exhorbitant price, make a fine textbook for an upper level undergraduate student in textiles. It is an excellent reference for all those involved in fiber and textile research and development.

My own main concern about the book is that it reflects the classical view of fibers taken by textile technologists. The emphasis despite the authors best intentions is clearly on cotton and wool. The problems and views of the synthetic fiber scientist are hardly reflected at all. The changes in fiber properties brought about by variation in melt or solution spinning, drawing, and texturing operations are not addressed. The lack of overlap of this volume with Ziabicki's "Fundamentals of Fibre Formation", recently published by the same company, is striking. Perhaps the influence of Manchester, where the ghost of Richard Arkwright still walks the streets, and its traditions are too strong. Hopefully, the next edition might have a coauthor or consultant from Wilmington, which has other traditions and other ghosts.

James Lindsay White, *University of Tennessee*

Evaluated Kinetic Data on Gas Phase Hydrogen Transfer Reactions of Methyl Radicals. By J. A. KERR and M. J. PARSONAGE (University of Birmingham). Butterworths, London. 1976. viii + 238 pp. £18.00.

This volume covers the extensive literature on the reaction $CH_3\cdot + HR \rightarrow CH_4 + \cdot R$ for over 250 different compounds HR (and DR). Most, but not all, of the R groups are carbon radicals. The body of the book, the "data sheets", contains thermodynamic data where available on reagents and products (from sources only cited generally) for each RH and hence the overall values of $\Delta H°$, $\Delta S°$, and ΔC_p, for abstraction of each type of hydrogen from RH. This is followed by a compilation of all relatively recent kinetic work, presented as the Arrhenius equation constants, and one rate constant. In most cases there are then presented the "preferred rate parameters", as for example, $\log k = 8.02\ (\pm 0.6) - 6.1\ (\pm 1.0)/2.3RT$, together with the temperature range over which these parameters are expected to apply and an error limit on the rate constant k. This latter is somewhat hard to interpret; there are examples where k is assigned error limits of ±150%, which is confusing at the lower limit. When data are presented from several sources, there is often an Arrhenius plot showing the data keyed to the various sources, together with the line based on the preferred parameters. This often shows clearly how the preferred parameters were selected; in other cases the rate at some intermediate temperature is converted to the preferred parameters by assigning the A value (frequently $\log A = \sim 8$ per equivalent hydrogen).

In the first section of the book general methods, including the use of common reference reactions, are described, and reading this section is very illuminating to those of us brought up on directly measured rates in solution. It becomes clear that the problem of measuring these rates with high precision is indeed formidable, and the task of this evaluation becomes highly worthwile. The methods of evaluation appear quite sound within the framework of fitting data to the Arrhenius equation, and the results should be reliable.

It is a specialized field, but to anyone needing the information this book is by far the easiest as well as the most critical and up-to-date source. This reviewer has found it very useful already and recommends it.

Edward S. Lewis, *Rice University*

Group Theoretical Techniques in Quantum Chemistry. By C. D. H. CHISHOLM (The University of Sheffield, England). Academic Press, New York, N.Y. 1976. x + 272 pp. $22.25.

In the past few years many chemists have become familiar with elementary applications of group theory in describing molecular orbitals, molecular excited states, molecular vibrations, etc. This book, published as Volume 5 in the Academic Press Series of Theoretical Chemistry Monographs, aims to close the gap between very elementary texts and advanced works. While it does review the properties of finite molecular symmetry groups, the book is perhaps most useful as an excellent introduction to other types of groups including the symmetric group, continuous groups, double groups, and Lie groups. Indeed, the chapters on the properties and applications of the symmetric and continuous groups comprise the core of the volume. The use of Young tableaux is introduced early (p 78) and referred to extensively. By contrast, the topic of tensor operator analysis is left to the last chapter, with the important Wigner-Eckhart theorem being first presented on p 230. Thus the scope of this book is very different from that of Fano and Racah's "Irreducible Tensorial Sets" or Griffith's "The Irreducible Tensor Method for Molecular Symmetry Groups". There are no problem sections, but numerous illustrative examples are discussed throughout the book.

In summary, this volume represents an important addition to the group theoretical literature. It is especially recommended to quantum chemists wishing to expand both the breadth and depth of their knowledge of group theoretical techniques.

Lawrence L. Lohr, Jr., *University of Michigan*

Reduced Density Matrices in Quantum Chemistry. By E. R. DAVIDSON (University of Washington, Seattle). Academic Press, New York, N.Y. 1976. viii + 136 pp. $17.00.

The formulation of quantum chemical problems in terms of density matrices has led to a large body of research literature in the past 20 years.However, this literature has tended to remain unfamiliar to those not working actively in this field. This book, written as Volume 6 in the Academic Press Series of Theoretical Chemistry Monographs, should increase the awareness of the progress being made in understanding the electronic structure of atoms and molecules through the use of the reduced density matrix. The compact style of this volume, containing 634 numbered equations in 122 pages of text, does not make for easy reading. However, the presentation represents a high level of scholarship, including thorough discussions of the N-representability problem for both first-order and second-order reduced density matrices. Also included is a presentation of results of natural orbital calculations, including some of the author's own important contributions. Thus this volume is highly recommended to quantum

chemists and physicists wishing to become more familiar with the present state-of-the-art in applications of the density matrix formalism.

Lawrence L. Lohr, Jr., *University of Michigan*

Non Linear Laser Spectroscopy. By V. S. LETOKHOV (Institute of Spectroscopy, Academy of Sciences, USSR) and V. P. CHEBOTAYEV (Institute of Semiconductor Physics, Academy of Sciences, USSR). Springer-Verlag, Berlin. 1977. 458 pp., $27.90.

With the field of nonlinear spectroscopy burgeoning at an accelerating pace there is a strong need at this time to stop to summarize and evaluate progress to date, as well as to explore new directions the field is likely to take. This new book has fulfilled this need admirably although the task may seem somewhat difficult. The text is logically constructed and readable by anyone in the field. The derivations are complete and detailed, but assume at least some knowledge of laser optics, advanced electromagnetism, and spectroscopy.

The book opens with a survey of Doppler broadening of spectral lines as a limitation to resolution in traditional spectroscopy and then briefly surveys the major techniques suggested for transcending this limitation. Then the authors examine the theory of resonant interaction between laser radiation and a gas, including a very clear and complete discussion of hole-burning, and saturation. The authors consider the techniques of saturation spectroscopy (Lamb dip techniques), two-photon spectroscopy, and a technique first suggested by one of the authors of trapping particles in a strong standing light wave. The first two techniques are treated in considerable detail since numerous experimental applications have already been achieved, while the latter technique has yet to be attained in the laboratory, and is thus somewhat sketchy.

The book deals almost exclusively with the gas phase although from the title it is not clear that the considerable body of nonlinear laser spectroscopy in solids is to be excluded.

The references are complete and quite detailed and up to date. This book would be extremely valuable to a researcher in the field or a graduate student contemplating research, but of little value for someone who just wants a survey for general knowledge.

John R. Lombardi, *City College, CUNY*

Energetics of Gaseous Ions. By H. M. ROSENSTOCK, K. DRAXL, B. W. STEINER, and J. T. HERRON, *J. Phys. Chem. Ref. Data*, **6**, Suppl. 1 (1977). 783 pp. $65.00 (ACS Members $30.00).

This complete revision of the classic reference work "Ionization Potentials, Appearance Potentials, and Heats of Formation of Gaseous Positive Ions" (IP, AP, and ΔH_f) extends the coverage of literature on positive ion data through 1971. Data from quantum mechanical calculations have been eliminated, but IP values calculated from Rydberg series of the earlier literature and negative ion data through 1973 have been included, as well as an auxiliary table of ΔH_f values of neutral species. Nineteen distinct techniques have been used to determine the positive ion values, whose accuracies vary from ± 0.001 to 10 eV, but most are ≤ 0.5 eV. The data have been critically evaluated; only when it was felt that reliable ΔH_f values could be calculated are these listed, but references are also given to earlier, obsolete, and inferior IP and AP measurements. The introductory material contains an excellent review of the title field for positive and negative ions which should be useful for graduate students in chemistry and physics as well as those utilizing the data, although few references are more recent than 1973. The high scientific caliber of the data, the evaluations, and the text reflect the extensive experience and high stature which the authors have in this field.

The collection and evaluation of reference data is a fundamentally important, but often thankless, task in science. It is hoped that we researchers who stand to benefit in a major way from this 1966–71 update of gaseous ion data can show our appreciation sufficiently to motivate the appearance of a 1972–77 update in the near future.

F. W. McLafferty, *Cornell University*

Comprehensive Chemical Kinetics. Volume 14A. Free-Radical Polymerization. Edited by C. H. BAMFORD (Liverpool) and C. F. H. TIPPER (Liverpool). Elsevier, Amsterdam. 1976. xiii + 594 pp. $102.

The very important class of chain polymerizations which proceed through a free-radical mechanism is extensively treated in this new volume in the series "Comprehensive Chemical Kinetics". It constitutes a valuable addition to the literature on polymerization processes and should be in the library of any institution in which polymer research is being carried out.

The chapters and their authors are "The Kinetics of Free-Radical Polymerization of Vinyl Monomers in Homogeneous Solution" (G. C. Eastmond), "Chain Transfer, Inhibition, and Retardation" (G. C. Eastmond), "Kinetic Data for Homogeneous Free-Radical Polymerizations of Various Monomers" (G. C. Eastmond), "Copolymerization" (G. C. Eastmond and E. G. Smith), "The Reactivity of Monomers and Radicals" (N. C. Billingham and A. D. Jenkins), "Free-Radical Polymerization in Heterogeneous Systems" (N. C. Billingham and A. D. Jenkins), and "The Calculation of Mole-Weight Distributions from Kinetic Schemes" (H. Tompa). The book concludes with a very thorough Subject Index.

J. E. Mark, *University of Cincinnati*

Fourier Transform NMR Techniques: A Practical Approach. By K. MÜLLEN and P. S. PREGOSIN (Eidgenössische Technische Hochschule). Academic Press, New York, N.Y. 1976. vii + 149 pp. $14.75 (£6.80).

This little handbook, which will fit comfortably into your coat pocket or beside your FT NMR spectrometer, is not designed to be comprehensive, but instead contains just enough of the pertinent details to appeal to a broad class of readers. Thus, like a guide in the Peterson wildlife series, this book can be readily used in the field where the observations are to be made. Hence, this is an ideal reference book beside the NMR spectrometer, to be employed by the NMR technician, by students, and by professors alike. The style and content allow easy reading, and we have found that this book can be easily understood by persons of varying backgrounds.

This book would seem to cater strongly to the following types: (1) the NMR technician who does not want to wade through data and equations to find the method or concept to be employed; (2) the researcher who desires to step quickly through the usual mathematical details and "get to it"; (3) the scientist/teacher who wants to get up to date with FT with a minimum of time and fuss.

Theory is treated rather quickly so that the practical aspects of experimental NMR spectroscopy can be handled with some detail. Subject matter includes: a description of coherent wave and pulsed NMR; the computer, how it works, how to use it, and its capabilities and limitations; spectrometer operation, including locking, various modes of decoupling, and suggested sequences for operation; T_1 applications, with fairly substantial tables of T_1 values for representative molecules; common problems encountered, including solvent peak suppression and use of relaxation reagents; structure elucidation and chemical shift assignments, dynamics, and reaction mechanisms. Also, specific examples are given to clarify some of the methods and applications. Various nuclei are discussed, principally C-13, but also N-15, P-31, and others.

This text could also be used for an NMR course. Although by usual standards it is a little short for a full-semester textbook, it should serve as an excellent outline and should be a useful reference book for the student in his future studies.

James L. Marshall, *North Texas State University*

Metal Toxicity in Mammals. Volume 1. By T. D. LUCKEY and B. VENUGOPAL (University of Missouri, Columbia). Plenum Press, New York, N.Y. 1977. x + 238 pp. $27.50.

This volume provides biologists, chemists, and physical scientists with an excellent basis for an understanding of the chemical toxicity of metals and their inorganic compounds in mammalian systems. An introduction to heavy metal toxicity in mammals is provided in the first chapter, while Chapter 2 deals with modes of intake and absorption. Chapter 3 covers the topics of detoxication, excretion, and physiologic homeostasis. Chapter 4 includes an excellent discussion of the physicochemical properties of metals, and the relationship of toxicity to the principle of hard and soft acids and basis is especially cogent. A summary of the carcinogenicity and teratogenicity properties of metal groups is given in Chapter 5, and a general summary and overview are provided in the last chapter. Two appendixes, a glossary, and a reference section complete the book.

The authors have done a superb job of putting together a book which is concise, clear, and very well written. It provides background and understanding to the chemical toxicology field, and this volume will be an invaluable resource to those of us who are not professionals in the field. It really is a splendid book!

William C. Kuryla, *Union Carbide Corporation*