tential. In fact, the results of ref 11 suggest that there is no "double well". However, the dramatic *change* in the IR spectra we predict for $H_3N\cdots H-F$ as a function of amount of H_2O is not dependent on whether the resulting "ionic" $NH_4^+F^-$ will have a single or double proton well.

Experimental work relevant to this study was discussed by Herschbach (D. Herschbach, Lecture at 2nd International Congress of Quantum Chemistry, New Orleans, La., April 1976). He pointed out that in crossed beams of NH_3 and HI, an ion pair was formed only when one additional NH_3 was present. This is analogous to our theoretical study, except: (1) Herschbach used HI, a stronger acid than HF; and (2) he used NH_3 rather than H_2O as solvent. The elucidation of the solvation "forces" required for creating ion pairs thus appears to be a fruitful area for combined theoretical and experimental investigations.

Book Reviews

Principles of Electrochemical Machining. By J. A. McGeough. Wiley/Halsted, New York, N.Y. 1974. 255 pp. $18.75.

This book is a highly specialized one which deals with a new electrochemical process of interest to all engineers. The process of electrochemical machining incorporates two fundamental fields, fluid dynamics and electrochemical engineering, in a very exciting fashion. To the conventional electrochemist it is quite a surprise to find out that the process of electrochemical machining is operating under current densities of 50 A/cm^2, whereas most electrochemists are accustomed to rates in the order of $\mu A/cm^2$ and mA/cm^2. The amazing thing is that the same principles hold in general although the rates of the electrochemical reactions are increased by a factor of up to sixfold. Fluid dynamics is of utmost importance in electrochemical machining because of its role in the removal of heat and mass during the high rate of metal dissolution.

The first 83 pages of the book are dedicated to fundamental review of fluid dynamics and electrochemistry. These reviews are well written and contain important fundamental material. It is not recommended that a newcomer into this field start from this brief review; however, the introductory review is suitable for merging various backgrounds of readers into a common starting point. The second half of the book deals with the technology and research of electrochemical machining. The types of metals, electrolytes, and the dynamics and kinematics of the process are discussed in detail. The last three chapters cover the practical aspects of electromachining: smoothing, shaping, mechanical properties, irregularities, cathode design, and flow patterns. Examples from industrial practice are brought up in the last chapter. The subject index is very useful and the pictures, especially from the studies of Muller, Tobias, and their coworkers, are educational.

In conclusion, this book is well written and incorporates together electrochemistry and fluid dynamics. Its main contribution, beside covering the process of electrochemical machining, is the demonstration that combining two fields can result in significant progress and in this particular case achieving current densities that were unheard of only a few years back.

Jacob Jorné, *Wayne State University*

The Alkaloids. Chemistry and Physiology. Volume XV. Edited by R. H. F. Manske (University of Waterloo). Academic Press, Inc., New York, N.Y. 1975. xv + 315 pp. $39.50.

For more than 25 years, natural products chemists and those interested in the biological properties of secondary plant metabolites have relied on the series "The Alkaloids" by Manske to help them keep pace with progress in the alkaloid field. This latest offering in the series, written in six chapters by authors active in the field of alkaloid research, surely will find similar use.

The volume is arranged according to botanical origin rather than structural type. However, within each chapter, the alkaloids are subdivided into structural classes. Structure elucidation, transformations, synthesis, biosynthesis, and varied coverage of biological properties are given attention.

Chapter 1 brings us up to date on the ergot alkaloids, which were last treated in Volume VIII. Concentrated coverage is given to the peptide alkaloids of lysergic acid and the complex state of biosynthesis.

Alkaloid chemists will welcome, in particular, Chapter 2, "The Daphniphyllum Alkaloids" since this contribution represents the first summary review of these triterpenic alkaloids. The chapter is rich in spectral data and the chemical transformations needed for structure distinction.

Chapter 3 covers the "Amaryllidaceae Alkaloids" and is the longest. Regrettably, the author's style is not always conducive to ready comprehension, and the nonexpert will find annoying the lack of numbering in diverse structures. This criticism aside, the coverage is valuable, continuing earlier treatment of these alkaloids in Volumes II, VI, and XI.

Chapter 4, entitled "The Cyclopeptide Alkaloids", is neatly organized and is easily read, the latter being a tribute to the Editor who translated the original German version. "The Pharmacology and Toxicology of the Papaveraceae Alkaloids" is offered in Chapter 5. The treatment is extensive and thorough as attested by the 691 references, the oldest from 1804, for 36 pages of text. Finally, as is characteristic of recent volumes in the series, the last chapter is committed to alkaloids of unclassified and unknown structure.

"The Alkaloids", according to the Preface, "attempts to review timely topics related to alkaloids". Overall, this volume has succeeded.

Robert T. LaLonde
State University of New York
College of Environmental Science and Forestry

Flame-Retardant Polymeric Materials. Edited by Menachem Lewin (Israel Fiber Institute), S. M. Atlas (Bronx Community College, CUNY), and Eli M. Pearce (Polytechnic Institute of New York). Plenum Press, New York, N.Y. 1975. xii + 457 pp. $45.00.

The editors state that the objectives of this series are varied, and the contributed chapters in this volume show this variability mainly in the depth of coverage given to the respective topics. Fairly extensive chapters dealing with the flameproofing of cellulosics (which places much emphasis on test methods for fabrics), polyamides, and organic coatings are not quite balanced by the briefer coverage given to poly(ethylene terephthalate) or rubber flameproofing. Other chapters concern general aspects of polymer combustion and the flameproofing of protein fibers, polyurethanes, and thermoset resin systems. A treatise by C. P. Fenimore on the candle-type test for polymers is also included.

The editors are to be commended for stressing attention to chemical mechanisms of polymer degradation, combustion, and fire retardation. The varying degrees to which this goal has been met reflect, perhaps, the status of these investigations. Good mechanistic discussions were found in the chapters on polyurethanes, polyamides, and resin systems.

Since the references are generally current through 1973, this volume updates some of the discussion found in Lyons' earlier work. Whether intentional or not, this volume also appears to be directed to an area of interest not emphasized in other recent books in this field, namely the fiber-forming polymers. As a result, it should have particular appeal to scientists involved with fabric flammability.

David F. Lawson, *Central Research Laboratories*
The Firestone Tire & Rubber Company

Higher Excited States of Polyatomic Molecules. Volumes I and II. By MELVIN B. ROBIN (Bell Laboratories). Academic Press, Inc., New York, N.Y. Vol. I: 1974. xvi + 374 pp. $31.00. Vol II: 1975. xii + 418 pp. $39.50.

Until recently the field of vacuum-ultraviolet spectroscopy has been of little interest to those not actively engaged in its development. This has been due both to the specialized nature of the experimental techniques and to the lack of a firm theoretical basis for describing "higher" excited states of molecules. The present two-volume monograph should greatly stimulate the interest of both spectroscopists and quantum chemists in these states, which Robin takes in general as being those which lie between 50 000 and 100 000 cm^{-1} above the ground state. The overall structure of the monograph is largely that of a carefully edited compendium of spectra and derived term values arranged by compound classes and accompanied by detailed discussions of the spectral assignments. The discussions, rather than tables of data, comprise the bulk of the monograph and make it unusually readable. The unifying theme is the combination of data from vacuum-ultraviolet, electron-impact, and photoelectron spectroscopies in order to characterize molecular Rydberg states; little detail is given of the actual instrumentation used. The importance of photoelectron spectroscopy cannot be overstated, which may surprise those not acquainted with its interplay with direct spectroscopic methods; it permits the energies of excited states to be referenced relative to the ionization limits rather than just to the ground state, thus easing the burden on the theoretician who would calculate or explain these energies.

Volume I of the monograph reviews both the theoretical description of Rydberg states and relevant experimental techniques, and then systematically treats various classes of saturated compounds including alkanes, alkyl halides, boron compounds, and oxo compounds. Volume II is largely devoted to unsaturated and aromatic compounds, with short sections on inorganic and biological compounds. The two volumes contain 572 and 852 references, respectively, thus rendering the monograph of great value both to spectroscopists and to quantum chemists wishing to acquaint themselves with many important but unfamiliar features of familiar compounds.

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

Selected Papers of Robert S. Mulliken. Edited by D. A. RAMSAY (National Research Council, Ottawa) and J. HINZE (University of Chicago). The University of Chicago Press, Chicago, Ill. 1975. xvi + 1128 pp. $47.50.

Modern molecular science is deeply indebted to Robert Mulliken for its theoretical development. In preparation for over fifteen years, this volume serves as a very fitting tribute to the scientist awarded the Nobel Prize in Chemistry in 1966 "for his fundamental work concerning chemical bonds and the electronic structure of molecules by the molecular orbital method". Reproduced are 70 of the 237 papers (excluding book reviews and meeting abstracts) which Mulliken published from 1919 through 1974. Those selected span the years 1929–1967, including the 1967 reprint of his 1913 high school salutatorian address, "Electrons: What They Are and What They Do", and encompass the fields of molecular orbital theory, hyperconjugation, band spectra of diatomic molecules, spectra and structure of polyatomic molecules, Rydberg states, and intensities of electronic transitions. The papers are arranged chronologically within subject headings, with each section having a short introduction written by Mulliken for the collection. His important contributions on molecular complexes are not included as they are contained in the book "Molecular Complexes: A Lecture and Reprint Volume", by Mulliken and Person. The present volume contains a complete bibliography of Mulliken's publications and, as added interest, a list of Mulliken's participating colleagues, visiting professors, postdoctoral fellows, and graduate students. The volume should be of particular value to spectroscopists and quantum chemists as well as to future historians of molecular science.

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

The Application of Mathematical Modelling to Process Development and Design. By L. M. ROSE. Halsted Press/Wiley, New York, N.Y. 1974. xiii + 364 pp. $37.50.

Although the title sounds formidable, the author presents mathematical modelling in such a way that someone who has once had the calculus is in a situation where he can derive benefit from a perusal of the text. A mathematical model is a collection of equations that describe some aspects of the behavior of the system being investigated. There are many different mathematical models which are discussed in the book, for example, an economic evaluation of a process would include income, capital expenditures, depreciation, plus operating and raw material costs. A control evaluation would include volumes, pressures, temperatures, lag times, and flow rates. One would use this information in order to optimize the profitability of a process through the use of a computer. The design of the mathematical models is discussed in the first two-thirds of the book. The last third, the appendixes, discuss the methods for solving the mathematical models. Any chemist or chemical engineer involved with process design or development will find this book helpful. The book is an excellent introduction to the applications of mathematical modelling.

George W. Mach, *Lawrence Institute of Technology*

Anomalous Scattering. Edited by S. RAMASESHAN (National Aeronautical Laboratory, Bangalore) and S. C. ABRAHAMS (Bell Laboratories). Munksgaard, Copenhagen. 1975. xi + 539 pp. Dkr. 200.00.

This book contains the proceedings of a 1974 conference on anomalous scattering of x-rays and neutrons, sponsored by the International Union of Crystallography. The 33 invited and refereed papers are arranged in eight chapters, beginning with a historical survey, and continuing with theoretical calculation and experimental measurement of anomalous scattering effects. The remainder of the book, about 400 pages, deals with applications. These include the determination of absolute configuration of molecules and crystals, that is, the Bijvoet experiment and its generalizations, of which to date some 500 examples have been published. Other chapters deal with x-ray intensity measurement in relation to anomalous scattering, with the effect of anomalous scattering (or noncorrection for it) on refined structural parameters, and with the exploitation of anomalous scattering effects in the solution of crystal structures. Over 100 pages are devoted to the important applications of anomalous scattering to the structure analysis of biological macromolecules. A final chapter deals with structure determination using neutron anomalous scattering. A discussion summary is given at the end of each chapter. A detailed 11-page subject index concludes the book.

This book is aimed at a wider readership than its "conference proceedings" format might suggest. Chemical crystallographers and others interested in the experimental basis of structural chemistry will appreciate the choice of contributors and the care shown by the individual authors in developing their subject in an accessible and instructive way. The book is both an effective and readable introduction to the subject of anomalous scattering, and an up-to-date presentation of the state of the art. The aim of the conference, ". . . to result in a book of immediate and continued value to all who measure or make use of anomalous scattering . . .", seems indeed to have been successfully realized. Practicing crystallographers should note that "all who measure . . . anomalous scattering" (consciously or otherwise!) includes everybody.

C. E. Nordman, *University of Michigan*

Computers in Chemistry and Instrumentation. Volume 4. Computer-Assisted Instruction in Chemistry (in two parts). Edited by JAMES S. MATTSON (University of Miami), HARRY B. MARK, JR. (University of Cincinnati), and HUBERT C. MACDONALD, JR. (Koppers Co., Inc.). Marcel Dekker, Inc., New York, N.Y. 1974. Part A (General Approach): xi + 271 pp. $24.50. Part B (Applications): xv + 258 pp. $26.50.

More wheels have been reinvented in this area than any other in chemistry, partly because people entering this area are unaware of what has already been done by others. Other than conference proceedings, this volume is one of few to try to cover the broad range of topics associated with the use of computers in chemical education. Part A includes an overview by Lagowsi which summarizes the pros and cons of CAI; curriculum enrichment with computers using the Pittsburgh CATALYST/PIL system (K. J. Johnson); on-line classroom computing via video projection (R. W. Collins); and practical considerations of computer-assisted instruction including costs (R. L. Ellis and T. A. Atkinson). M. E. Williams presents a review of computer information systems, sources, and services; and F. D. Tabbutt gives an excellent view of analog and hybrid computation, comparing it to digital computation.

Part B includes a description of the use of APL in an interactive laboratory system (T. R. Dehner and B. E. Norcross); computer-based teaching of organic chemistry using PLATO (S. G. Smith and J. R. Ghesquiere), and other applications in physical chemistry (M. Bader); computer-generated repeatable tests (J. W. Moore, F. Prosser, and D. B. Donovan); canned programs (L. Sherman); and an excellent description of computer-simulated unknowns (C. G. Venier and M. G. Reinecke). As might be expected, there is some duplication in these two books, but that allows comparison of techniques and styles. Sophistication of approaches ranges from using an 18 million dollar system down to an unbelievable description of wiring collating machines for computerized homework grading.

The books include very useful author and subject indexes. Anyone just entering this area of work should certainly consult these books, because they provide useful references to the literature and present a reasonable, although uneven view of this field.

W. Todd Wipke, *University of California—Santa Cruz*

Topics in Stereochemistry, Volume 8. Edited by E. L. ELIEL (University of North Carolina) and N. L. ALLINGER (University of Georgia). Interscience/Wiley, New York, N.Y. 1974. 436 pp. $24.50.

This volume, which is dedicated to the memory of J. H. van't Hoff and J. A. Le Bel on the 100th anniversary of the conception of the tetrahedral carbon atom, contains four reviews. N. B. Wilson and J. B. Stothers discuss stereochemical aspects of ^{13}C NMR spectroscopy. They begin by briefly reviewing the basic parameters available, namely, chemical shifts, coupling constants, and relaxation times, and then discuss applications to a wide variety of compounds, from alkanes to polymers and organometallics. Dynamic ^{13}C NMR applications to chemical equilibria and exchange processes are dealt with in a separate section. There is also a separate section dealing with application of T_1 measurements. Proton-enhanced nuclear induction spectroscopy for the observation of ^{13}C resonances in solids is mentioned briefly in one paragraph, but its promise as a useful tool in the future is noted.

R. Bucourt's review on "The Torsion Angle Concept in Conformational Analysis" has a strong emphasis on six-membered rings and fused systems. This useful survey includes a section on conformational transmission effects and is an excellent source of information on the extensive strain-energy calculations published by Bucourt in the French literature.

There has been a continuing interest in boat forms in six-membered rings, and G. M. Kellie and F. G. Riddell review this subject in a critical fashion. Literature claims of nonchair forms have sometimes not been well founded, and pitfalls in determining solution conformations are stressed by the authors.

R. M. Moriarty reviews the stereochemistry of four-membered rings, including fused ring compounds. Extensive structural parameters for a variety of systems are presented and discussed, as is also the puckering motion in cyclobutane and analogous compounds. This review includes sections on the cyclobutyl and related cations formed in solvolysis reactions, on photodimerization reactions, and on rearrangements in sesquiterpenes containing four-membered rings.

All four reviews in this book are well written, and the "coldtype" production, although less pleasant than standard printing, is satisfactory and economical. There is a subject index, but it is a pity that the author index, which was contained in earlier volumes in this series, has been dropped. However, this volume clearly follows the high standard set by previous volumes, and is a valuable addition to the literature on stereochemistry.

Frank A. L. Anet, *University of California, Los Angeles*

Enzyme Handbook: Supplement I. By THOMAS E. BARMAN. Springer-Verlag, New York—Heidelberg—Berlin. 1974. 517 pp. $21.30.

This Supplement to the "Enzyme Handbook" published in 1969 provides molecular and catalytic data on 430 enzymes which have been described since that date. Data on about half of the newly described enzymes is presented in the Supplement; others are listed in Enzyme Nomenclature, Recommendations (1972) of the International Union of Pure and Applied Chemistry and the International Union of Biochemistry. This Supplement utilizes the current Enzyme Commission numbering system and lists changes in numbering that apply to the original Handbook.

As in the "Enzyme Handbook," enzymes are listed serially following the Enzyme Commission numbering system. Data provided include equilibrium constant, molecular weight, sources, specific activities and substrate specificities of enzymes from various sources, inhibitors, K_m values, relative velocities, metal-ion requirements, and references to the literature from which the data are abstracted. In some cases, catalytic properties are described briefly. The Supplement contains literature citations through September 1973.

The Supplement extends the usefulness of the "Enzyme Handbook" by increasing the number of enzymes covered to more than 1200. The listing in Enzyme Nomenclature includes approximately 3000 enzymes, however, so the Handbook with its Supplement provides an incomplete source of information. The basis for selection of entries is not stated. The Supplement will be of value in libraries and reading rooms and to individuals interested in comparative properties of enzymes and in searching the literature for known enzyme activities.

Robert Barker, *Michigan State University*

Specialist Periodical Reports. Organometallic Chemistry. Volume 4. Senior Reporters: E. W. ABEL (University of Exeter) and F. G. A. STONE (University of Bristol). Reporters: D. A. Armitage, B. L. Booth, N. G. Connelly, J. A. Connor, M. Cooke, D. A. Edwards, S. K. Gupta, J. P. Maher, Lj. Manojlović-Muir, K. W. Muir, T. Onak, S. D. Robinson, J. L. Wardell, W. E. Watts, and C. White. The Chemical Society, London. 1975. xv + 497 pp. $74.25.

This volume (No. 4) of the Specialist Periodical Reports of Organometallic Chemistry contains a review of the literature published in this area of research during 1974. Organo derivatives of the main-group metals are surveyed according to element groups, whereas compounds of the transition metals are reviewed by ligands (e.g., metal carbonyls, hydrocarbon–metal π complexes, etc.) or other common features (e.g., organometallic compounds containing metal–metal bonds, etc.), as well as by reactions (e.g., oxidative addition and related reactions, homogeneous catalysis by transition complexes, etc.). The concluding chapter provides a survey of diffraction and x-ray studies of organometallic compounds of both the main-group and transition elements, including a brief discussion of selected molecular structures.

Despite the enormity of this area of research, there are few omissions of literature references in this volume, which incidentally is of variable size. The presentation of the materials is clear and concise. Frequently, the subject under review is presented in a critical manner and not merely as a survey.

The Chemical Society (London) should be praised for having initiated this series of specialist reports. Moreover, the individuals, both senior reporters and reporters, responsible for the preparation of this volume deserve every congratulation for their genuine effort in producing an excellent account of the scientific advances made in the area of organometallic chemistry. This and the preceding volumes in the series are indispensable for active researchers in organometallic chemistry.

Avi Efraty, *Rutgers, The State University of New Jersey*

Chemical Oceanography. Volumes 1 and 2. Second Edition. Edited by J. P. RILEY and G. SKIRROW (University of Liverpool). Academic Press, London—New York—San Francisco. 1975. Vol. 1: xx + 606 pp. $49.00. Vol. 2: xx + 647 pp. $51.50.

A decade has passed since the original publication of "Chemical Oceanography". This second volume is a totally expanded and updated version that appears to be even more useful and excellent than the first edition.

The reviewer has only had an opportunity to read Volumes 1 and 2 but is aware of the contents of Volumes 3 and 4. The first edition consisted of 22 chapters by 18 authors as compared to the latest edition of 23 chapters by 27 authors. Many chapters deal with topics not covered or briefly covered in the first edition, and those chapters covering the same material as the first edition have been completely rewritten and updated.

Some of the new chapters include reasoned discussions on the use of the sea as a "rubbish bin" and updated material derived from the Deep Sea Drilling Project. Chemical oceanographers should be especially pleased with the chapters dealing with sea water as an electrolyte system, with speciation and with aspects of colloid chemistry as well as the many dealings with analytical methodology especially in organic chemistry. The marine geologist should be very interested in the chapters on sedimentary cycling and the evolution of

sea water, oceanic and estuarine mixing processes, and the hydrochemistry of land-locked basins and fjords. The marine biologist should also be interested in the updated chapter on oceanic and estuarine mixing processes but especially the chapters on biological and chemical aspects of dissolved organic matter in sea water and primary productivity. Aside from these major revisions and additions, the Appendix has been greatly expanded.

An added attraction as far as this reviewer is concerned is that most of the chapters in the second edition have been written by authors other than those that produced the first edition, and thus the second edition is considerably different from the first, which makes the second edition really much more than a rewritten or updated first edition and maintains the first edition as a viable and useful resource. Therefore I suggest that those individuals possessing the first edition to acquire the second and keep them side by side as a valuable and continuously usable component of their scientific library. Those without the first edition will do well with this second edition.

The book cover frontispiece of this second edition suggests "this second edition of a much used and highly praised work will be invaluable to research workers in oceanography, to those newly entering the field, and to those in peripheral study areas, such as marine biologists and geologists", and I agree whole heartedly with this opinion. In all honesty, my review took longer than it should because I became quite interested in many sections and read considerable portions of Volumes 1 and 2 in detail. As a marine micropaleontologist with a relatively poor background in chemistry, I have found much of general interest and quite a bit that helps my own research and teaching directly.

In conclusion, I would have bought this edition had I not been given a free copy to review of course. That is a very strong recommendation.

Richard E. Casey, *Rice University*

Amino-acids, Peptides, and Proteins. Volume 7 (Specialist Periodical Reports). Senior Reporter: R. C. SHEPPARD (MRC Laboratory of Molecular Biology, Cambridge). The Chemical Society, London. 1976. xvi + 431 pp. £ 21.00.

This seventh annual survey of peptide chemistry covers the literature for 1974. The topics covered include primary structure, x-ray structure, conformation, chemical modification, and synthesis of peptides and proteins; atypical peptides; amino acids; and metal derivatives. The section on chemical structure and biological activity, which dealt mainly with peptide hormones in the preceding two volumes, presently covers only the enzymes.

This series of annual reviews on amino acids, peptide, and proteins is a valuable tool for the research chemist. It is also most useful for those who wish to gain quick access to recent results in the peptide field. Although temporal and financial constraints preclude an encyclopedic survey of the annual literature, the senior reporter and his 20 reporters continue to provide a balanced and stimulating summary of current peptide research. The major fault with this series is the absence of a subject index to augment the extensive author index.

Bruce W. Erickson, *The Rockefeller University*

Hydrodynamic Fluctuations, Broken Symmetry, and Correlation Functions. By DIETER FORSTER (Temple University). W. A. Benjamin, Inc., Reading, Mass. 1975. xix + 326 pp. $19.50 (cloth), $13.50 (paper).

Many experiments in chemistry and physics consist in studying the response of a bulk medium to an external probe such as optical photons, x-rays, electrons, or neutrons. The observed spectrum of inelastic scattering characterizes the long-lived collective modes associated with oscillations of the target's density, charge, magnetization, or other attributes. The present book addresses these and related questions in a lively style (apart from the unexpected use of rationalized cgs electrical units), providing a unified framework based on correlation functions and the memory-function formalism. Its interesting examples range from the familiar Brillouin and Rayleigh scattering in a compressible viscous fluid to condensed systems with long-range order, like permanent magnets, charged and neutral superfluids, and nematic liquid crystals. Each of these topics comprises a separate chapter that reviews the relevant experimental facts and then applies the memory-function method. Thus, in principle, the book is suitable for individual study as well as for classroom use in relatively advanced graduate courses. It is not elementary, however, for it expects a sophisticated knowledge of Fourier and Laplace transforms and complex variables, well beyond those of an average first-year graduate student in chemistry or physics. Regrettably, neither the text nor the references provide guidance for a reader with deficient mathematics, and most instructors will likely want to introduce supplementary material. In this regard, the book might have benefitted from a more complete treatment of the analytic properties of the simplest correlation functions in Chapter 2. Subsequent reference to such discussions could have made the text more accessible for independent study. Otherwise, I found the book carefully prepared and stimulating, and recommend it both for the fundamental topic and for the varied applications.

Alexander L. Fetter, *Stanford University*

Encyclopedia of Electrochemistry of the Elements. Volume IV. Edited by A. J. BARD (University of Texas at Austin). Marcel Dekker, Inc., New York, N.Y. 1975. xv + 465 pp. $79.50.

With the availability now of four volumes of Part I (inorganic electrochemistry; organic electrochemistry will be the domain of Part II) of the series, one can begin to grasp the immense scope of this ambitious project. It is a relief especially for electrochemists to know the entire encyclopedia will conform to a single carefully formulated scheme of symbols and format as outlined in identical volume introductions. The organizational chart at the start facilitates the location of each element chapter since publication is in order of editorial receipt. This volume chart lists alphabetically, with their Gmelin numbers, 103 elements, 37 of which have been now covered in the first four volumes. With four chapters on group VI elements written by the same author, this volume deals with nine elements in nine chapters, namely Sb, F, Au, Tl, Sn, S, Se, Te, and Po, and includes a subject index just for Volume IV. The user needs to be aware that elements other than these nine will appear in this index as compounds of the chapter element when the latter has the higher classification number. Thus zinc (no. 19), lead (no. 28), and some other metal compounds of gold (no. 40) appear in this volume and index even though the chapter on lead is in Volume I and zinc has not yet appeared.

Each chapter has been compiled by an expert in the field, and the truth of this fact is borne out on careful scrutiny of known specifics. Nearly any reviewer would obviously be at a loss to pass judgment on an entire volume, let alone even a single chapter as regards overall scientific accuracy which from all outward appearances is high. There is an exceptional absence of printing and citation errors, and the authors have struck an excellent balance between the space conserving but uninformative form nearly approaching the mere listing of reference titles, and the strong temptation to generate a complete abstract for each citation. The result is a reference volume (and probably an entire encyclopedia) which fills that desperate need for the reader to quickly form an overall perspective of an element's electrochemistry, a perspective sufficiently detailed to perhaps suggest immediate research activity, but not so detailed that the suggestion drowns in facts; yet the facts are still there if needed in the copious supply of references.

The degree to which these general comments apply to each chapter varies, of course, with the author. To a larger extent, however, this variation seems to depend on the amount and kind of electrochemistry that has been done. Fluorine electrochemistry (38 pages, 196 references), because of its obvious difficulties, tends to represent mostly technologically significant areas (e.g., fluorine evolution) and is much more limited in scope than the extensive electrochemistry of gold (81 pages, 342 references), for example. From the 81 pages devoted to sulfur electrochemistry, one might conclude this to be as extensive as that of gold except for the smaller number (176) of references. Whatever is the admixture of the author's style with the artifacts of a possible translation that results in this less compact format for sulfur, it does not detract from the virtue of balance mentioned above. The scarcity of the element, finally, is the main reason for the brevity of the shortest chapter on polonium (9 pages, 23 references).

Electrochemists especially will now appreciate having access to this latest expansion of the encyclopedia as much as they will anticipate the extensive coverages of elements yet to come such as H, C, Pd, Ag, Pt, Hg, and others. It should be an acquisition of high priority for all scientific libraries serving electrochemists or their research.

Bruce B. Graves, *Eastern Michigan University*

Foreign Compound Metabolism in Mammals. Volume 3. Senior Reporter: D. E. HATHWAY (Imperial Chemical Industries). The Chemical Society, London. 1975. xvi + 727 pp. $52.

Metabolism of foreign compounds by mammals is an area which

has attracted increasing attention from chemists in the past several years due to the recognition that many adverse biological effects of drugs and other xenobiotic substances are the result of highly chemically reactive metabolites. The book is the third volume in a series of Specialist Perodical Reports which are of substantial value both to those working the field and those wishing to enter it. Over 2000 references are cited to cover the two-year period 1972–1973 and are accompanied by useful compound and author indexes. As was the case for the earlier volumes in the series, chapters on drug kinetics, biotransformations, mechanisms of biotransformations, and species, strain, and sex differences are presented. New areas covered consist of environmental and toxicological perspectives as well as neonatal pharmacology. A particularly satisfying aspect of this volume is the critical evaluation made in certain instances where data are possibly questionable or their interpretation is open to question in terms of mechanism. Unfortunately, the rapid pace of research in drug metabolism has already made the present volume somewhat out of date.

Donald M. Jerina, *National Institute of Arthritis, Metabolism and Digestive Diseases National Institutes of Health*

Inorganic Syntheses. Volume XVI. Edited by FRED BASOLO (Northwestern University). McGraw-Hill Book Co., New York, N.Y. 1976. xii + 257 pp. $22.95.

Volume XVI maintains the high quality of preceding members of this series. Seven topical areas include 130 thoroughly detailed and checked syntheses of a broad range of compounds. The chapters are: Metal Nitrosyl Complexes; Metal Carbonyl Compounds; Werner Type Metal Complexes; Other Transition Metal Complexes; Main-Group and Actinide Compounds; Ligands Used to Prepare Metal Complexes; and Compounds of Biological Interest. Two areas are particularly strong in this volume. The chapter on metal nitrosyls describes the preparation and properties of 30 complexes, covering ten different metals. Chapter 6 adds a novel touch by describing the synthesis of a variety of mono- and polydentate ligands, most of which contain phosphorus donor groups, that are required in the preparation of complexes of current research interest. In addition, the chapter on Compounds of Biological Interest includes preparation of the cyclam ligand, purification and synthetic procedures for two common porphyrin systems, and preparation of several other complexes of interest to bioinorganic chemists. This area deserves to be continued and expanded in a future volume.

Although an index to compounds in Volume XVI is included, the omission of the very useful cumulative index format is a disappointment. Hopefully, this feature will be restored in subsequent members of this outstanding series.

James H. Krueger, *Oregon State University*

Physical Chemistry. An Advanced Treatise. Volume VIB. Kinetics of Gas Reactions. Edited by HENRY EYRING, DOUGLAS HENDERSON, and WILHELM JOST. Academic Press, New York, N.Y. 1975. xxii + 1032 pp. $49.50.

This series attempts to provide a comprehensive treatment of physical chemistry at an advanced level in a series of articles by distinguished investigators in various fields. Since elementary theory and facts have not been excluded from the presentations, the articles can serve the dual function of introducing the basic concepts and reviewing recent advances in an area. Volume VIB completes the discussion of gas kinetics begun in Volume VIA. Volume VII will deal with kinetics in condensed phases.

The three chapters in Volume VIB that deal chiefly with experimental material ("Elastic and Reactive Scattering of Ions on Molecules" by A. Henglein, "Atom Reactions" by Juergen Wolfrum, and "Relaxation Methods in Gases" by A. B. Callear) fulfill the dual purpose quite admirably. In addition, Callear's article is a very comprehensive review of his subject. In the articles dealing primarily with theoretical matters ("Collision Processes, Theory of Elastic Scattering" by H. Pauly; "Unimolecular Reactions: Experiments and Theories" by Jürgen Troe; and "Interaction of Chemical Reactions, Transport Processes, and Flow" by K. H. Hoyermann), it is more difficult to satisfy the function of introducing the subject in the space allowed. However, each of these is carefully written, with a unique viewpoint of its topic, and is worthwhile reading for those with some background in the area.

References through 1974 are included in all of the articles. As an efficient medium for both reviewing and keeping current in important areas of chemical kinetics and molecular dynamics, this volume is greatly praised. It is recommended for chemical libraries and for researchers in these fields.

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