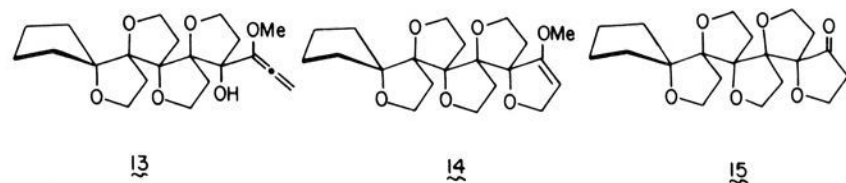


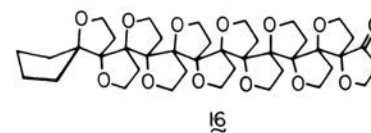
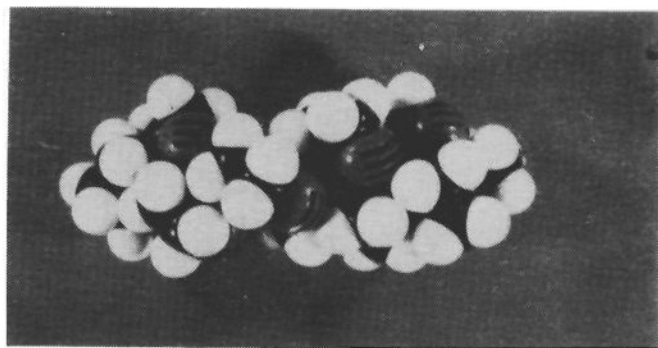
Figure 1.

to  $R = 0.08$  for the 3085 diffractometer measured intensities. Both molecules in the asymmetric unit have the same geometry and Figure 1 is a computer-generated drawing of them.

Cyclopentyl[4]helixane **12** was treated with  $\alpha$ -lithio- $\alpha$ -methoxyallene to give the adduct **13** (90%),<sup>13</sup> which cyclized to **14** when exposed to  $\text{KO}^t\text{Bu}$  (0.1 equiv)/ $\text{HO}^t\text{Bu}$ /18-crown-6 (0.05 equiv); acid hydrolysis (6 N  $\text{H}_2\text{SO}_4$ ) of **14** gave cyclopentyl[5]helixane **15**, mp 195–197 °C. Again **12** has only one face of the carbonyl group available for nucleophilic addition, and as a result **15** is a single, stereochemically pure compound. It should be noted that **15** has five quaternary carbons adjacent to one another in the carbon backbone, and each quaternary carbon is part of a tertiary ether function.



One can in principle continue this *reiterative* reaction and make extended versions of **15** such as the cyclopentyl[12]-helixane **16** (see CPK model photograph) where the helicity



is more readily seen. We are pursuing this objective and the more general concept of synthesizing primary helical molecules, along with studies of their physical and chemical properties.

**Acknowledgments.** P.M. thanks the National Institutes of Health (GM25231-01) for their support and J. C. thanks NIH-NCI-CA24487 for their support.

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- (10) All yields refer to distilled or recrystallized pure compounds. All new compounds were characterized by IR, NMR, MS, and microanalytical data.
- (11) The naming of these compounds is as follows: **6**, 1,11-dioxadispiro[4.0.4.3]tridecan-4-one; **9**, 1,12,15-trioxatrispiro[4.0.0.4.3.3]heptadecan-4-one; **12**, 1,13,16,19-tetraoxatetraspiro[4.0.0.0.4.3.3.3]heneicosan-4-one; **15**, 1,14,17,20,23-pentaoxapentaspriro[4.0.0.0.0.4.3.3.3.3]pentacosan-4-one. A more descriptive system of naming is to use the prefix cyclopentyl to indicate the starting carbonyl compound, the suffix helixane to indicate the helical nature of the total molecule, and a number to indicate the number of spiro linkages. Thus **6** becomes cyclopentyl[2]helixane; **9** becomes cyclopentyl[3]helixane; **12** becomes cyclopentyl[4]helixane; **15** becomes cyclopentyl[5]helixane. Sherry Anthony (*Chemical Abstracts*) is thanked for the naming of these compounds.
- (12) Formulas from **6** on are drawn without spatial implications.
- (13) If the addition of  $\alpha$ -lithio- $\alpha$ -methoxyallene is carried out twice, the yield of **10** is increased to 90%. The reported yield of **13** was obtained in this way.

David Gange, Philip Magnus\*

The Evans Chemistry Laboratory, The Ohio State University  
Columbus, Ohio 43210

Lawrence Bass, Edward V. Arnold, Jon Clardy\*

Baker Laboratory, Department of Chemistry  
Cornell University, Ithaca, New York 14853

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## Book Reviews\*

**The Pendulum and the Toxic Cloud.** By THOMAS WHITESIDE (New Yorker Magazine). Yale University Press, New Haven, Conn. 1979. 205 pp. \$4.95 paper, \$15.00 cloth.

The story of tetrachlorodibenzodioxin, the extraordinarily toxic substance produced in the manufacture of the herbicide 2,4,5-trichlorophenoxyacetic acid, which it sometimes contaminates, is the subject of this book. It focusses on the infamous industrial accident at Seveso, Italy, in 1977, but reviews the whole field in perspective. The treatment of the subject is suitable for the informed layman, but

documentation is very thorough, and the book can be recommended to the chemist who wishes to become well acquainted with the matter. A five-page index is included.

**Modern Cost Engineering: Methods and Data.** By Chemical Engineering Magazine staff. McGraw-Hill Book Co., New York. 1979. 579 pp. \$35.00.

The contents of this book have been collected from *Chemical Engineering* magazine articles over the past decade. The treatment is of engineering in general, but with emphasis on chemical plants. A large quantity of useful information is presented in text, tables, and

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

graphic displays. There is no index, but the table of contents is fairly detailed.

**Handbook of U.S. Colorants for Foods, Drugs and Cosmetics.** By DANIEL L. MARMION. John Wiley & Sons, New York. 1979. 350 pp. \$21.50.

Coloring agents for foods, drugs, and cosmetics have commanded greatly increased public attention in recent years because of concern with their possibly toxic effects. The literature on them is scattered, although the total number of colorants certified for use in the USA is rather small. In this book, the information is brought together under three rubrics: History, Regulation, Description, and Use; Colorant Analysis; Resolution of Mixtures and Analysis of Commercial Products. Some spectra and thermograms are illustrated, and specific laboratory directions are given as part of the last topic. There are many tables, good bibliographies, a substantial index, and a glossary of special terms. The chemist not specifically concerned with colorants will find the first section informative and interesting, for it provides one with the background to answer the inevitable questions asked by one's family, one's colleagues, and the general public (notably absent is information on toxicity; certified colorants are, of course, believed to be nontoxic).

**Synthetic Methods of Organic Chemistry. Volume 33.** Edited by W. THEILHEIMER. S. Karger AG, CH-4011, Basel, Switzerland. 1979. xvi + 596 pp. \$324.75.

The new methods of preparative value reported between 1976 and 1978 have been compiled by the editor and a staff of collaborators in the meticulous manner that organic chemists have learned to expect. There are no changes to the highly organized classification method, which is supplemented as usual by a very thorough index (cumulative for Volumes 31–33). The series continues to be a source of key references in a form suited both to quick visual inspection (lots of equations) and to systematic retrieval. A five-page introductory section, "Trends in Synthetic Organic Chemistry 1979", constitutes the only discursive part beyond the preface. In succinct form it draws attention to such subjects as the use of solid, polymer-based catalysts, new applications of tosylhydrazones, and an advantageous and safer substitute for diazomethane as a methylating agent, trimethylsulfonium hydroxide.

The price of this book will shock most readers, and may even make them think more tolerantly of OPEC! But like oil, it is hard to get along without it.

**Flame Retardancy of Polymeric Materials. Volume 5.** Edited by W. C. KURYLA and A. J. PAPA. Marcel Dekker, Inc., New York. 1979. 200 pp. \$29.75.

This volume is concerned with flame-retarded textiles, and provides an integrated review of the principles and technology in three chapters: Flame Retardance of Cotton and Other Naturally Occurring Cellulosic Polymers, Flammability and Flame Retardation of Cotton-Polyester Blends, and Red Phosphorus as a Flame Retardant. The last title should cause most chemists to stare in disbelief, but it is seriously meant. The discoverer of the effect, H. Piechota, wrote in 1965: "elementary red phosphorus—as strange as it may sound—is in fact a flame retardant of excellent effectiveness". Those who want to know how and why will have to read the chapter.

**Residue Reviews. Volume 71.** Edited by F. A. GUNTHER and J. D. GUNTHER. Springer-Verlag, New York. 1979. ix + 181 pp. \$22.00.

The latest volume in this series, which is devoted to the chemistry and biology of residues in foods of pesticides and similar substances, consists of three contributed chapters: Chemical Methods for the Analysis of Veterinary Drug Residues in Foods (J. J. Ryan and H. A. McLeod); Physical and Chemical Properties of Fly Ash from Coal-Fired Power Plants (A. L. Paze, A. A. Elseewi, and I. R. Straughan), and Impact of Biological and Chemical Mosquito Control Agents on Nontarget Biota in Aquatic Ecosystems (M. S. Mulla, G. Majori, and A. A. Arata).

**Strained Organic Molecules.** By ARTHUR GREENBERG and JOEL F. LIEBMAN. Academic Press, New York. 1978. xi + 406 pp. \$41.50.

This book is an attempt to review and organize the vast field of strained organic molecules. The work expands on the authors' review article [*Chem. Rev.*, 76, 311 (1976)] and naturally contains more information and more recent references.

In Chapter 1, energy and entropy are considered with special em-

phasis on thermochemistry and the origins of molecular strain. The most important parts of the book are Chapters 2 and 3 on cyclopropane, cyclobutane, and other unique strained groupings including bicyclic, spirocyclic, and bridged hydrocarbons, distorted alkenes, alkynes and aromatic rings, and tetrahedrane. Chapter 4 deals with polycyclic hydrocarbons with special emphasis on adamantane and related compounds. Chapter 5 considers kinetic and thermodynamic stability and includes sections on strained heterocycles, the transition metal chemistry of strained molecules, and the effects of substituents. In the last chapter, the authors consider distorted forms of carbon such as planar carbon and inverted tetrahedra in propellanes, paddlanes, and fenestrane, with a final section on five- and six-coordinate carbon.

"Strained Organic Molecules" is written in a highly readable style, and the authors have injected commentary at many points suggesting interesting experiments, interpretations, and molecules to be considered for synthesis. The approach is pedagogical. The literature is covered in about 1900 references through June of 1977, and a short addendum extends the coverage to the end of 1977. The subject index is adequate, but there is no author index.

The authors are to be commended on a successful endeavor. Chemists interested in strained molecules will want to have this stimulating book in their libraries, and graduate students will find it a valuable introduction to the field.

John R. Wiseman, Israel Agranat, *The University of Michigan*

**Carbon-13 NMR Spectroscopy. Second Edition.** By E. BREITMAIER (Universität Bonn) and W. VOELTER (Universität Tübingen). Verlag Chemie, Weinheim, West Germany, and New York. 1978. xiii + 344 pp. \$50.00.

The field of  $^{13}\text{C}$  NMR is expanding at such a rapid rate that the periodic revision of textbooks and reference works is almost mandatory. The second edition of this excellent monograph is most welcome and hopefully portends more frequent future revisions and expanded coverage.

It is inevitable that comparison be made with the standard texts in the field, specifically "Carbon-13 Nuclear Magnetic Resonance for Organic Chemists" by G. C. Levy and G. L. Nelson and "Carbon-13 NMR Spectroscopy" by J. B. Stothers. Both of these were published in 1972. The former is an excellent introduction to the routine use of  $^{13}\text{C}$  NMR for identification and characterization of organic compounds. Stothers' book provides a more comprehensive theoretical background and a more extensive tabulation of chemical shift data. Breitmaier and Voelter's monograph is similar to Stothers' in presenting NMR theory at a level for serious spectroscopists. However, it is generally more readable and contains better descriptions of several advanced techniques now being used routinely—evaluation of relaxation parameters ( $T_1$  and  $T_2$ ) and coupling constants. In addition, Chapter 3 is a unique survey of "spectral parameters and structural properties". This collection of brief descriptions summarizes important trends and common effects, giving one a "feel" for  $^{13}\text{C}$  NMR that otherwise takes years to develop. Among others are included the effects on chemical shifts of hybridization, conjugation, steric interactions, solvent and concentration changes, and protonation. Also given are extensive discussions of one-, two-, and three-bond coupling constants between  $^{13}\text{C}$  and  $^1\text{H}$ ,  $^2\text{H}$ ,  $^{13}\text{C}$ ,  $^{15}\text{N}$ ,  $^{19}\text{F}$ , and others. The excellent theoretical introduction to relaxation in Chapter 2 is extended to evaluation of experimental results in Chapter 3.

The most valuable application of this monograph is as a general reference of chemical shifts and coupling constants. The tables comprising the last half of the book cover the entire spectrum of organic and biochemistry from simple alkanes to heterocycles, from carbohydrates and steroids to nucleosides and peptides. The only major area not covered is synthetic polymers, an inexcusable omission in view of the importance and amount of effort devoted to this field. The text accompanying these tables includes relevant discussions of Hammett relationships,  $T_1$  determinations, isotopic labeling, and metabolic pathways, for example.

In short, this is the best currently available single-volume introduction to and reference on  $^{13}\text{C}$  NMR spectroscopy.

Lon J. Mathias, *Auburn University*

**Polymer Fracture.** By H. H. KAUSCH (Ecole Polytechnique Federale de Lausanne). Springer-Verlag, New York. 1979. x + 332 pp. \$59.00.

This book represents the most authoritative monograph on polymer fracture in existence. The author presents the macroscopic aspects

and problems of fracture and then proceeds to elegantly unfold the quantum mechanical, molecular, morphological, environmental, and kinetic processes controlling deformation and fracture properties in a variety of polymers. The book is divided into nine chapters with 867 bibliographical references. Each chapter contains sufficient basic material and original contributions which could potentially be expanded into a separate book. The author has spared the reader the ordeal of this perusal and has condensed each chapter into a package of succinct critical knowledge abounding in precise qualitative descriptions of fracture processes usually supported by quantitative examples or comparative analyses. He has obviously sifted through a myriad of experimental data and related theoretical interpretations in a very successful endeavor to reduce a vast and sometimes vague domain of macroscopic and molecular fracture studies to a level of physical logic.

The book is not a review article or edited collection of works, but, at the same time, it does contain a comprehensive discussion of the important fracture theories and related experimental methods. For example, Chapter 3 delivers an excellent critique of statistical, continuum mechanical, and rate process theories of fracture which would be very useful to the macroscopic or molecular analyst of polymer fracture. Chapters 4 and 5 respectively discuss the strength of bonding in polymers, and mechanical excitation of chains under various deformation conditions. An interesting discussion of the stress-strain curve of a single chain is presented in terms of entropic and internal energetic arguments. Chapter 6 contains an in-depth description of ESR (or EPR) spectra and mechanically formed free radicals which prepares the reader for the excellent treatment of molecular fracture outlined in Chapters 7 and 8. While ESR is the author's forte and this technique has been used extensively to measure polymer chain fracture, other techniques such as IR, electron microscopy, and X-ray are discussed and presented with equal ease. The book ends with a terse presentation of the mechanics of polymer chains in materials with spatially heterogeneous fracture processes, e.g., crack propagation and crazing in amorphous polymers. The microstructural arguments portrayed in the latter chapter are noteworthy.

Generally, aspects of fracture not alluded to in considerable detail are, with few exceptions, properly referenced for the reader to pursue elsewhere. On the negative side, this reviewer would like to have seen more discussion or inclusion of the following points: (a) the time dependence or probability for chain scission at a particular stress depends on the interaction of the local phonon spectrum with the chain via its temperature-dependent nonlinear potential strain energy function; this probability is not necessarily defined by a modified Arrhenius description used by most kinetic theories of fracture particularly with regard to the morphology dependence of the local phonon interaction with the chain; (b) literature values of single chain moduli vary by several factors depending on temperature, strain, and method of measurement; (c) mass spectroscopy studies of chain fracture have been ignored; (d) the role of secondary bonding in fracture of multi-component systems such as block copolymers and composites deserves more attention; and (e) the very important corollary to fracture, i.e., crack healing, should have been emphasized. The book also suffers from the lack of an authors' index.

In summary, this reviewer considers this book to be the most important single work on polymer fracture available in the literature. It is certainly prescribed reading for any student or researcher with interests in molecular, microstructural, or macroscopic aspects of fracture. The book is well written with a scholarly style and the chapters are appropriately integrated. It is suitable technical reading for chemists, physicists, engineers, and material scientists, with sufficient generality for undergraduates and complexity for graduate students—or vice versa. This book is highly recommended.

**Richard P. Wool**, *University of Illinois at Urbana-Champaign*

**Chemical Reactor Theory: A Review.** Edited by L. LAPIDUS (Princeton) and N. R. AMUNDSON (University of Minnesota). Prentice-Hall, Inc., Englewood Cliffs, N.J. 1977. viii + 856 pp. \$28.00.

A former editor of the *American Scientist* refused to have edited books reviewed in his Sigma Xi periodical. The reason was that such books were already reviews and should a review be reviewed? As usual, there are exceptions to any wise rule. The collection of thirteen reviews on all of the current aspects of chemical reactor theory is a notable exception. Indeed, the book is an outstanding summary of the most productive segment of academic chemical engineering during the past twenty-five years. In 1955, there was very little theory behind the

design and operation of chemical reactors. Today, there exists an elaborate and solid edifice, built by many distinguished university researchers all over the world, many of whom are represented among the writers and editors of the book which is properly dedicated to Princeton's R. H. Wilhelm who was himself a great animator of this creative burst in contemporary chemical engineering. The review deals critically with mathematics of reaction networks, catalytic kinetics, coupling between kinetics and diffusion of heat or mass, basic morphology of stirred, tubular, fixed bed, fluidized bed, and monolithic reactors, biological and polymerization systems, periodic phenomena in reaction and reactor kinetics, and control theory of chemical reactors. In my opinion, the book is a definitive state-of-the-art work for the next ten years.

This excellent review should be consulted by practicing chemical engineers who want to know what their academic brethren have been doing for them, by chemists who may believe that chemical engineering is mostly fluid mechanics, and by anyone interested in contributing to the next twenty-five years of the new science of chemical reactors. The past has been largely macroscopic, as admirably described in this book. The future will be microscopic, in the reactor applications of state-to-state kinetics, kinetic relaxation spectrometry, non-steady-state behavior, and new coupled phenomena like magnetically stabilized fluidized beds, shape-selective catalysis, physicochemical spontaneous or forced oscillations, and photoelectrocatalysis.

**Michel Boudart**, *Stanford University*

**Excuse Me Sir, Would You Like to Buy a Kilo of Isopropyl Bromide?** By MAX G. GERGEL. Published by Pierce Chemical Co., Rockford, Ill. 1979. i + 193 pp. \$?

This story written in autobiographical form covers the life of Max G. Gergel from 1934 when he was a student in junior high school to 1977 when he retired from heading a chemical company which he had built up over the years. While still in high school he acquired a job cleaning laboratories and equipment in the university in his home town and started making chemical compounds with equipment and chemicals borrowed (?) as well as with discarded material from the university. After graduating from the university with a degree in chemical engineering, he set up a chemical company, an operation that required help of family members as well as friends.

The manufacture of alkyl halides was one of the principal operations of his company over the years. Other materials included sulfur compounds which led to unpleasant relations with the neighbors. When the company developed an industrial section, it listed soap powder, concrete cleaner for service stations, insecticides, rat killer, antifreeze, termite and roach exterminators, and antiwetting treatment for fabrics. The tales about their experiences with the manufacture and sale of some of these materials is often amusing, for example, the sale of the antiwetting agent to a diaper laundry.

Most of the latter part of the book is devoted to the chemists who were his friends in both industrial and educational circles. The presentation of his work and problems, including his draft deferments, in WW II, make delightfully amusing reading.

**Leigh C. Anderson**, *University of Michigan*

**Multiphoton Processes (Proceedings of an International Conference at the University of Rochester, Rochester, N.Y., June 6-9, 1977).** Edited by J. H. EBERLY, (University of Rochester) and P. LAMBROPOULOS (University of Southern California). John Wiley & Sons, Inc., New York. xx + 419 pp. \$24.95.

This book contains the 29 papers presented at the conference grouped under six main topics: Quantum Electrodynamics and Electrons in Intense Fields; Strong Field Resonance Fluorescence; Atomic Multiphoton Processes; Coherence and Resonance Effects; Molecular Multiphoton Processes; and Collisions in Intense Fields. As might be expected the contributions are somewhat uneven in depth and clarity, and, as is typical in a very active field, they are more brief research reports rather than in-depth reviews.

The first three papers discuss the fundamental formulations of the interaction of intense radiation fields and matter, particularly in the limit of very high field strengths. In the rest of the book formulations of the problem in terms of dressed atoms (a good introduction is given by Cohen-Tannoudji et al.), the rotating wave approximation, or other simpler approaches are used without apology. In the remainder of the book also experimental and theoretical work is interspersed, with some comparison of the two.

Throughout the book the emphasis is generally on the progress

toward understanding the poorly understood phenomena rather than reviewing what is well known. Thus for the two-level systems discussed in Section Two, the effects of finite bandwidth of radiation and of variations with intensity are presented. In Section Three, the emphasis is on the differences between intermediate resonant and nonresonant multiphoton ionization and excitation of atoms, and the comparison of experiment and theory. In Section Four, these problems are explored more fully, and the effects of photon statistics, coherence, and photon correlations are emphasized in several very good experimental and theoretical papers. Those by Gontier and Trahin, Armstrong and Feneville, and Mainfray are exceptionally worthwhile.

The status of molecular multiphoton dissociation is well presented by the set of papers in Section Five. As usual, the major topic is SF<sub>6</sub>, but the contributions of Cantrell, Galbraith, and Ackerhalt to the knowledge of the lower vibrational state distributions in the presence of anharmonic splittings, the confirmation of the general features of the quasi-continuum model in the elegant two IR laser experiments of Letokhov, and the complementary beam experiments of Lee et al. represent a fascinating review of the current (1977) knowledge on the subject. In the final article of this section, Karlov presents a good discussion of what is not well understood about MPD and reasonable speculations thereon. The final section, on collision processes, is very brief and most qualitative. Vinogradov, however, gives an interesting comparison of the quantum and classical approaches to electron scattering in intense laser fields.

In summary, given the relatively sophisticated experimental and theoretical subject matter and the relative brevity of most of the papers, this book will be a valuable status report for scientists knowledgeable in the field, but will be less useful as an introduction or survey for the general scientific public.

John C. Light, *The University of Chicago*

**Catalyse de contact—Conception, preparation et mise en oeuvre des catalyseurs industriels.** By J. F. LE PAGE. Éditions Technip, Paris. 1978. xxxii + 622 pp. 480 FF.

In the introduction, J. Limido says, "I am aware of no group of workers whose domain of competence covers kinetic studies, heterogeneous catalytic reactions, preparation of catalysts, optimization of catalysts and their application to industrial installations which has ever shared its knowledge by uniting all of these aspects into one book . . ." The group in question consists of the members of the French Institute of Petroleum. Twelve names follow that of J. F. Le Page on the title page, but the book is a well-integrated whole, not a series of essays by specialists.

The book is indeed unusual. The book contains an introduction to heterogeneous catalysis and sections on such matters as catalytic kinetics, adsorption, the determination of the chemical and textural properties of solid catalysts, and correlations in catalytic activity and selectivity. These sections are useful but not unusual. However, some other sections cover material rarely seen in print in the detail given here. For example, there is a section which treats the requirements of a successful industrial catalyst and which outlines procedures used in developing one, and there is a section which provides detailed descriptions of the preparation of supports and catalysts on a large scale. The material of this last section is largely general knowledge among an international but quite restricted group of people, but it rarely appears in print in any detail because industrial organizations are understandably reluctant to permit their employees to publish such matters—3% might turn out not to be general knowledge. The sections on the determination of the mechanical and catalytic properties of catalysts and on the nature and characteristics of various types of catalytic reactors contain less "unusual" material, but these sections provide a unified treatment of these matters which is not commonly found.

The book closes with six chapters, each of which gives a detailed history of the course of the successful commercial development of a catalyst and reactor system for a particular reaction. The reactions are: the hydrogenation of benzene (a Raney nickel); the oxidation of methanol to formaldehyde (an iron molybdate); the selective hydrogenation of dienes and other gum-formers from gasoline feed stocks (a poisoned, supported nickel); the "hydropurification" of petroleum stocks (removal of S, N, O, and, if desired, the hydrogenation of arenes and olefins) (cobalt-molybdenum sulfides and nickel-tungsten sulfides); hydrotreating stocks for lubricating oils (nickel-molybdenum oxides on silica-alumina); and re-forming (Pt/acidic alumina first and later bimetallic catalysts). Although some proprietary items may have been omitted from these chapters, they provide, nonetheless,

detailed pictures of the courses of development from scientific bases and kinetics through such real world items as lifetime, sensitivity to poisons, mechanical strength, regenerability, the choice of a reactor and auxiliary equipment, and cost.

Any person starting work in any position related to heterogeneous catalysis would profit greatly from studying this book, but experienced workers in catalysis, both academic and industrial, would find a number of sections from which they would profit.

Robert L. Burwell, Jr., *Northwestern University*

**The Scientist as Editor: Guidelines for Editors of Books and Journals.** By M. O'CONNOR (Senior Editor, Ciba Foundation, London, England). John Wiley & Sons, Inc., New York/Toronto. 1979. vi + 218 pp. \$12.50.

The days are long past when a scientist-researcher could establish his own journal and thus become, without benefit of natural or other independent selection, an editor (as did, e.g., Hoppe-Seyler with his *Zeitschrift für Physiologische Chemie*, or Liebig with his *Annalen der Chemie*). Possibly the closest contemporary approach to that idyllic situation is the monograph, but even here the author(s) face(s) the editorial staff and the concerns of the publisher. (Even Liebig and Hoppe-Seyler presumably had to deal with the printing and publishing establishments of their times.) Editors of journals—and of most multi-authored serial and nonserial books, including conference proceedings—are chosen as (or induced to become) editors by others, such as learned societies or commercial publishers. Usually the person so selected is, or has recently been, a working scientist whose chief contact with scientific communication (with its twin imperatives that "science is not done until it is published" and "publish or perish") is as an author, a petitioner before another (seemingly) omniscient and all-powerful editor. From his experiences, which begin with his first tentative essays, the author is apt to develop a rather distorted concept of an editor's duties and responsibilities.

Usually, this concept takes into account only the interaction between editor and author, with little if any awareness of the responsibilities of the editor to other authors, as well as to readers, publishers, financial interests (society or commercial), librarians, abstractors, data-retrieval services, etc., as well as to the author himself in aiding him to put his best foot forward and to make his most effective contribution to the advancement of knowledge. The latter effort is often construed by the author, trained to be an individualist in his research, as obstructionism, the former concerns as immaterial or inconsequential. As a result of such ideas, the author, who began, and may still be, unskilled in the art of communication, finds himself an amateur in, or at least untrained for, the complex interactions revolving about him when he becomes an editor; these range from the intuitive and psychological to the hard realities of the publishing business. Few, if any, editors (defined as those whose names appear as such in the publications) come to their exalted, if often misunderstood, positions as trained professionals, conversant with all aspects of their new craft.

This book deals, in some cases in exhaustive detail, with all of these aspects. There are chapters or sections on: guiding authors; creative and substantive editing (ranging from proper language to total reorganization); refereeing; technical editing; printing requirements and modes of printing (present and impending); nomenclature, tables, and figures; proof reading; as well as on the problems associated with the management of conference proceedings and invited papers for multi-authored books. Each of these chapters is organized into sections with appropriate subheadings, for quick and accurate reference, and each has its own series of references to other writings on the subject. A series of appendixes deal with, and give well-considered examples of, such specific items as: contracts, copyrights, letters to potential contributors of invited papers, guidelines for authors and for referees, international recommendations on citations of references, and a list of associations of editors.

Since the book covers all major types of scientific publications—journals, multi-authored review-type books (serial or not), and conference proceedings—there is much in it that will seem not to be pertinent to one engaged in just one or two of these types. However, most working scientists have contact with all of these at one time or another in their careers, as authors or as one-time editors, so that the breadth of coverage is useful to all. Engagingly written, and with sufficient anecdotal material to enliven the more general description of duties and responsibilities, this book could well be made as much a part of the training of young scientists as (should be) the Instructions to Authors of major journals (in their fields), Style Manuals (e.g., that

of Council of Biology Editors), and Handbooks for Authors (e.g., that of American Chemical Society).

Present, well-settled editors may not learn much from this book, although they will enjoy the presentation of the problems they must solve. Most have learned most of it the hard way and could, if so motivated, write similarly. But novices, and those whose experiences are limited, will find much to consider. This is especially true if they construe their primary function to be the advancement of knowledge: moving novel ideas and findings clearly, succinctly, completely, unambiguously, and economically from the mind of each progenitor into the minds of potentially interested readers. The "how" to accomplish this, from helping the author to ensuring the best reception, is what editing and this book are all about.

Waldo E. Cohn, *Biology Division, Oak Ridge National Laboratory*

**Methods in Enzymology. Volume 53. Biomembranes. Part D: Biological Oxidations—Mitochondrial and Microbial Systems.** Edited by SIDNEY FLEISHER (Vanderbilt University) and LESTER PACKER (University of California, Berkeley). Academic Press, New York, 1978. xxii + 731 pp. \$45.00.

This volume is the fourth of seven "biomembrane" volumes within the "Methods in Enzymology" series. Fleisher and Packer have edited the entire series. That seven volumes are needed is evidence of the importance and broad application of membrane biochemistry. This volume is subdivided into six sections: electron transport complexes, cytochromes, nonheme metalloproteins, flavoproteins, quinones, and other microbial electron transport systems.

Most of the 61 chapters describe the purification and characterization of enzymes, complexes, or redox chromophores. Though not regimented to a format, these analytical chapters generally adhere to the format familiar to those who have referred to earlier numbers in this series. These volumes have been invaluable to graduate students and others new to a field because they allow the author to guide his reader through the procedure, almost as if they were together in the laboratory. This volume, too, is frequently punctuated with statements of caution and of pitfalls to avoid, statements frequently disallowed in primary publication for lack of substantiation.

Whereas most of the chapters are only likely to be read by those with a vital interest in the subject, I direct the casual reader to Ljungdahl and Andreessen's chapter on formate dehydrogenase. Their description of the rigorous anaerobic conditions needed even during purification and assay of this enzyme will evoke in the reader both admiration at their fortitude and a mental note never to work with such a system.

The editors are to be complimented on heading several of the sections with introductions. These chapters range from a short discussion of the preliminary separations of electron transport complexes to an extensive review of flavoproteins. I recommend this approach as long as the chapter is short and limited to placing the subsequent chapters within a context. Such specific overviews would enhance the usefulness of this series for novices.

Those active in biomembrane research should have a copy of Volume 53 at their disposal. Of course, all biochemistry libraries should have this and every other volume in the series.

Patrick L. Coleman, *E. I. du Pont de Nemours & Co., Inc.*

**Physical Chemistry.** By R. A. ALBERTY and F. DANIELS (MIT). John Wiley & Sons, Inc., New York, 1979. xii + 682 pp. \$19.95.

Alberty and Daniels' Fifth Edition is the latest revision of a virtual institution in chemistry teaching, tracing its direct lineage to Frederick Getman's original work in 1913, and now carried on by Robert Alberty. Not fundamentally changed from the Fourth, this edition is likely to keep old friends, and convert few new ones. More satisfactory treatments of the Second Law (via Carnot cycles) and some aspects of quantum mechanics and statistical mechanics must please most people, but one has a general feeling that the author really has little hope of his audience understanding difficult things in depth. The conceptual stumbling blocks, such as entropy, partition functions, symmetry arguments, activity, are treated without a serious or successful attempt at conveying insight. Many other topics which lend themselves to interesting quantitative development receive only a descriptive survey—on the whole, not a book for the bright and inquiring student.

Befitting a classic, the presentation is middle-of-the-road. Everything is touched on; few things are singled out for an extra spark of interest. The development is often exceptionally lucid, seldom stimulating. My only serious quarrel with the overall construction is the

chapter on symmetry; it is condensed and hard to learn from, but the painfully acquired methods and concepts are not motivated by any serious range of application, nor are they used at all in the rest of the book. Especially in the rather sketchy spectroscopy chapter, opportunities are passed by to illuminate and enliven with symmetry arguments. Modern developments in molecular beam and laser chemistry are also given short shrift.

It is amusing to try to find mistakes or misleading statements; the book is very carefully written, and the game is generally unrewarding. One, however (p 301): the molecular wave function is *not* "an eigenfunction of the symmetry operations".

Another quibble: Authors who reproduce Maxwell's "proof" of the Maxwell distribution of velocities ought to point out that it is not in fact a proof, but only a derivation from the non-obvious assumption of independence of velocity components; a true proof from transparent postulates is not trivial.

I don't like the problems: they are almost exclusively of the most routine and tedious plug-in variety. Little to stretch the mind or offer a new perspective. The current enthusiasm for changing and renaming units poses a hopeless problem to the textbook author in this field; Alberty's compromise between conventional units and SI units seems a reasonable one.

Well and clearly written, modest in its mathematical expectations, with a solid flavor of biological relevance, this will continue to be a popular choice for the less high-powered sort of physical chemistry course.

R. C. Dunbar, *Case Western Reserve University*

**Treatise on Analytical Chemistry. Part II: Analytical Chemistry of Inorganic and Organic Compounds. Section A: Systematic Analytical Chemistry of the Elements. Volume 10: Antimony, Arsenic, Boron, Carbon, Molybdenum, Tungsten.** Edited by I. M. KOLTHOFF (University of Minnesota) and P. J. ELVING (University of Michigan). Wiley-Interscience, New York, 1978. xviii + 566 pp. \$34.50.

Volume 10 now completes the series of the first 15 volumes comprising Part II of the "Treatise on Analytical Chemistry". Volume 16, in preparation, will complete Part II. The chapters in this volume follow, at the same high level of excellence, the organization format of their predecessors. The background material that provides an added dimension to an understanding and appreciation of the analytical chemistry of these elements is all there: natural occurrence, the general chemistry of the elements, and chemical and physical properties. The analytical aspects deal with detection, identification, separation, isolation, and, of course, determination. The various categories of methods are described briefly but clearly, and adequately for determining the best approach to a specific problem. Laboratory procedures are also provided, selected on the basis of their generality, and breadth of application. Original references provide access to additional details in specific situations.

Documentation is impressive, particularly in the cases of molybdenum and tungsten, each chapter having over a thousand references. An especially good job has been done in the seemingly impossible job of treating the analytical chemistry of carbon in 100 pages, at no sacrifice of significant detail.

The book will be of value to anyone interested in the general chemistry of these elements, as well as their analytical chemistry. This would include students, research workers, and analytical chemists in a wide variety of environments.

J. F. Flagg, *UOP Inc.*

**Pericyclic Reactions. Volume II.** Edited by A. P. MARCHAND and R. E. LEHR (University of Oklahoma). Academic Press, New York, 1977. 327 pp. \$35.00.

Under the heading "Pericyclic Reactions" one can include a large number of topics that are of interest to organic chemists. The first volume in the series had chapters dealing with both theoretical and practical aspects of molecular orbital theory applied to molecular pericyclic transformations (H. E. Zimmerman and Lehr-Marchand). It also included excellent review articles on pericyclic reactions of carbenes (W. M. Jones and U. H. Brinker) and carbanions (S. W. Staley). This mixture of theory and reviews on particular molecular types is continued in the second volume.

The first chapter on carbocations (T. S. Sorenson and A. Rauk) covers electrocyclic conversions, cycloadditions and cycloreversions, sigmatropic rearrangements, and the ideas of cationic stabilization by unusual orbital topologies. The expert will appreciate the literature

references which are reasonably complete through 1975. A second chapter on cumulenes maintains a high standard with a good review and list of references on cycloaddition reactions of ketenes, allenes, and ketenimines. Frontier molecular orbital theory is used successfully throughout the review to rationalize chemical reactivity in these systems. Shorter chapters on chelotropic reactions (W. L. Mock) and thermally forbidden hydrocarbon rearrangements (J. E. Baldwin) are also interesting and usefully blend theory with discussions of experimental results. The longest chapter is titled "Applications of Frontier Molecular Orbital Theory to Pericyclic Reactions" (K. N. Houk). It contains a very good review of earlier theoretical work, particularly on cycloadditions, and gives clear expositions of how to do frontier MO calculations.

Each one of the chapters in this book is of interest to both experts and the general reader. It is a good addition to the literature of organic chemistry.

William C. Herndon, *The University of Texas at El Paso*

**Physics of Superionic Conductors (Topics in Current Physics, Volume 15).** Edited by M. B. SALAMON. Springer-Verlag, Berlin-Heidelberg-New York, 1979. xii + 255 pp. Cloth DM 59; U.S. ca. \$32.50.

The class of solid materials known as "superionic conductors", or "solid electrolytes", is characterized by the liquid-like conduction of an ionic species within a rigid framework. As the title of the book indicates, the emphasis is placed on the physics of ionic conduction in solids. The eight independent contributions adhere to a central theme of providing a complete and fundamental picture of the superionic phase which exhibits both solid and liquid-like properties. Consideration of the structural and spectroscopic techniques used to characterize this new solid phase receives primary focus, although this is supplemented with discussions on current theories and models of ionic conduction.

The level and depth of the presentations allow the newcomer to gain familiarity with the field, yet the experienced researcher will generally find previously unpublished results and new insights. Although the understanding of this field is far from complete, this is a quite successful attempt to present a unified summary of the properties and principles of superionic conduction.

Specific topics are indicated in the following list of contributions: Introduction (M. B. Salamon); Structure and Its Influence on Superionic Conduction: EXAFS Studies (J. B. Boyce and T. M. Hayes); Neutron Scattering Studies of Superionic Conductors (S. M. Shapiro and F. Reidinger); Statics and Dynamics of Lattice Gas Models (H. V. Beyeler, P. Brüesch, L. Pietronero, W. R. Schneider, S. Strässler, and H. R. Zeller); Light Scattering in Superionic Conductors (M. J. Delaney and S. Ushioda); Magnetic Resonance in Superionic Conductors (P. M. Richards); Phase Transitions in Ionic Conductors (M. B. Salamon); Continuous Stochastic Models (T. Geisel).

Albert Highe, *California Institute of Technology*

**Principles of Enzymatic Analysis.** Edited by H. U. BERGMAYER with K. GAWEHN. Verlag Chemie, Weinheim-New York, 1977. xvi + 260 pp. \$23.80.

The use of enzymes as analytical tools is now a standard practice in both clinical and research laboratories. Because of their specificity, enzymes are ideal probes for the determination of the indigenous concentrations of substances in complex mixtures such as those found in a tissue homogenate or extracellular fluid. As defined by the editors, Enzymatic Analysis includes not only the determination of the concentration of compounds by the use of enzyme and enzyme-labeled reagents but also the determination of the catalytic activities of enzymes in biological materials.

This book, which is derived from "Section A" of the same editors' invaluable compendium, "Methods of Enzymatic Analysis", covers both the theoretical and practical aspects of the subject. Although much of the material has been carried over with slight expansion from the previous version, there are significant additions such as the sections dealing with Enzyme-Immunoassays. The treatment of the theoretical aspects of enzymatic analysis is somewhat terse, in many places, but this defect is compensated by ample references to the appropriate literature and copious use of practical numerical examples. The section on statistical treatment of data, while considerably condensed, is still quite useful. About one-half of the book is devoted to the practical aspects of the subject. Topics such as the storage and stability of reagents and samples, the types and operation of micro and macro vol-

ume measuring and dispensing devices, and the types of automated analyzers are considered. There is also a survey of the operational principles of the various instrumental techniques used to follow enzyme reactions, of which spectrofluorescence is conspicuously omitted. Unfortunately the material on cell and tissue preparation that was in the original "Section A" has not been included in this volume.

This is not the type of book that one will consult repeatedly over the course of years of work; however, it does contain a wealth of valuable theoretical and practical information that would make it extremely useful to those commencing their use of enzymes as analytical reagents. As such it is an essential complement to future editions of "Methods of Enzymatic Analysis", and both should be in any central or departmental library.

Robert C. Rosenberg, *Howard University*

**Radiation Processing (two volumes).** Edited by J. SILVERMAN and A. R. VANDYKEN. Pergamon Press, Inc., New York, 1977. 885 pp. \$100.00 for 2 volumes.

This volume represents an important milestone in the use of high-energy radiation, both isotopic and machine-generated electrons, for industrial processing. The two volumes contain the proceedings of the "First International Meeting on Radiation Processing" held in Puerto Rico in May 1976. The meeting itself was a great success with the participation of more than 300 delegates from 22 countries. The two volumes are quite separate and different in design and content. The first volume contains 22 invited papers and presents an overview of the various basic areas of the subject. It is of considerable value in the sense that it presents the basic principles and hence has an educational value, but it also brings the reader up to date on the latest developments of the field in a general way. It includes discussions of basic and applied radiation chemistry including sterilization, crosslinking, grafting, and polymerization. Important engineering concepts are discussed including dosimetry, source design, shielding, and other practical considerations in the large-scale use of high-energy radiation. In addition, a review of the current uses of high-energy radiation is presented.

The second volume contains 44 contributed papers describing new work. These are grouped under somewhat similar general headings to those presented in Volume I. Included are original papers concerned with applied radiation chemistry and technology, engineering aspects, dosimetry, and sterilization and a series of papers on new and promising applications of high energy radiation. These two volumes will be read with interest by all who have a present or potential interest in the field. The "Second International Meeting on Radiation Processing" and its proceedings will be awaited with considerable excitement and interest.

V. T. Stannett, *North Carolina State University*

**Laser-Induced Processes in Molecules.** Edited by K. L. KOMPA (Max-Planck-Institut für Laserforschung, Garching) and S. D. SMITH (Heriot-Watt University, Edinburgh). Springer Series in Chemical Physics No. 6, Springer-Verlag, Berlin-Heidelberg-New York, 1979. xiv + 367 pp. \$32.50.

This book contains the proceedings of the European Physical Society Divisional Conference held at Heriot-Watt University, Edinburgh, Scotland, on 20-22 September 1978. There are 95 brief papers, almost all on chemical and spectroscopic applications of lasers. Among the more interesting "nuggets" to be found in this volume are reports on killing cancer cells with a laser (p 19), on diode-infrared laser double resonance in SF<sub>6</sub> (p 37), and on early work in multiphoton ionization mass spectrometry (pp 6, 219). There are seven papers on multiple infrared photon excitation of SF<sub>6</sub>; in addition, laser-induced chemistry is reported for CH<sub>3</sub>OH, CH<sub>3</sub>NC, CH<sub>3</sub>NH<sub>2</sub>, C<sub>2</sub>F<sub>5</sub>Cl, CH<sub>3</sub>CF<sub>2</sub>Cl, H<sub>2</sub>CO, (C<sub>2</sub>H<sub>4</sub>)<sub>2</sub>, BCl<sub>3</sub>, and cyclobutane.

As is the case with all proceedings volumes of this type, none of the articles serves as a definitive reference on any one topic. It is very useful, however, to have all these articles together in the same place. With this volume in hand, the interested researcher can proceed to use the author indexes of the basic research journals in the field with maximum efficiency. The individual articles are, by and large, attractively prepared, although not all of them conform to the stringent standards for camera-ready copy laid down by Springer-Verlag. Aside from a glaring error in the title of the very first article in the book, the overall quality of the volume is quite high. This book will be a useful reference to anyone who is keeping up with the rapidly proliferating applications of lasers to chemistry and molecular physics.

Jeffrey I. Steinfeld, *Massachusetts Institute of Technology*