

## Book Reviews\*

**Modeling in the Technology of Wastewater Treatment.** By Imre Horvath (Post-Graduate Training Institute for Engineers and Managers, Budapest, Hungary). Pergamon Press: Oxford, England. 1984. 202 pp. \$40.00 ISBN 0-08-023978-1.

This book was written to relate the applications of scale-up methods, similarity theory, and dimensional analysis of wastewater treatment. The very brief introduction simply reminds us that converting results of model studies to pilot plant and to operating plant scale is not a simple matter. The author notes with pleasure his observation that more and more sophisticated scale-up considerations have been brought to bear in wastewater technology in recent years. This sets the stage for a critical review of the literature on this subject. This review comprises about three-fourths of the book and deals with a wide variety of equipment commonly used in wastewater treatment (e.g. filters, settling basins, chemical reactors, etc.). Throughout this long chapter, the reader must be prepared to go slowly and to digest a heavy dose of mathematics to gain the full meaning of the comparisons. The author succeeds in being fully consistent in the use of the many abbreviations and symbols for a very wide variety of terms. An introductory table of nomenclature and symbols is very helpful in keeping track of the many symbols used throughout the book.

This is then followed by a very thorough chapter on the applications of similitude in activated sludge treatment. Various operating parameters are defined mathematically and then related to the problems of scaling from one size to another. Most of this chapter deals with the author's own original research over the past two decades. A chapter called Economic Similarity brings the book nearly to an end. In this chapter, the costs associated with scaling up or down are considered. This chapter is easier reading for the non-engineer than any of the earlier material.

The book is well documented and has a thorough bibliography. It will be valuable to a person seriously committed to studying the difficulties involved in wastewater treatment plant design and construction but is not recommended for the casual reader.

James D. Carr, *University of Nebraska*

**Metal Ions in Biological Systems. Volume 17. Calcium and Its Role in Biology.** Edited by Helmut Sigel (University of Basel). Marcel Dekker: New York. 1984. 532 pp. \$85.00. ISBN 0-8247-7172-9.

This is an ambitious book, which succeeds in bringing together information from numerous disciplines and presenting it in a manner that is current and, for the most part, well-organized. This book gives needed insight into the emerging dogma and unresolved complexities in calcium biochemistry, a field which boasts a monumental base of literature to which can be added a recent explosion of reports regarding calcium's role as a second messenger and its intracellular modulation by calmodulin. Scientists working in the field will appreciate the overall perspective and the efforts made to identify recurring themes and future directions. Most contributors to this book successfully integrate the background information and present it in a manner accessible to newcomers to the field. Each chapter is followed by a long list of current references for those desiring a treatment of a particular topic that is more in depth.

Twenty authors have contributed their expertise to produce the eleven chapters. Topics covered are the bioinorganic chemistry of calcium, crystal structure of calcium complexes, intestinal and renal absorption of calcium, calcium transport across biological membranes, mitochondrial calcium transport, calmodulin, brain proteins, regulation and mechanism of exocytosis, blood coagulation, regulation of the skeletal muscle contraction-relaxation cycle, and calcification of vertebrate hard tissue.

Early chapters give the reader a background in fundamental calcium chemistry and biology. The data presented are useful, particularly those regarding phosphate solubilities and sulfate equilibria. The discussion of crystal structure studies on model compounds is carefully presented but occasionally misses the mark when addressing questions of biological selectivity for  $\text{Ca}^{2+}$  over  $\text{Mg}^{2+}$ . Absorption and excretion of calcium in the body is treated in a concise, organized manner. Calcium transport across plasma, intracellular and bacterial membranes, a chapter written in 3 sections by 3 authors, conspicuously lacked the organization, overview, and insight that characterized the remainder of the book. A noticeable exception was section 3.7, on Coupling Mechanisms. One frustration with the earlier chapters was the lack of detail at the molecular level of various aspects of calcium function (identity of renal calcium excreted or intramitochondrial calcium precipitate). Important

diagrams and figures are occasionally lacking, and additional biological background would often have been helpful.

The final seven chapters explore the various complex biochemical roles played by calcium. It is here that the book achieves its goals in every way. The authors present the reader not with a wealth of controversial results but with a summary of the known details and unknown aspects of biological function together with intelligent commentary on the biochemical rationale which utilizes a multidisciplinary approach. Chapter 6, Mode of Action Of The Regulatory Protein Calmodulin, is a particularly good example. Rather than review the general molecular properties of calmodulin, it attempts to answer questions such as "what particular structural features allow this Ca-binding protein, and only this one, to be an efficient activator?" The final chapter, on calcification of vertebrate hard tissues, is a fitting capstone to this fine book. It brings together the inorganic chemistry of calcium phosphate, the physical chemistry of bone mineralization, the biochemistry of calcium in plasma, interstitial and intracellular fluid, and the biological needs dictated by the cellular physiology. In the words of the author, R. E. Wuthier, "...The field seems poised for a new period of breakthroughs. Developments from many lines of research will undoubtedly provide much excitement in the years ahead."

P. B. O'Hara, *Amherst College*

**Quantum Chemistry. Third Edition.** By Ira N. Levine (Brooklyn College, CUNY). Allyn and Bacon Inc.: Boston, MA. 1983. viii + 566 pp. \$43.30. ISBN 0-205-07793-5.

Most of the new material in this third edition of Professor Levine's popular introductory text on quantum chemistry might loosely fall under the heading of "applications". A section has been added which briefly compares some of the most popular semiempirical models (MINDO/3, MNDO, PRDDO, X-alpha, molecular mechanics, etc.) with ab initio calculations using one of the standard basis sets developed by J. A. Pople and co-workers. The portion of the book treating the widely used configuration interaction (CI) method has been expanded.

This edition maintains the easy readability of its predecessors. Mathematical techniques are introduced in the context of specific topics as they are needed, rather than being isolated at the end of the book. As in the earlier editions the questions at the end of each chapter are well chosen. Answers to selected questions are given in an appendix. In short, those features of the first two editions which lead to this text's widespread use are still much in evidence. While the third edition actually contains fewer pages than the first edition, which appeared in 1970, this edition succeeds in introducing the reader to many of the major advances in the field, while simultaneously covering the original topics more clearly and concisely.

In spite of the new supplementary material dealing with applications it will still be necessary to augment this text with additional material from the current literature if students are to obtain even a superficial feeling for the capabilities of current programs running on many widely available computers. For example, the text mentions that CI's involving up to 23 000 configurations can be performed on minicomputers, whereas by 1984 calculations involving over 1 million configurations had reportedly been done on so-called superminicomputers. Likewise, the rapidly improving ability of theoreticians to accurately compute an evergrowing number of molecular properties, and the impact that will have on the interplay of theory and experiment, is hardly mentioned.

David Feller, *Indiana University*

**Chemical Ecology of Insects.** Edited by William J. Bell (University of Kansas) and Ring T. Cardé (University of Massachusetts). Sinauer Associates, Inc.: Sunderland, MA. 1984. xvi + 524 pp. \$28.50 (paper); \$45.00 (cloth). ISBN 0-87893-070-1 (paper), 0-87893-069-8 (cloth).

Chemical ecology, as defined by the journal of the same name, encompasses studies on the "origin, function, and significance of natural chemicals that mediate interactions within and between organisms". As practiced in insect systems, chemical ecology has for many years been synonymous with pheromone research. However, as this book ably demonstrates, the discipline has matured into a robust analytical approach that embraces all aspects of insect biology, from the physiology of receptor cells to the organization of insect societies. The editors are to be congratulated on the breadth of topics covered and the choice of authors to cover them.

The book is divided into seven sections, with chapters on perceptual mechanisms, odor dispersion and chemo-orientation mechanisms,

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

plant-herbivore relationships, parasitoid-host relationships, chemical protection, chemical-mediated spacing, and sociochemicals. Some treatments are primarily in the literature review format, while others offer new analytical approaches to their subject. The use of accurate, mechanistic, non-teleological terminology is a most welcome theme stressed by several authors.

The section on sociochemicals could have been the high point of the book, given the diversity of chemical-mediated behavior in social insects. However, I found these to be the least satisfying chapters, in part because of the lack of simplifying and unifying principles. I quickly got lost in the maze of behavioral patterns exhibited by various taxa of bees, ants, and termites. No doubt, this simply reflects the youthfulness of the discipline. Major advances in chemical ecology now require the development of model systems to test how chemical stimuli are coded by the insect and translated into behavior.

The subject index is marginally useful. A major limitation is that there is no way, short of reading the entire book and making notes, for a chemist to access information based only on a knowledge of classes of compounds.

Jerome J. Kukor, *University of Michigan*

**Contemporary Practice of Chromatography.** By C. F. Poole and S. A. Schuette (Wayne State University). Elsevier Science Publishers: Amsterdam and New York. 1984. ix + 708 pp. \$61.25. ISBN 0-444-42410-5.

The purpose for writing this book, as explained in the preface, was to provide an organized review of modern gas, liquid, and thin-layer chromatography at a level commensurate with the needs of a textbook for graduate courses in the separation sciences. The practice of chromatography was to be its unifying theme. The authors superbly accomplished their goals, providing a complete and well-balanced treatment of this broad subject area.

The fundamental theories, definitions, and calculations pertaining to chromatography are outlined in Chapter 1. Chapters 2 and 4 describe the columns, their preparation, and the relationships of column parameters to chromatographic performance for gas chromatography and liquid chromatography, respectively. As a follow-up, the instrumental requirements and practices for both types of chromatography are contained in immediately following chapters (Chapters 3 and 5). Preparative-scale chromatography is covered separately (Chapter 6), as well as is hyphenated methods (Chapter 8) and high-performance thin-layer chromatography (Chapter 9). Particularly noteworthy is a very extensive and well-organized chapter on sample preparation for chromatographic analysis (Chapter 7), which covers everything from pre-concentration techniques and derivatization to select chromatographic methods (such as complexation chromatography) and pyrolysis gas chromatography.

In addition to treating the more conventional forms of chromatography, the authors have adequately covered the promising newer forms, including supercritical fluid chromatography, small-diameter columns in liquid chromatography, and multidimensional techniques. In fact, this reviewer was not able to find any subject pertaining to chromatography that was not treated to some degree in this book. The listings of references at the ends of the chapters were also found to be rather extensive and complete in providing a good sampling of the relevant literature.

This book can be highly recommended as a review and study guide for educating the interested reader in the state-of-the-art practice of all aspects of chromatography.

Milton L. Lee, *Brigham Young University*

**Beilstein's Handbuch der Organischen Chemie. 4th Edition. 5th Supplement. Volume 17/1.** Executive Editor R. Luckenbach. Springer-Verlag: Berlin, Heidelberg, New York, Tokyo. 1984. xxxviii + 858 pp. \$560.00. ISBN 3-540-13418-2 and 0-387-13418-2.

It is the policy of this journal not to review individual volumes of such compendia as Beilstein and Gmelin but, instead, to recognize important milestones in the progress of these invaluable works. This volume marks what may be the most far-reaching event in the history of the institution that Beilstein has become since its original founding: the conversion from German to English. Recognizing that about 70% of the subscriptions came from outside the German-speaking regions, the Beilstein Institute began preparations some years ago for the great change, of which this volume is the consummation.

The 5th supplement is begun in English with this volume because it starts the section on heterocyclic compounds (rings with one O or other chalcogenide). It represents not only a linguistic revolution but also a monumental effort to catch up, for unlike earlier supplements, it covers a 20-year period: 1960-1979. This surge in timeliness will obviously have a major effect on the usefulness of Beilstein, which for some time has suffered from the common difficulty of keeping up with the information explosion. In making these changes, the Institute has adopted

some less apparent changes, which have the effect of increasing the information density, without, however, noticeably detracting from readability. Nevertheless, numerical data on the properties of compounds are still given in abundance, spectroscopic information is referenced if it is not feasible to present it in full, preparative methods are described succinctly but comprehensibly, and all significant reactions are identified.

The classical virtues of Beilstein are retained, including the fundamental one of arranging the entries in structural order, independent of names. This not only makes it easier to locate compounds but also brings related compounds together. Critical evaluation of published data is continued, and it is one of the valuable features of Beilstein. Conflicting reports are either resolved or noted, revisions of earlier reports in the light of newer information or insights are attended to, and redundant or trivial results are eliminated. The result is satisfyingly reliable. It is also a great time saver, for one has the essence of many publications collected together on the same page and is spared the task of a tedious literature search followed by an often exhausting effort to retrieve the original articles from widely scattered sources.

The usefulness of Beilstein will in the near future be increased by the availability of a computer-based information system for ONLINE retrieval.

Although the arrangement in Beilstein is by structure, it is worth noting that the compilers make meticulous efforts to give correct names to every compound, following the recommendations of the IUPAC Commissions. The chemist faced with the problem of naming a complex compound can quickly resolve it with the aid of Beilstein. Solutions cannot be expected to be always perfect, however, because nomenclature is itself always in a state of development, adjusting to the discovery of new structural types and new insights into old ones. For example, the recently introduced "lambda convention" for indicating non-standard valence states finds wide application in this volume (e.g., "1-iminotetrahydro-1 $\lambda^4$ -thiophene: for C<sub>4</sub>H<sub>8</sub>S=NH). Full consistency has not yet been reached, however, for compounds with  $\lambda^4$  sulfur having S=C bonds are named by Beilstein preferentially as ylides, whereas the analogous compounds with S=N bonds are named only by the  $\lambda$  convention. Similarly, the divalent sulfur bridge (i.e., a fused-ring thiirane) is expressed by a "1,2-sulfanedijyl" prefix, whereas the same structure with O instead of S is denoted by "epoxy". These names, however, are correct; they stand at the threshold of evolving nomenclature, and furthermore, one need not know them in order to locate the compounds. An extensive table of prefixes used in naming compounds is found in the introductory pages; it is a helpful guide to the solution of many nomenclature problems.

**Line Coincidence Tables for Inductively Coupled Plasma Atomic Emission Spectrometry. Second Edition.** By P. W. J. M. Boumans (Philips Research Laboratories, Lindhoven). Pergamon Press: Oxford and New York. 1983. xxv + vi + 35 pp + 996 tables. Two Volumes: \$215.00. ISBN 0-08-031404-X.

This compilation is concerned with spectral interferences that occur in emission spectra, and the data are intended to "enable the user to make a rational choice of analysis lines so that spectral interferences ... are minimized." The data are mainly for low-power argon-coupled spectra. A substantial introduction ends with a section on the use of the tables. Then comes a "finding list", presenting prominent lines arranged according to element and detection limit and wavelength. The bulk of the work is in print-out format, approximately one page per table. The pages are punched and contained in two screw-post binders, to accommodate additions that are anticipated. A complementary computer software package is promised for 1985.

**Friedel-Crafts Alkylation Chemistry. A Century of Discovery.** By Royston M. Roberts (The University of Texas at Austin) and Ali Ali Khalaf (The University of Assiut). Marcel Dekker, Inc.: New York and Basel. 1984. X + 790 pp. \$165.00. ISBN 0-8247-6433-1.

The first 100 years of Friedel-Crafts alkylation chemistry is compiled and critically examined in this significant monograph. The coverage of the chemical literature from the first report in 1877 to the more plentiful reports of 1977 is exhaustive with more than 2000 citations, but regrettably, only a few of the more recent contributions to the field are discussed in this book.

The discovery and the scope of the Friedel-Crafts alkylation reaction are discussed in Chapter 1 to provide the readers with a perspective of the subsequent 7 chapters. The second chapter presents an excellent discussion of the information available concerning the rearrangement reactions of alkylating agents. The third and fourth chapters relate the chemistry of alkylation with alkyl halides, alcohols, ethers, esters, and alkenes. The fifth chapter is devoted to the chemistry of more highly functionalized compounds such as dihalides, unsaturated alkyl halides and alcohols, and dienes. Cyclization reactions are discussed in the sixth

chapter. The seventh and eight chapters are concerned with an analysis of the broad family of transalkylation, dealkylation, rearrangement, and fragmentation reactions of alkylbenzenes and arenes induced by Friedel-Crafts catalysts.

The authors have done an excellent job of assembling and carefully reviewing the available experimental results for a broad variety of reactions. Much important information about the chemistry of carbocations is incorporated into this volume as well as the information of Friedel-Crafts alkylation. The discussion is critical, and the authors have pointed out discrepancies in experimental results and have, appropriately, corrected some important errors in previous interpretations of this complex chemistry. They also have made special note that certain rather widely held notions, for example, the ideas about the rearrangement tendencies of alkyl groups during alkylation, are only partially correct and need to be revised. The summaries at the end of the principal chapters, which are complete and succinct, will be generally useful to the casual readers of this book.

While it is unfortunate that the appearance of this work to celebrate the Friedel-Crafts centennial has been so long delayed, it is evident that both new and old workers in the field will find this book an extremely valuable resource.

Leon M. Stock, *The University of Chicago*

**Azides and Nitrenes.** Edited by E. F. V. Scriven (Reilly Tar Chemical Corporation). Academic Press, Inc.: Orlando, FL. 1984. xii + 542 pages. \$99.50. ISBN 012-633480-3.

This book consists of 10 chapters authored by authorities in individual subfields. The first six chapters are delineated by structural type whereas the final four deal with characterization methods and applications. Chapter 1, authored by E. Kyba, gives a selection of the preparations and reactions of alkyl azides. Chapter 2, by A. Hassner, deals with vinyl azides and nitrenes. Synthesis and reactions of vinyl azides are discussed first, and a separate section considers processes in which vinyl nitrenes are likely intermediates. Aryl and Heteroaryl Azides and Nitrenes are the topic of Chapter 3 by P. A. S. Smith. Most of this chapter discusses the mechanistic possibilities and questions which arise in thermal and photolytic generation of aryl nitrenes. Chapter 4, by Walter Lwowski, entitled, *Acyl Azides and Nitrenes*, also includes sulfonyl azides and nitrenes. Cycloaddition reactions as well as thermolysis and photolysis are discussed. Chapter 5, by R. S. Atkinson, concerns azides and nitrenes in which the group is bound to elements other than carbon. Silyl azides and aminonitrenes are the most thoroughly discussed areas. In Chapter 6, R. A. Abramovitch and R. Jeyaraman discuss nitrenium ions. The major topics are decomposition of N-chlorinated amines and acid-mediated reactions of aryl azides and arylhydroxylamines.

Chapter 7, by M. S. Platz, summarizes direct structural and kinetic investigations of nitrenes. The ESR and optical spectra of nitrenes under matrix isolation conditions and the characterization of dialkylamino-nitrenes receive most thorough attention. Chapter 8, by C. Wentrup, is complementary to Chapter 7 and emphasizes gas phase and matrix reaction processes. In Chapter 9, H. Bayley and J. V. Staros outline the use of azides as biological photoaffinity labels. The emphasis is on the relationship between mechanistic and selectivity aspects of nitrenes and the requirements for successful interpretation of photoaffinity studies. In Chapter 10, D. S. Breslow describes industrial application of azides. The extensive references to the patent literature provide a good summary of the applications which have been investigated, but there is not as much information as to which systems have achieved and retained commercial importance.

Most of the chapters run 30-50 pages, but P. A. S. Smith's chapter on aryl systems is just over 100 pages. The book has been set in type. The structural drawings have been directly reproduced and vary in format from chapter to chapter, but all are adequately clear. There is a 20-page subject index, but it may not be entirely consistently constructed among the chapters. For example, azacycloheptatetraene, a key intermediate in aryl nitrene chemistry, appears on pages 105, 119, 127, and 365 as well as on the pages listed in the index.

This book provides good surveys and access to the literature of the respective areas under discussion. In many ways nitrene chemistry remains flavored by speculative interpretation, both because of the elusive nature of the intermediates and because of ambiguities as to when a nitrene or nitrenium ion is free and when it is "nitrenoid". In general the authors have presented contrasting points of view in situations where there is conflicting evidence. Because of the inherent space limitations of these reviews, readers will need to study the primary literature to obtain full perspective in the more complex cases.

All in all, this is a nicely done collection of reviews. Newcomers to the field will find it a useful summary, and current practitioners should find that it provides cross-fertilization from the subfields within the azide and nitrene area. Theoreticians interested in the properties of open-shell

species could find many interesting problems to address.

Richard J. Sundberg, *University of Virginia*

**Selectivity—A Goal for Synthetic Efficiency. Workshop Conferences Hoescht. Volume 14.** Edited by E. Bartmann and B. M. Trost. Verlag Chemie: Weinheim. 1984. 423 pp. \$42.50. ISBN 3-527-26142-7.

The book (taken from the "Proceedings of the Fourteenth Workshop Conference Hoescht, Schloss" Reisenburg, September 18-22, 1983) consists of photocopied contributions from 22 noted researchers, dealing with many aspects of the important question of selectivity in organic chemistry. The general topic is timely and the coverage is broad, ranging, for example, from Conformational Control of Chemical Reactions (W. C. Still), Selectivity in Chemical and Enzymatic Synthesis (J. E. Baldwin), Radical Mediated Cyclization Processes (G. Stork), Designed Complexes—Science and Applications (D. J. Cram), Selectivity in Excited State Chemistry (P. A. Wender), Chiral Building Blocks in Synthesis (G. Quinkert; E. Winterfeldt), and Selectivity and Reactivity in Oligosaccharide Synthesis (H. Paulsen) to the development of relative and absolute acyclic stereochemistry and applications to synthesis (P. A. Bartlett, D. Enders, R. W. Hoffmann, Y. Kishi, K. B. Sharpless, and C. J. Sih). The writing is generally clear and concise although a few sections are rather cryptic. This minor problem is offset by liberal use of flow charts, equations, schemes, and tables with key references often provided; a fine index is also included.

These overviews of individual and collective efforts to control regio-, stereo-, and enantioselectivity provide fine introductions and numerous key references to these many aspects of selectivity. The volume will be a worthwhile and useful addition to personal and scientific libraries.

Steven P. Tanis, *Michigan State University*

**Grosse Naturforscher. Volume 45. Otto Hahn—Ein Forscherleben Unserer Zeit.** By Walther Gerlach; supplemented and edited by Dietrich Hahn. Wissenschaftliche Verlagsgesellschaft m.b.H.: Stuttgart, Germany. 1984. 267 pp. German Marks 35.00. In German.

Otto Hahn published two autobiographies. The first one, "Vom Radiothor zur Uranspaltung",<sup>1</sup> which he called a scientific autobiography, appeared in 1962. The second one, "Otto Hahn—Mein Leben",<sup>2</sup> was finished just months before he died; it appeared in 1968. At the end of 1969 a booklet with the title "Otto Hahn—Ein Forscherleben unserer Zeit" was published in the series "Abhandlungen und Berichte des Deutschen Museums". The author was a well-known German physicist, the late Walther Gerlach. Since it received little attention, Otto Hahn's grandson, Dietrich, decided to save it from falling into obscurity by publishing it together with extensive supplements in the series "Grosse Naturforscher". With two autobiographies already on the shelf, one asks, of course, whether the new biography provides any additional information. Otto Hahn stated himself that most of his relevant notes and documents were lost during an air raid in 1944, so that he had to reconstruct the initial 66 years of his life from memories, "and memory often preserves what is unimportant and allows what is important to sink into oblivion".<sup>2</sup> Therefore, additional information would be welcome, especially when it comes from a longtime acquaintance. One also should keep in mind that Hahn and Gerlach were interned together with eight other German nuclear scientists at the end of WW II at Farmhall, Godmanchester, U.K.

Gerlach expertly reviews and summarizes Hahn's research achievements. He explains details where necessary and puts the results in the proper framework of international developments. He also adds some additional touches to the image of Hahn's personality (e.g., his character in general, his attitude toward his co-workers). Unfortunately, it is too little. The Farmhall episode may serve as a typical example. Describing these six months of internment, O. Hahn<sup>2</sup> tells us more personal stories about Gerlach than vice versa. The fact that Farmhall had been bugged and that transcripts of the conversations of the German scientists had been available to their hosts has been public knowledge since L. R. Groves published "Now It Can Be Told" in 1962<sup>3</sup> (German translation in 1965). Hermann, in a short biography on Heisenberg,<sup>4</sup> deals with this affair at length. Also, Elisabeth Heisenberg in her very recent book, "Das politische Leben eines Unpolitischen—Erinnerungen an Werner Heisenberg",<sup>5</sup> spends about 5.5 pages to deal with the tapes. The tran-

(1) O. Hahn, "Vom Radiothor zur Uranspaltung," F. Vieweg & Sohn: Braunschweig, 1962.

(2) O. Hahn, "Mein Leben", Bruckmann: München, 1968.

(3) L. R. Groves, "Now It Can Be Told", Da Capo Press: New York, 1962.

(4) A. Hermann, "Werner Heisenberg", Rowohlt Verlag: Reinbek (Hamburg), 1976.

(5) E. Heisenberg, "Das politische Leben eines Unpolitischen—Erinnerungen an Werner Heisenberg", R. Piper & Co. Verlag: München, 1980.

scribed conversations reach a climax when the internees learn of the dropping of the first atom bomb on Hiroshima. A few remarks by Hahn directed at Heisenberg stirred up some controversy. Elisabeth Heisenberg uses these remarks to demonstrate "how psychologically difficult the interpretation of the tapes is."<sup>5</sup> Since Hahn did not shed any light on this affair, one is curious as to what Gerlach would have to contribute. Unfortunately, nothing. The whole Farmhall episode is described on only two pages in a very sterile fashion. Another shortcoming of this biography by Gerlach is the lack of references.

Dietrich Hahn added some valuable compilations concerning his grandfather: a chronology of events; list of important discoveries and scientific methods; list of courses taught at the Friedrich—Wilhelm University (Berlin 1907–1935); statements by contemporaries about Hahn (a biographical listing of the authors is added); list of academic titles, offices, and awards; publications which make reference to Hahn the man and scientist, to his discoveries, and their impact. At the end of the book D. Hahn also added an overall index of names.

The chronology of events, which sketches Hahn's life and pertinent historical developments, make interesting reading. Under 1942, for example, one finds the following entries (translation by reviewer):

*February 26 and 27.* Participation of Hahn in the secret scientific meeting of the research section for nuclear physics (Reich Research Council—Army Ordnance Office).

*June 4.* Hahn participates in a conference with the Minister of Armaments, Speer, on the current German nuclear research.

*June 23.* Speer informs Hitler about the "Nuclear Fission Conference"; "Hitler was plainly not delighted with the possibility that the earth under his rule might be transformed into a glowing star" (Speer).

*Fall.* The Ministry of Armaments abandons the development of a possible atomic weapon after Heisenberg had made it clear to Speer "that one could not count on it within a period of three to four years" (Speer). "We knew that if we would make a candid report then it just would be called off" (Heisenberg).

The excerpts demonstrate one major weakness: insufficient references. Quotes by others than O. Hahn are in quotation marks and show the author's name in parentheses: in the above excerpts (Speer) and (Heisenberg). The reader has to find out by himself that it is A. Speer, "Erinnerungen", Propyläen Verlag Berlin, 1969, and W. Heisenberg, Interview with David Irving, in ref. 4. Throughout the chronology, quotes by O. Hahn are in italics but without any reference to the original publication.

A second edition or a translation would be a good opportunity to remedy these shortcomings.

**Ralf Vanselow, University of Wisconsin—Milwaukee**

**Organic Chemistry.** By G. Marc Loudon (Purdue University). Addison-Wesley Publishing Company; Reading, MA. 1984. xxvi + 1451 pp. \$34.95. ISBN 0-201-14438-7.

Like so many of the modern organic chemistry textbooks, this one is quite "thick" (29 chapters) and quite comprehensive in its coverage at the introductory level. Most instructors have approximately 90 hours to lecture time available in the traditional introductory 1-year organic course. Huge books like this and limited lecture time mean that current teachers must be very selective in the subject matter they choose to present. It is all there in this book to select from, well presented in good mechanistic detail and even including many name reactions (such as the Arbusov reaction, the Wadsworth—Emmons modification, and the Lemieux—Johnson oxidation; however, the Riley reaction is missing!). This is the kind of book the serious professional chemistry major will want to keep and not sell back after the course is over since it can be used as a good reference text in basic organic chemistry. The less serious chemistry student will find it too hard and detailed. It should work very well in a high-level or "honors" organic course. If one views, as I do, the subject to be best learned by a problem solving approach, one will be very happy to know this book contains 1550 original problems in graduated difficulty. These offer a stimulating challenge and afford lots of opportunity for drill for all students. This is a definite strong point for the book, but a definite weak point is that no solution manual or study guide is available to offer the correct answers for the students.

The author has organized his text along traditional functional group lines in a manner than seems to work best for most courses and most instructors. Alkanes and alkenes are covered early and the text moves along rapidly at the beginning, and gets the course going. These are followed by stereochemistry, alkyl halides, and NMR/IR. Dienes precede the Benzene/Aromaticity chapter (15), and this is approximately the place one realistically could reach after one semester or 45 lectures. Various functional group preparations, synthesis, examples, and reactions follow in subsequent chapters, and the last two (28, 29) contain biochemical topics (amino acid, proteins, and carbohydrates). Mass spec-

trometry (22) is inserted after the carbonyls (21). There is throughout a correct and proper emphasis on the synthesis of complex molecules by using the organic reactions that have been studied.

Another strong point, which is a unique feature of this book, is the utilization throughout of two-electron curved arrows to represent electron pair movement in polar reactions. Many of us are "electron pair pushers" in class, but few introductory books prior to this have successfully incorporated this convention. Carbonium ion chemistry (whatever happened to the "carbocation" term) is introduced early during alkene reactions and is unique in that most authors introduce free radical reactions first. The author claims that these electron deficient carbons are the "mechanistic centerpiece" of his book. Other books use nucleophilic displacements (S<sub>N</sub>1 and S<sub>N</sub>2) or free radical halogenation of alkanes as "the reaction to introduce mechanistic concepts". The advantage of this text's approach allows students, early on, to compare the energies of isomeric intermediates and examine the competition of two reaction pathways instead of just memorizing Markovnikov's rule.

Somehow, because of this, cationic chain growth polymerization is introduced before radical polymerizations and I feel uncomfortable with this, probably only because it is non-traditional. Although polymerizations of organic molecules are well integrated in the appropriate chapters in this text, I feel uneasy that they might not get the attention they deserve in the course by this random scatter technique. I admit, however, that the argument is stronger for a separate course in organic polymers than for another separate chapter in an already large book.

Other strong features of this text include the following: sections at the conclusions of some chapters on industrial organic reactions—the manufacture and use of ethers, glycols, aldehydes, and ketones; the section on safety hazards of ethers; the correct balance on nomenclature systems (IUPAC and common); the use of the chemical literature section; and the interesting section at the end of the stereochemistry chapter (7) on a brief history of chemistry of chirality and the tetrahedral carbon.

**J. R. Williamson, Eastern Michigan University**

**Marine Natural Products, Chemical and Biological Perspectives. Volume 5.** By Paul Scheuer (University of Hawaii). Academic Press: New York. 1983. xvi + 442 pp. \$69.50. ISBN 0-12-624005-1.

The fifth volume in this very useful series contains chapters on (i) Chemotaxonomy of Porifera, (ii) Biosynthesis of Marine Metabolites, (iii) Dinoflagellate Sterols, (iv) Constituents of *Laurencia*, (v) Marine Indoles, (vi) Echinoderm Saponins, and (vii) Bioactive Marine Biopolymers. Each of the chapters was written by an expert who has made significant research contributions to the area reviewed. Overall the chapters tend to be uniformly well written and well organized.

The choice of topics for this volume has created a nice blend of reviews of well-established areas of marine natural products and little explored areas which hold considerable promise for the future. I found the chapters on Dinoflagellate Sterols, *Laurencia* Constituents, and Echinoderm Saponins to be very useful summaries of the extensive literature in each of these areas, and I found that the chapters on Biosynthesis of Marine Metabolites and Bioactive Marine Biopolymers provided the type of background and perspective that would be invaluable to anyone wishing to embark on research in these new areas.

This book is a must for all active marine natural product chemists and it should be of considerable interest to the wider community of synthetic and structural natural product chemists who want to keep up with, or become acquainted with, the marine literature.

**Raymond Andersen, University of British Columbia**

**Practical Aspects of Gas Chromatography/Mass Spectrometry.** By Gordon M. Message (Hewlett Packard's Measurement Systems Group in England). John Wiley and Sons: New York, NY. 1984. xiv + 351 pp. \$59.95. ISBN 0471-06277-4.

This book should prove to be extremely useful for anyone who routinely uses GC/MS equipment. It discusses, in a detailed and practical manner, all aspects of GC/MS and should benefit both the novice and the experienced user. In its approach and content, it differs from the kind of highly theoretical texts that often contain no practical advice.

The book is divided into four main sections. The first section discusses the theory of operation of GC/MS, along with all of its hardware and design considerations. Detailed chapters are included on vacuum systems, ion sources, mass analyzers, ion detectors, gas chromatography, GC/MS interfacing, and data systems. Examples are shown of some of today's most commonly used systems. Some of the material may be beyond the grasp of readers who do not have a background in physics or electronics. However, the material is covered thoroughly enough so that readers of various backgrounds may extract as much useful information as desired.

The second part of the book covers the actual techniques and procedures for performing GC/MS analysis. It is not a step-by-step guide on how to operate one particular instrument, but rather a general discussion

of the procedures and considerations which hold true for any type of instrument. Topics include optimizing GC parameters, selecting ionization modes, resolution adjustment, instrument tuning and zeroing, data reduction, and good laboratory practice. Also included is a section on preventive maintenance.

Section three covers troubleshooting and repair. This section, along with the chapter on preventive maintenance, provides a useful supplement to the sometimes sketchy operation and maintenance manuals that come with a particular instrument. These chapters are full of helpful hints and practical advice, drawn from the author's background as a service engineer. It should help the reader to locate and correct some of the most common problems.

The last section is a guide to selecting a GC/MS system, for readers who are contemplating such a purchase. It does not advocate buying any particular system, but instead it presents guidelines on evaluating system performance to determine whether a particular instrument will fit your laboratory's needs.

Overall, this book is quite readable and should appeal to a wide range of scientists and technicians. It forms a valuable and comprehensive reference that will help scientists to obtain a greater understanding of their GC/MS systems, and thereby improve the performance of them.

James A. Windak, *The University of Michigan*

**Mixed Crystals.** By A. I. Kitaigorodsky (Institute of Elemento-organic Compounds, Moscow, USSR). Springer-Verlag: New York. 1984. xiv + 388 pp. \$45.00. ISBN 0-387-10922-6.

Professor Kitaigorodsky first drew attention to the importance of the principle of closest packing as the prime determinant of structure in molecular crystals in his earlier book "Organic Chemical Crystallography". In this much more wide-ranging work, he shows how the principle applies to ordered mixed systems—metallic, inorganic, organic, polymeric, and biological. The word "Crystals" is used to cover any condensed state of a substance having a sufficient degree of order in the arrangement of its components, and "Mixed" covers both homogeneous and heterogeneous systems.

The book begins with a brief historical introduction followed by five chapters on phase equilibria, packing in crystals, calculations of free energy in solid solutions, heterogeneous systems, and X-ray scattering. Following this theoretical introduction come chapters on intermetallic compounds, solid solutions of metals, and inorganic solid solutions: then comes the heart of the work—three chapters on organic solid solutions and complexes, naturally reflecting the author's own extensive and important pioneering work in this area. The book closes with two chapters on polymers and biopolymers. There is an extensive list of references, extending through 1981, and a good subject index. The translation from the Russian reads smoothly.

Anyone who has worked in more than one of the areas covered in this book is sure to have been struck both by the identity of the physical principles involved in tackling problems of partial order in different kinds of systems and the almost complete lack of communication between workers in the different fields. It is Kitaigorodsky's belief that "fascinating discoveries take place where several sciences overlap, where the ideas and methods of one branch of the natural sciences are borrowed by another". This is the justification for a book that deals with topics not normally brought together in one binding. Kitaigorodsky admits that the book offers no new facts to those who specialize in a particular field, but he suggests that it may be interesting and useful to learn more about one's "neighbors" in science. And, of course, there is the unifying theme of the importance of close packing, a powerful principle familiar to crystallographers but still largely unappreciated by chemists and physicists.

Professor Kitaigorodsky has performed a valuable service in presenting this overview of different areas of research into mixed condensed phases. Research in this field is bound to be stimulated by the powerful new neutron and X-ray sources becoming available in this country and elsewhere. This book should be indispensable to anyone seeking a broad introduction to the field, and it may help to break down the constricting bonds of overly narrow specialization with which many arrive.

Robert F. Bryan, *University of Virginia*

**Proceedings of the Fifth Tihany Symposium on Radiation Chemistry. Volumes I and II.** Edited by János Dobó, Péter Hedvig, and Róbert Schiller. Akadémiai Kiadó: Budapest. 1983. XIX + 1142 pp. \$75.00.

This work contains the full texts and discussions, all in English, of the 145 papers presented at the Fifth Tihany Symposium held at Siófok on Lake Balaton in Hungary in September of 1982. Of these 145 papers it is interesting to note that 61 were contributions from the Soviet Union, 19 from Hungary, 13 from Poland, and 20 from other Eastern European countries while there were only 6 from the United States. Hence these two volumes provide an excellent opportunity to learn what research in

the field of radiation chemistry is being done in the Eastern block of nations. The Proceedings are divided into five sections as follows: General Problems, Aqueous and Inorganic Systems, Organic Materials, Polymers, and Biological Problems. In the first section there is one paper dealing with muonium and four with positrons.

Although space does not permit an evaluation of all of these papers, it can be said that many are of very high quality, such as the paper on Electron Capture Processes in Terms of the Theory of Radiationless Transitions by Kroh and co-authors in Part One, the paper by Tliks et al. on Properties and Reaction Kinetics of Hydrated Electron in Concentrated Aqueous Solution of Inorganic Salts in Part Two, the paper by Hermann and co-authors on Energy Transfer from Alkane Singlets and Quenching of Alkane Fluorescences by Alkyl Chlorides. A Pulse Radiolysis Study in Part Three, the paper by Sidorova and Kabanov on Kinetics of Radiation-Induced Grafting of Acrylic Acid onto Polyethylene in the Liquid Phase in Part Four, and the paper by Bisby et al on Radiation-Induced Peroxidation of Egg Lecithin Liposomes in Part Five. It should be noted that Volume II consists entirely on Parts Four and Five.

The editors as well as the Hungarian Chemical Society are to be congratulated on their work in getting out this impressive collection of radiation chemistry papers.

Malcolm Dole, *Los Gatos Meadows, California*

**Organic Synthesis: The Disconnection Approach.** By Stuart Warren. John Wiley & Sons, Inc.: New York. 1983. xii + 391 pp. \$39.95. ISBN 0-471-10160-5.

This book is an extension of an earlier one (1978) written by the same author. It is written as a programmed text to help students design organic synthesis for themselves. The authors have attempted to formalize the concepts of retrosynthetic analysis and bond disconnections. At times there is too much emphasis on jargon and terminology such as "one-group C-X disconnections and two-group C-X disconnections". The book is really a compilation of 40 lectures in as many chapters, and the topics of these chapters are often as disconnected as the approach to synthesis itself.

Clearly, the book is not a textbook for learning reactions since very little information is given for the individual steps of a particular synthesis. Instead, it is a framework for viewing the synthesis of molecules from all possible bond disconnections. In my opinion, the book best serves as a transition from undergraduate organic courses to graduate courses in synthetic organic chemistry. There are many good examples of synthesis presented in the book, but the level of sophistication and the complexity of the molecules do not progress throughout the book. Often, the bond disconnections presented are trivial or obvious, thus making the retrosynthetic analysis uninteresting. Nevertheless, this monograph could prove useful to organic students who are just beginning graduate school.

Joseph P. Marino, *The University of Michigan*

**The Retinoids. Volumes 1 and 2.** Edited by Michael B. Sporn (National Institutes of Health), Anita B. Roberts (National Institutes of Health), and DeWitt S. Goodman (Columbia University). Academic Press, Inc.: Orlando, FL. 1984. Volume 1: xiii + 446 pp. \$46.00. Volume 2: xiii + 424 pp. \$48.00.

Collected within this two-volume set are 16 chapters representing the works of 19 authors, all of whom are acknowledged experts in their respective areas.

A main part of Volume I is devoted to reviews of recent advances in synthetic chemistry as well as the methods for separation, extraction, and characterizations and also contains a much needed chapter on synthetic strategies for the isotopic labeling of retinoids. The sections in these chapters on the applications of spectroscopy, photochemistry, and quantum chemistry to retinoid structure and conformation are brief, but these sections do contain references to more complete reviews in the literature (including 1982 and some 1983 articles) for the uninitiated. The remaining portion of this volume centers on the biological methods for retinoid analysis and contains many carefully prepared tables which give structure-activity comparisons for numerous retinoids and a number of in vitro and in vivo biological assays. This is of particular importance to the chemist who seems to be continually perplexed by the variety of available methods. The first volume culminates with a well-written chapter on vitamin A nutrition that includes sections on vitamin A storage, transport, and deficiency diseases.

Volume 2 is devoted to a comprehensive review of the biochemistry of retinoids and, in subsequent chapters, moves to reviews on the clinical applications of retinoids. The initial chapter on the biosynthesis and metabolism of vitamin A is a good introduction to this volume, but it contains some information which was presented in the first volume. Three excellent reviews follow on the plasma retinol binding protein and cellular retinol and retinoic binding proteins and their roles in retinoid

biochemistry as well as a biochemical overview of the role of retinoids in vision. Specific information on rhodopsin in this last chapter has been limited, since the entire volume could have easily been devoted to this subject. Two chapters, which detail the metabolism of retinoids and examine several possible models for the mechanism of action of retinols at the cellular level, provide a good transition between the biochemical and clinical reviews. This volume concludes with chapters on the uses of retinoids in chemoprevention and chemotherapy of cancer, and in dermatology, areas where many clinical advances have been made in the past few years. Finally, contained at the end of each volume is a listing of over 80 retinoid structures with common and chemical names and CAS registry numbers.

The editors claim to have provided "the first comprehensive survey of the chemistry and biology of the retinoids" and, indeed, they should be congratulated for succeeding. These volumes capture the essence of the remarkably expanding area of retinoid research and are essential reading for the scientist involved in these activities. The literature will certainly refer to these volumes as a classic treatise on the subject of retinoids.

Donald D. Muccio, *University of Alabama at Birmingham*

**Peptide and Protein Reviews. Volume 3.** Edited by M. T. W. Hearn (St. Vincent's School of Medical Research). Marcel Dekker, Inc.; New York, 1984. viii + 226 pp. \$52.50. ISBN: 0-8247-7241-5.

Like Volumes 1 and 2, Volume 3 contains a number of concise reviews of recent research pertaining to several peptides or proteins. Each of the five sections is written by a group of scientists heavily involved in the research being discussed. The authors' own work is so prominent in some cases that one sometimes wonders as to the objectivity of the views being presented. Each section is well-written, however, and provides an interesting, close-hand account of the major developments in an important area of peptide or protein research.

The first section, by Hruby et al., describes studies conducted primarily over the last decade or so as to the relationship of structure to the biological activities of melanotropins. The second section, by Mahoney and Hermodson, describes a group of monosaccharide binding proteins found in the periplasmic space of gram negative bacteria, current ideas as to how they may be involved in the transport of those sugars across the cell membrane, and what is known about the role of those proteins in chemotaxis. Very brief and clear, this section provides a good overview of the subject area but with much less elaboration than the other sections. The third section, by Naithani and Zahn, describes many of the difficulties and successes encountered while attempting the chemical synthesis of proinsulin. Although never achieving the ultimate success, the knowledge gained in the course of those studies has been of immense benefit to peptide synthesis in general. This account of those studies provides many interesting insights into the development of that knowledge.

The fourth section of this volume, written by Summers et al., provides a description of some important structural features of  $\gamma$ -crystallin, one of the several large proteins from bovine lens, as determined by X-ray studies to a resolution of 1.6 Å. The fifth and last section of this volume, written by Sandberg and Davidson, describes what is known about the structure of elastin, its biosynthesis, the isolation and preliminary characterization of its messenger RNA, preparation of a corresponding cDNA, and its insertion into and the cloning of the resulting bacterial plasmid.

Like the earlier volumes, Volume 3 contains a lot of interesting and valuable information. It would be a worthy addition to any major library.

Gary E. Means, *The Ohio State University*

**Studies in Inorganic Chemistry. 5. Sulfur. Its Significance for Chemistry, for the Geo-, Bio- and Cosmosphere and Technology.** By Achim Muller (University of Bielefeld) and Bernt Krebs (University of Munster). Elsevier Science Publishers: The Netherlands. 1984. xiv + 511 pp. \$111.50. ISBN 0-444-42355-9.

Our understanding of sulfur chemistry has progressed enormously in the last several decades. The only similarity between this book and my 1962 book "Mechanisms of Sulfur Reactions" (McGraw-Hill) is the biblical citation that the Lord used burning sulfur to drive away the devil! This book presents chapters that are expansions of the lectures given at a meeting held at the University of Bielefeld in June 1983, and most of the authors are from Europe or the United Kingdom. This book is noteworthy in that it covers an unusually wide variety of topics in the field of sulfur chemistry.

The book contains four main sections. The first, consisting of four chapters, is entitled Sulfur: The Element, Its Geochemistry and Some Aspects of Its History. Of these, I found the chapter on elemental sulfur to be particularly fascinating. The second section covers the chemistry of sulfur compounds and includes eight chapters covering organic sulfur chemistry, organometallic sulfur compounds, sulfur ligands, and the

electronic and Raman spectroscopy of sulfur compounds.

Section three covers the technology of sulfur compounds and includes five chapters. Sulfuric acid, flue-gas desulfurization, electrochemical devices, rubber vulcanization, and metal recovery from sulfur minerals are covered. The fourth section is entitled Sulfur in Microbiology, Biochemistry and Medicine and includes a discussion of microorganisms and the sulfur cycle, cytochromes and iron sulfur proteins, sulfur-containing ligands in metalloproteins, and genetic diseases of sulfur metabolism.

This book appears to be done by a camera-ready technique, but the right-hand margins are justified and the attractive typeface is uniform throughout. Some of the illustrations appear to be copies of lecture slides, sometimes with inappropriate notations still left in them, but in general the artwork is well done. I was disappointed at the absence of an author index, but the subject index appears to be exceptionally complete for a book of this type. This book will make a welcome addition to libraries at universities where sulfur chemistry is being studied, but its price will largely restrict its sales to libraries.

William A. Pryor, *Louisiana State University*

**Magnetism and Ligand-Field Analysis.** By M. Gerloch. Cambridge University Press: New York and Cambridge. 1984. xiv + 593 pp. \$110.00. ISBN 0-521-24939-2.

Gerloch's book is aimed at the chemist rather than the physicist, although the material is firmly based in physics and had its origins in pioneering work done by physicists. The author begins with a historical commentary on the development and direction of ligand-field theory. From this he advocates a synthesis of old and new physicochemical concepts with which to provide a means of exploiting ligand-field properties of transition-metal and lanthanide complexes. The aim is that this synthesis lead to a quantified chemical insight into the individual metal-ligand interactions in such complex molecules. The author achieves his aim and has produced an interesting and very readable book. There is a flavor of the author's enthusiasm for his subject throughout.

Magnetic behavior is one of the foundations on which a treatment of ligand-field theory can be based. The author's choice of a greater emphasis on magnetism instead of the more common predominantly spectroscopic approach reflects his own research interests: he enjoys a very high name recognition among inorganic and other chemists for his work in magnetochemistry, magnetic anisotropy, and ligand-field theory.

A theoretical development of magnetism early in the book leads into a description of experimental methods of magnetic susceptibility and magnetic anisotropy measurement. A casual reader might have expected to find this at the end of the book or at the end of the magnetic properties section. The first half of the book ends with a good treatise on magnetic susceptibility and anisotropy, illustrated with some appropriate applications. The second half of the book deals with ligand-field theory. Here, the author considers the functional group as a concept ubiquitous in chemistry and gaining favor in solid-state physics but which has failed to enrich our understanding of ligand-field theory until recently. To this end, he presents a detailed and lucid description of the angular overlap model, again with suitable examples. Despite the title and although the "magnetism plus ligand-field" approach is novel, spectroscopy is not ignored, and the two halves of the book fit together very well.

The book should become a standard work for the Physical Inorganic Chemist's shelf, much like Cotton and Wilkinson's book is on the shelves of most inorganic chemists, though, of course, Gerloch's book is aimed at a more specialized, and therefore narrower, audience. It is not intended to replace more general physical inorganic texts like that of Drago, but it will likely supplant earlier books on magnetochemistry and on ligand-field theory. It deserves to find a larger market than the price seems to anticipate.

Ekk Sinn, *University of Virginia*

**Kirk-Othmer Concise Encyclopedia of Chemical Technology.** Edited by M. Grayson and D. Eckroth. John Wiley and Sons: New York. 1985. xxxii + 1318 pp. \$129.95. ISBN 0471-86977-5.

This gargantuan volume should not be dropped on an unbraced floor, nor lifted by chemists who are out of shape! When supported adequately (beware of weak bookshelves!), however, it will be found to be a rewarding source of information. Weighing in at eight pounds avoirdupois, it costs about the same as Godiva chocolates, but it is sure to last much longer.

The content of the 26 volumes of the full work has been abridged by professional writers, whose product was then approved by the original contributors. Each original title has thus been retained, along with many of the tables, diagrams, and illustrations. Tables have been shortened, however, and the lists of numbered references have been replaced by a few general references. The size of type has been reduced to about half, so that there is about twice as much information per page. A typical article has been contracted to about a fifteenth of the original.

The full set is not affordable by individuals and requires more shelf space than is usually available in an office. Neither of these limitations applies to this concise version, and it should find a substantial market in personal purchases.

**Organic Reactions. Volume 33.** Edited by A. S. Kende. John Wiley and Sons: New York. 1985. xvii + 347 pp. \$45.00. ISBN 0471-80229-8.

This volume, somewhat slimmer than the usual, begins with an innovation: a cumulative list of chapter titles by volume, immediately following the preface. It also ends with an innovation, for there is no longer a subject index to the present volume. In between are found two chapters: Formation of Carbon-Carbon and Carbon-Heteroatom Bonds via Organoboranes and Organoborates, by Negishi and Idacavage, and The Vinylcyclopropane-Cyclopentane Rearrangement, by Hudlicky, Kutchan, and Naqvi. The former is much the larger. It firsts treats the several processes by which the new bonds are formed from organoboron reagents and then takes up the various classes of compounds that can be made, from alkanes to nitrogen, halogen, and sulfur compounds. The tabular survey occupies 167 pages. The latter chapter follows the conventional pattern more closely. The history of the reaction is followed, its discovery in 1959 and the initial focus on the mechanism of the rearrangements of vinylcyclopropanes to its later applications to synthesis of cyclopentenes. The tabular survey occupies 57 pages. This volume maintains the quality and timeliness of the series.

**Spectral Problems in Organic Chemistry.** By R. Davis and C. H. J. Wells. International Textbook Company. Distributed in the USA by Chapman and Hall: New York. 1984. vi + 121 pp. \$10.95 paperbound. ISBN 0-412-00561-1.

This is a collection of 56 problems, each of which consists of elemental analyses (not empirical formulas), infrared,  $^1\text{H}$ , and  $^{13}\text{C}$  NMR and mass spectra, shown graphically. The selection is meant for undergraduate instruction. Six pages of correlation tables and a list of answers complete the book. The answers are not given directly but are in the form of references to the Aldrich Chemical Company catalog, CA Registry Numbers, Merck Index, Beilstein, and Heilbronn.

**Reactive Intermediates. A Serial Publication. Volume 3.** Edited by M. Jones, Jr., and R. A. Moss. John Wiley and Sons: New York. 1985. ix + 435 pp. \$79.50. ISBN 0-471-01893-7.

This work finds its place as an approximately biennial review of the recent developments in the chemistry of nine types of reactive intermediates: Arynes (by R. H. Levin); Carbanions (by S. W. Staley); Carbenes (by the editors); Metal-Carbene Complexes (by C. P. Casey); Diradicals (by W. T. Borden); Carbocations (by E. M. Arnett, T. C. Hofelich, and F. W. Schriver); Free Radicals (by L. Kaplan); Nitrenes (by W. Lwowski); and Silylenes (by P. P. Gaspar). The last, at 97 pages, exceeds even the Free-Radicals chapter in length and indicates the rapid rise of interest in silylenes.

It will be noticed that the authors of the respective chapters are largely the same as in the previous volumes; only the carbocations chapter is by new authors. It is apparently the intent of the editors to maintain continuity as much as possible in this way. The literature covered is largely that of 1980-1982, with a substantial incursion into 1983, but citations as early as 1885 can be found. The style is essentially reportorial, with critical but conservative interpretation by the contributors, who are well-known experts in the fields covered. They have done a good job, and their efforts will be very helpful not only to those whose work lies in these fields but also to those who are expecting to become concerned with reactive intermediates.

**Interpretation of NMR Spectra. An Introductory Audiovisual Program.** By J. D. Coyle, E. J. Haws, K. Miller, and K. Norton. John Wiley and Sons: New York. 1984. 4 cassettes; 4 boxes of slides; an Introductory Booklet (13 pp) and a Workbook (62 pp). \$390.00. ISBN 0471-26228-5.

This review of a largely nonprinted publication is an experiment, and it is not to be taken as precedent or policy.

Spectroscopy in organic chemistry can be taught from the pages of a book, by lectures combined with blackboard work, augmented perhaps by spectra shown with an overhead projector, or by cinematography. The phenomena that are encountered are usually more easily comprehended by the student when examples are shown rather than described, but there are obvious difficulties in showing spectroscopic features by hand-drawn means, and even projected spectra fall short if they are in black and white and do not show dynamic transformations. The need has been met by films in motion and color, which are able to illustrate such phenomena as spin-spin coupling by means of animation techniques. Excellent as such films are, they do not allow the student to examine a specific spectrum long enough to work out the interpretation; the sound track

inexorably leads the student passively on.

The present work has a sound track on audiocassettes, keyed to slides that show spectra or parts of them. The sound track poses questions based on a spectrum that is in view; a following slide shows the answers, with an accompanying thorough explanation by voice. The presentation can be stopped for as long as desired while the viewer thinks about the question. A workbook is provided in case one wants to write the answer down; this workbook contains the same images as the slides, but printed only in black. The program is thus well suited for self-study use, if access to a cassette player and slide viewer is provided. Alternatively, the program can be presented to an entire class, with the instructor controlling the rate of programs by stopping the play whenever desired.

The presentation begins with an explanation of the phenomenon of magnetic resonance and then proceeds successively to the chemical shift, spin-spin coupling, integration, and practice in interpreting representative examples of proton spectra. The last quarter of the program is devoted to  $^{13}\text{C}$  NMR, proceeding from basics to examples. If the presentation is not interrupted, about four hours of playing time is required altogether.

When part of the program was played to an undergraduate organic chemistry class, the response was very favorable, even though no interruptions were made for pondering the questions. The class had previously been shown a 20-min film on NMR; although the film had been judged to be very helpful, the class was unanimous in praising the present audiovisual program, which was pronounced to be even more helpful. This program is suitable for student use and could be an effective means for established chemists whose knowledge of NMR spectroscopy of organic compounds has faded to review their acquaintance with the basics.

Reviewing audiovisual programs is time consuming and requires some special arrangements. Those that are designed primarily for instruction at the undergraduate level would be more suitable for review in journals specializing in chemical education. For the most part, it is not anticipated that it will be feasible to go further than a simple listing of audiovisual publications in this Journal.

**Equilibrium Thermodynamics. Third Edition.** By C. J. Adkins (University of Cambridge). Cambridge University Press: Cambridge, U.K. 1984. xiii + 285 pp. \$39.50 hard bound; \$14.95 paper bound. ISBN 0-521-25445-0 (hard bound); 0-521-27456-7 (paper bound).

This book is a clear and wellwritten text on macroscopic thermodynamics. Its 12 chapters present lucid coverage of undergraduate-level thermodynamics without invoking microscopic models.

The text begins with the zeroth and first laws and then continues with a discussion of idealized heat-engine cycles, from which the second law (Chapter 4) and the concept of entropy (Chapter 5) emerge. The Carathéodory formulation of the second law is then presented in chapter 6, to broaden the reader's perspective on the second law. The subsequent chapters deal with the free energy functions, selected applications of the first and second laws, phase changes, and multiple-component systems. The third law is developed in the final chapter (Chapter 12).

The book is rather traditional and physical in scope; there is only one short chapter on irreversible changes (Chapter 9). The specific systems treated in this chapter are the Joule and Joule-Thomson expansions, gas liquefaction with a countercurrent heat exchanger, and Kelvin's treatment of thermoelectricity.

A number of particularly interesting examples are used throughout the book, including topics newly incorporated into the third edition. The treatments of the fountain effect in liquid helium, the magnetocaloric effect, and a macroscopic view of fluctuations are especially noteworthy. The discussion of chemically reacting systems is too light, however, and is confined to a very short section on ideal gas reactions.

At the end of the book there is a collection of over 100 good, representative problems.

As its preface asserts and as its title implies, the book does not attempt to cover irreversible thermodynamics or statistical mechanics.

For anyone selecting a text for a rigorous, calculus-based, purely macroscopic undergraduate thermodynamics course, this book is certainly worthy of consideration. The book should prove to be interesting and understandable to the student, and it will serve as a valuable reference for the physical chemist.

Mary Jo Ondrechen, Northeastern University

**The Alkaloids. Volumes XXII and XXIII.** Edited by Arnold Brossi (National Institutes of Health). Academic Press, Inc.: New York. 1984. Volume 22: xviii + 342 pp. \$50.00. Volume 23: xix + 399 pp. \$85.00. ISBN 0-12-469522-1.

Volumes 22 and 23 in the series continue the excellent, informative tradition of the previous texts. The format of each chapter covering a specific class of alkaloids presents a thorough, knowledgeable review of topics of interest to chemists and biochemists. As a reference source, these works are invaluable.

Volume 22 presents five chapters covering the following: Ipecac Alkaloids and  $\beta$ -Carboline Congeners; Elucidation of Structural Formula, Configuration, and Conformation of Alkaloids by X-Ray Diffraction; Putrescine, Spermidine, Spermine and Related Polyamine Alkaloids; Application of Enamide Cyclizations in Alkaloid Synthesis; and The Imidazole Alkaloids. The first chapter entails a thorough synthetic review of the ipecac and related alkaloids, with only a cursory treatment of their biosynthesis. The chapters concerning the polyamine and imidazole alkaloids offer a detailing of the variety of structures belonging to these two classes of alkaloids. Perhaps the two most enjoyable chapters in this volume are those covering enamide cyclizations and X-ray diffraction techniques. The numerous applications of enamide cyclizations in the synthesis of alkaloids covers the oxidative, nonoxidative, and reductive approaches. This chapter is very informative and well written. The chapter concerning X-ray diffraction techniques, written by Isabella Karle, gives an excellent description of the science and applications of X-ray diffraction. After reading this chapter, one becomes more appreciative of this technique as a field of serious research rather than merely a technician's tool in structure determination.

Volume 23 covers the following topics: Tropolonic *Colchicum* Alkaloids; Maytansinoids; *Cephalotaxus* Alkaloids; Constituents of Red Pepper Species: Chemistry, Biochemistry, Pharmacology, and Food Science of the Pungent Principle of *Capsicum* Species; Muscarine Alkaloids; and a chapter covering the rare Azafluoranthene and Tropoloisoquinoline Alkaloids. The various synthetic approaches to the maytansinoid and muscarine alkaloids are thoroughly and commendably covered in their respective chapters, though with little attention paid to isolation, structural assignment, and biosynthesis of these alkaloids. The chapter concerning the capsaicinoids emphasizes the food science and other biological aspects of these pungent principles of red pepper in precise details. Particularly noteworthy for natural products chemists are the chapters on colchicine and related alkaloids, and the *Cephalotaxus* alkaloids, Chapters 1 and 3. These chapters nicely detail both biological and chemical areas of interest, including isolation and structure determination, chemical transformations, synthesis, biosynthesis, and biological properties. These two chapters were written by Hans-Georg Capraro and Arnold Brossi, and Liang Huang and Zhi Xue, respectively.

John K. Snyder, *Boston University*

**Inorganic Electronic Spectroscopy. Second Edition.** By A. B. P. Lever (York University). Elsevier Science Publishers: Amsterdam. 1984. xvi + 862 pp. \$113.50. ISBN 0-444-42389-3.

In the 16 years since the first edition of "Inorganic Electronic Spectroscopy" was published, the field of transition metal ion spectroscopy has grown dramatically in number of experimental studies, types of systems studied, and variety of spectroscopic techniques employed. Lever has now prepared an expanded and updated version of his book which responds to these developments by including significant changes in format and content. While the first edition was directed at the beginning researcher in the field and contained introductory chapters on topics (atomic theory, molecular symmetry, group theory) which should be covered in an undergraduate curriculum, the second edition has been written for a more advanced audience. The first three chapters develop the crystal field, normalized spherical harmonics (NSH), and angular overlap (AO) models for the one-electron and many-electron d energy levels of transition-metal ions; the parameters of the latter two formalisms are used extensively in the following chapters to correlate experimental data and electronic structure. Chapter 4, titled Selection Rules, Band Intensities, Vibronic Coupling, Dichroism and Emission Spectroscopy, explains a variety of experimental phenomenon and practical techniques, introduces several spectroscopic methods complementary to electronic absorption, and provides useful background for the subsequent material.

As in the first edition, the strength of Lever's book is found in the two chapters which survey charge transfer and ligand field transitions of transition-metal ions and which comprise 50% of the text. Though not an exhaustive coverage of the literature, these chapters contain an extensive compilation (2000 references) and evaluation of electronic spectroscopic data (some of which is reproduced from the original literature) for transition-metal ions in various coordination environments and oxidation states. Increased coverage of charge-transfer transitions in this second edition is testimony to the numerous recent studies of these excited states, motivated in part by their occurrence and importance in bioinorganic systems. The penultimate chapters present a survey of experimental results for special transition metal ion systems which include metal-metal bonding, mixed-valence, cyclopentadienyl ligands, and the burgeoning field of bioinorganic chemistry. In the final chapter the author explores the experimental correlations between electronic structural parameters and chemical properties of transition metal ion complexes.

In general, this volume presents an extensive amount of material (110 tables and 12 appendices) in a clear format, which includes many parenthetical statements providing further explanation and critique. In-

terpretation of the electronic spectroscopic information is dominantly based on the NSH and semiempirical AO models, which have their limitations and criticism; more rigorous Molecular Orbital analyses receive only limited attention. Due to the considerable amount of MCD, CD, and resonance Raman data presented, this edition could have benefited from a more detailed explanation of these techniques, the information available from each, and their complementary relationship to other spectroscopic methods. One major weakness of this book is its limited indexing of the subject matter (for example, simultaneous pair excitations are discussed several times in the text, yet this topic does not appear in the index) and the lack of compound and author indices; for a book which aims to extensively cover a field, these deficiencies inhibit its utility.

I fully recommend the second edition of "Inorganic Electronic Spectroscopy" to those studying new inorganic systems (bioinorganic, organometallic catalysis, inorganic solid state, etc.) who can benefit from an extensive compilation and correlation of transition metal ion electronic spectroscopic data and the framework for interpreting such data; there is no other single volume which covers this field so comprehensively. The continuing rapid growth of inorganic electronic spectroscopy, however, will surely require another edition in considerably less than 16 years.

Dean E. Wilcox, *Dartmouth College*

#### Books on Applied Subjects

**Energy Conservation in the Process Industries. Energy Science and Engineering Series.** By W. F. Kenney. Academic Press: Orlando, FL, and London. 1984. xii + 329 pp. \$46.00. ISBN 012-404220-1.

This book is intended to help find "ways of identifying more significant energy efficiency improvements" and is stated to involve "a marriage of practical and fundamental principles, of academic and industrial scenes, and of entropy and economics." It proceeds from an introduction on Energy Outlook through thermodynamics, fundamental and applied, to methods of design and Guidelines and Recommendations for Improving Process Operations.

**The Technology of High-Level Nuclear Waste Disposal. Advances in the Science and Engineering of the Management of High-Level Nuclear Wastes. Volume 2.** Edited by Peter L. Hofmann. Technical Information Center, Office of Scientific and Technical Information, U.S. Department of Energy, Oak Ridge, TN. 1982. Available from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA. x + 378 pp. ISSN 0737-1179. \$17.75.

Contains papers on Site Exploration and Characterization, Repository Development and Design, and Waste Package Development and Design, subjects of special pertinence at a time when the disposal of nuclear wastes is in the public eye.

**Steam and Gas Tables with Computer Equations.** By T. F. Irvine, Jr., and P. E. Liley. Academic Press: Orlando, FL and London. 1984. xiv + 185 pp. \$29.50. ISBN 012-374080-0.

This is a companion to the cassette microcomputer programs published by the authors; it includes the property equations used in the programs, as well as the data in tabular form.

**Deactivation of Catalysts.** By R. Hughes. Academic Press: Orlando, FL, and London. 1984. xviii + 265 pp. \$42.00. ISBN 012-36087-8.

A monograph that reviews the occurrence, monitoring, and mechanism of the decrease in activity of heterogeneous catalysts and the possibilities for regeneration.

**Catalytic Cracking of Heavy Petroleum Fractions.** By D. Decroocq. Editions Technip: Paris. 1984. vii + 123 pp. FF 210. ISBN 2-7108-455-7.

Designed to be an introduction to the science and technology of cracking for scientists, students, and engineers. No index; limited references.

**Innovation and Technology Transfer for the Growing Firm. Text and Cases.** By J. Lowe and N. Crawford. Pergamon Press: Oxford and New York. 1984. x + 226 pp. \$49.50. ISBN 0-08-026251-1.

Contains eleven chapters under the rubrics The Environment of Licensing, Alternate Licensing Strategies, and Empirical Evidence and Public Initiatives. The case studies include chemical industries as well as others.

**PVC Technology. Fourth Edition.** Edited by W. V. Titow. Elsevier Applied Science Publishers: London and New York. 1984. xxx + 1233 pp. \$203.50. ISBN 0-85334-249-0.

In this new edition, much has been rewritten, and several new chapters have been added. The 26 chapters deal with such subjects as commercial poly(vinyl chloride) polymers, formulation, plasticization and plasticizers, stabilizing, moulding, pastes, cellular materials, etc.