

## Book Reviews\*

**Annual Reports in Inorganic and General Syntheses—1975.** Edited by H. ZIMMER and K. NIEDENZU. Academic Press, New York, N.Y. 1976. ix + 344 pp. \$18.00 (softbound).

With this fourth volume, the series seems to be well established. As before, new chemistry is reviewed with emphasis on preparatively useful reactions, but other information is included freely. The chapters are organized by element or class of element and are mostly devoted to the literature of 1975. A review article on a timely subject is also included: "Synthesis of Radiopharmaceuticals by the Reduction of  $99^m\text{TcO}_4^-$ ". There is now a good subject index, which is expected to be a permanent feature.

**Aromatic and Heteroaromatic Chemistry. Volume 4.** Edited by C. W. BIRD and G. W. H. CHEESEMAN. The Chemical Society, London. 1976 (distributed in North America by Special Issue Sales, American Chemical Society). xiv + 513 pp. £28.00.

This volume in the Specialist Periodical Reports series continues the organization of the first three volumes, and covers the literature reported in *Chemical Abstracts* Volumes 81 and 82. A group of diligent contributors have taken up the broad subject in 14 chapters, ranging from "Ring Systems of Topical Interest", in which annulene chemistry is prominent, to three chapters on naturally occurring compounds, with several chapters devoted to processes, such as ring transformations, addition reactions, etc. It is a wonderful way to catch up on the recent literature one has missed, and an author index helps one keep an eye on the activities of one's friends, rivals, and heroes.

**The Determination of Sulfur-Containing Groups. Volume 2: Analytical Methods for Thiol Groups.** By M. R. F. ASHWORTH (University of the Saarland). Academic Press, New York and London. 1976. ix + 288 pp. \$21.50

This book gives a comprehensive and detailed review of the published methods for analytical determination of mercaptans and polyfunctional compounds containing the -SH group, with certain arbitrary exclusions. The amount of information on such a subject is quite astonishing; in the first chapter, titled "Oxidation", no less than 54 different reagents are listed, ranging from cacotheline to vanadate. In the other 12 chapters, all manner of methods are described, from the purely physical, such as mass spectrometry, to biological. The approach is to give brief descriptions, essentially noncritical, of as large a variety of examples as feasible. There are extensive tables, good bibliographies, and useful indexes (author and subject).

**Handbook of Marine Science. Compounds from Marine Organisms. Volume 1.** By J. T. BAKER and V. MURPHY (Roche Research Institute of Marine Pharmacology, Sydney). CRC Press, Cleveland, Ohio. 1976. 226 pp. \$29.95.

This compendium consists of a series of annotated tables that record the known organic compounds derived from marine organisms, along with important ancillary information: structure, source, biological activity, references, and availability from other sources. The intention is to include all compounds reported through 1973; future volumes will record new reportings after that year. In addition to the tables, there are short discursive chapters on the various classes of compounds (e.g., sesquiterpenes, prostaglandins, sterols, etc.). There are both author and subject indexes.

**An Introduction to the Chemistry of Heterocyclic Compounds. Third Edition.** By R. M. ACHESON (Queen's College, Oxford). Wiley/Interscience, New York, N.Y. 1976. xvii + 501 pp. \$24.95.

In the preface, the author expresses his very understandable difficulties in attempting to keep up with the rapidly increasing flow of pertinent publications over the ten years since the last edition of this book. He also makes there a point that has a much wider relevance: established mechanisms of reaction are much fewer than speculations

about them, and it is important to distinguish between the two. He wisely presents largely only the former in this book.

In conformity with the title of the book, it remains carefully limited in scope, even though it has meant omitting some material of earlier editions in order to include new material. The scope remains as before: chapters on representative specific ring systems, rather than on classes. That is, there is no overall treatment of azoles generally, but there are specific chapters on pyrroles, pyrazoles, etc.

The information given is selected and good. It is particularly useful to find diagrams of known angles and distances of various rings, as well as thermochemical data. Fundamental properties such as melting and boiling points and solubilities are confined to the unsubstituted parent ring system in most instances, and there is no tabulated information. The author states that he has attempted to include "the more important work published up to mid-1975". Considering the magnitude of the field, that is a most difficult task for a single individual to accomplish. It is therefore forgivable that some things have been missed, such as the preparation and characterization of phosphabenzene by Ashe in 1971 (only the older, highly substituted examples are mentioned).

There are two good indexes: one for compounds, and one for subjects. The latter even has an entry under "rat", but oddly enough, none under "mouse".

**NMR. An Introduction to Nuclear Magnetic Resonance Spectroscopy.** By A. AULT and G. O. DUDEK. Holden-Day, Inc., San Francisco, Calif. 1976. viii + 141 pp. \$4.95.

This softbound book is designed for the undergraduate student, but could also be a useful aid for review by graduate students. It goes beyond the treatment given in introductory organic texts, and answers most of the questions that ordinary textbook chapters are likely to leave in the minds of students. An instructor who prefers to give greater emphasis to NMR in an introductory course might find it useful as a supplement. There are lots of problems, lots of spectra, and lots of explanations. A strong point is the inclusion of much practical information that is generally omitted entirely in introductory textbooks, such as explanations of ringing, spinning side bands, filtering, etc., together with simple directions for routine operation of an NMR spectrometer. Such bringing together of the abstract and the concrete is too often overlooked in conventional works.

**Molybdenum in the Environment. Volume 1. The Biology of Molybdenum.** Edited by W. R. CHAPPELL and K. K. PETERSEN. Marcel Dekker, Inc., New York, N.Y. 1976. xii + 315 pp. \$29.50.

The appearance of a book of this title makes one wonder if there is any element left whose fearful effects on our environment have not been disclosed! In the present case, we are given the somewhat unsettling information that molybdenum is ubiquitous in nature, although we are assured that its effect is often beneficial. This book is part of the proceedings of a symposium on the subject, held in Denver in 1975. It contains 19 papers that are reports of original research on biological effects. There is no index, but perhaps there will be one in Volume 2, yet to come.

**Organophosphorus Compounds. Volume 7.** Edited by G. M. KOSOLAPOFF and L. MAIER. Wiley/Interscience, New York, N.Y. 1976. viii + 871 pp. \$38.50.

This is the final volume in the series, which has attempted to list all the more than 100,000 organophosphorus compounds along with their properties and methods of preparation. The two chapters in this volume are "Phosphoric Acids and Derivatives", by Worms and Schmidt-Dunker of Henkel & Cie GmbH, Düsseldorf, and "Organic Derivatives of Thio (Seleno, Telluro) Phosphoric Acid", by Ailman and Magee, of American Cyanamid Co., Princeton. The first has 89 pages of text and a list of 397 pages; the second has 84 pages of text and a list of 303 pages. The textual parts are largely devoted to methods of preparation. Six pages of errata to earlier volumes conclude the work, which has no index, but only a cumulative list of chapter

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

titles. The bibliographic effort involved in this series is most impressive; in this volume alone, there are 3570 citations! It should stand for a long time as the definitive source on the subject.

**Residue Reviews. Volume 63.** Edited by F. A. GUNTHER and J. D. GUNTHER. Springer-Verlag, New York, N.Y. 1976. vi + 193 pp. \$16.80.

The volumes of this series come out almost faster than they can be reviewed! This one contains three reviews, one of which deals with toxicological evaluation of carbamate and organophosphorus pesticides, another deals with mass spectra of organophosphorus esters and their alteration products, and the third is a comprehensive review of the insecticide "Kelevan", which is made by condensation of the notorious insecticide "Kepone" with ethyl levulinic acid. Its systematic name,  $\delta$ -(5-hydroxy-1,2,3,4,6,7,8,9,10,10-decachloropentacyclo[5.3.0.0<sup>2,6</sup>.0<sup>3,9</sup>.0<sup>4,8</sup>]decyl)levulinic acid ethyl ester, is about as arcane as they come. There is the usual good subject index.

**Solubility of Gases and Liquids.** By W. GERRARD (The Polytechnic of North London). Plenum Press, New York and London. 1976. x + 275 pp. \$39.50.

The subtitle of this book is "A Graphic Approach: Data—Causes—Prediction." It includes a vast amount of data, most of it in the form of graphs, but some in tables, interspersed on every page with an extensive critical text. Not only is the information from the literature brought together comprehensively, but new measurements by the author are included as well. All is carefully interpreted. The author expresses his opinion that the concepts of ideal solution, Raoult's law, and Henry's law, which have dominated the past treatment of the subject, have "greatly hindered the approach to an understanding of the mechanisms of the dissolution processes in real systems, for such treatment has fostered the search for systems which conform . . . to these idealistic notions." In this book, he is evidently trying to provide a balancing force, by giving details of real systems in abundance. It should be of much use not only to chemists, but chemical engineers and biological scientists as well.

**Topics in Current Chemistry. Volume 59. Organic Syntheses.** Edited by F. L. BOSCHKE. Springer-Verlag, New York, N.Y. 1976. 136 pp. \$23.80.

This series of little hard-bound books appears frequently enough to qualify as a periodical, but at irregular intervals. This volume contains four reviews. The first is "Use of Activated Metals in Organic and Organometallic Synthesis", by R. D. Rieke. It takes up the improvements obtainable using either metal powders generated from the reaction of metal salts with an alkali metal in an inert solvent, or the condensation of metal vapors with an organic substrate, but is not in general concerned with metal catalysts.

In "New Directions in Aromatic Nucleophilic Substitution", J. A. Zoltewicz treats new developments since 1972. It is good to see that heterocyclic aromatic systems are given the prominence that their chemistry warrants. On the other hand, it is disappointing to see that the author perpetuates the nomenclatural horror of the name "dicyclohexyl-18-crown-6" for a substance that contains no cyclohexyl substituent, but a cyclohexano ring fusion.

"Formation and Reactions of Aminyloxides", by H. G. Aurich and W. Heiss, reviews the low-energy free radicals, commonly called nitroxides, for which IUPAC endorses the names "aminoyls" or "aminyl oxides". These substances have risen from obscurity to a position of considerable importance in recent years. The last review is "Cyclobutadienoids", by K. P. C. Volhardt. It covers cyclobutadienes and its annelated and heterocyclic analogs, all of which are of much interest because of the antiaromatic ring.

These are good reviews, with valuable bibliographies, but the lack of an index is a drawback.

**Viscosity. Volume 11 of Thermophysical Properties of Matter.** By Y. S. TOULOUKIAN, S. C. SAXENA, and P. HESTERMANS. Plenum Press, New York, N.Y. 1976. xxv + 647 pp. \$65.00.

This volume is an impressive accomplishment of the Thermophysical Properties Research Center of Purdue University. It is largely a collection of data carefully organized and presented in the form of tables and graphs, introduced by a 46-page discussion of theory, estimation, and measurement. Everything is thoroughly documented, and for the text portion alone there are 1218 references! It will be an enduring work, of great use in both chemistry and engineering. The

reliability and utility of the work are supported by an ongoing "Data Update Plan", which includes the possibility for subscribers to inquire by telephone, if necessary, about the latest available information.

**Advances in Heterocyclic Chemistry. Volume 19.** Edited by A. R. KATRITZKY and A. J. BOULTON (University of East Anglia). Academic Press, New York and London. 1976. xi + 376 pp. \$38.50 (£22.35).

The newest volume in this valuable series begins with a chapter on meso-ionic compounds, written by W. D. Ollis and C. A. Ramsden. The authors are most appropriately chosen, for the concept of meso-ionic systems was conceived in 1946 by Ollis and Baker in connection with their discovery of the sydnones. Thienothiophenes and their selenium analogues are reviewed by V. P. Litvinov and Ya. L. Gol'dfarb. These compounds were last reviewed in 1954, but there has been much activity in the field in recent years. In the third chapter, 1,2,3-triazines are reviewed by R. J. Kobylecki and A. McKillop. They were last reviewed in 1961, and the present reviewers give their principal attention to developments since then, the growth of which is attributed to the wide range of biological activity found in 1,2,3-benzotriazinone derivatives. The last chapter, by M. V. George, S. K. Khetan, and R. K. Gupta, is devoted to syntheses of heterocycles by addition of nucleophiles, such as amines, sulfonium ylides, etc. The variety of interesting structures accessible is impressive.

It is gratifying to find that most of the reviewers state the date up to which they searched the literature (variously to December 1973 or later to September 1974). Some additions were made at the proof stage. Now if only there were an index!

**Animal, Plant and Microbial Toxins. Volume I. Biochemistry.** Edited by A. OHSAKA, K. HAYASHI, and Y. SAWAI. Plenum Publishing Corp., New York, N.Y. 1976. xi + 555 pp. \$59.00.

The Fourth International Symposium on this subject was held in Tokyo in 1974. These Proceedings consist of the papers presented, all reports of original research. The variety of lethal or at least inimical creatures that populate our world is quite unsettling: snakes, crustacea, scorpions, shellfish, flatfish, bees, and a mysteriously named entity, the coral goby. The section on plant toxins is shorter and far more reassuring, and even deals with one curative substance. It is no surprise that the section on microbial toxins is large.

The papers are typeset and include photographs, graphs, tables, references, and experimental details. There is a good index specific to this volume. Volume II, subtitled "Chemistry", presumably will follow soon.

**Marihuana. An Annotated Bibliography.** By C. W. WALLER, J. J. JOHNSON, J. BUELKE, and C. E. TURNER (University of Mississippi). Macmillan Publishing Co., New York, N.Y. 1976. xxii + 560 pp. \$13.95.

The literature on marihuana, social, clinical, and chemical, is listed in this book for 1964 through 1974. For each reference, a short, non-critical abstract is given, as well as the title (translated if not in English). The listings are arranged in alphabetical order of senior author, but author and subject indexes make retrieval of desired articles easy. Thirteen of the introductory pages reproduce the structures of various cannabinoids together with a key to alternative numbering systems.

**Organic Electronic Spectral Data. Volume XII. 1970.** Edited by J. P. PHILLIPS, H. FEUER, and B. S. THYAGARAJAN. Wiley/Interscience, New York, N.Y. 1976. xiii + 1138 pp. \$45.75.

This compendium is the latest member of a series begun in 1957 with the object of recording in abstract form all the ultraviolet-visible spectra of organic compounds published in the primary literature. The first eleven volumes incorporated the material published from 1946 through 1969; this one is devoted to 1970. As heretofore, compounds are listed in formula-index order, and for each is given the solvent, the absorption maxima, the extinction coefficients, and the references to the original source. New volumes are scheduled annually.

**Residue Reviews. Volume 62.** Edited by F. A. GUNTHER and J. D. GUNTHER. Springer-Verlag, New York, N.Y. 1976. viii + 181 pp. \$16.80.

The larger part of this volume is devoted to a series of short articles on the subject of dangers to agricultural workers entering areas that

have been treated with toxic pesticides, particularly organophosphates. Another chapter deals with selenium in the environment, and covers analysis, uses, occurrence, and the interesting relation between nutritionally essential amounts of selenium and potential toxicity. Although there are large areas of the United States that are deficient in selenium, it is concluded that the human diet is generally adequate owing to interregional movement of human foods. The last chapter is a discussion of the fate of two herbicides in the environment: diquat (a quaternary salt of bipyridyl), and endothall (2,6-epoxyhexahydrophthalic acid).

**Topics in Current Chemistry. Volume 62. Synthetic and Mechanistic Organic Chemistry.** Managing Editor, F. L. BOSCHKE. Springer-Verlag, New York, N.Y. 1976. 258 pp. \$35.30.

This volume presents three essays or reviews: "Recent Aspects of Homolytic Aromatic Substitutions", by F. Minisci; "A General Protocol for Systematic Synthesis Design", by J. B. Hendrickson, and "Rearrangements and Interconversions of Carbenes and Nitrenes", by C. Wentrup.

A full half of the book is devoted to Hendrickson's contribution, which is an attempt to meet "the need to impose a systematic structure of new logic form on synthesis design." The article is intended to be complete in itself, and includes a glossary of new terms and concepts, explanation of coding systems, and a 69-page table of sequence lists in the code form developed in the text. The protocol developed is "a stepwise procedure for analyzing a target skeleton and arriving at a number of specific routes for its synthesis." The method is meant for use "by hand" (without computer aid).

Minisci's article begins by pointing out that interest in free-radical aromatic substitution has suffered from a lack of interest arising out of disappointment with the low selectivity of homolytic arylation. Recent work, largely by Minisci and his collaborators, has developed new free-radical substitution reactions, effective with both homocyclic and heterocyclic rings, that provide the high selectivity required for usefulness in synthesis.

Wentrup's contribution is concerned essentially with vapor-phase pyrolysis of azides and diazo compounds, and is centered on the work of the author with aryl and hetaryl systems, such as the phenylnitrene-pyridylcarbene interconversion. Thermochemical estimates of stability are used widely in discussing the behavior of these reactive intermediates, in an attempt to bring order to the otherwise bewildering array of reactions. A particularly interesting conclusion is that nitrenes are intrinsically more stable than carbenes, and when equilibration can occur, the nitrene side is favored.

The volume closes with an author index to Volumes 26-66, but no subject index.

**Energy. Volume III. Nuclear Energy and Energy Policies.** Edited by S. S. PENNER (University of California, San Diego). Addison-Wesley Publishing Co., Inc., Reading, Mass. 1976. xxxv + 713 pp. \$28.50, cloth; \$16.50, paper.

This is the third volume of a series on energy, Volumes 1 and 2 being written by S. S. Penner and L. Icerman, and this, the final volume, being edited by S. S. Penner. Volume 1 deals with the more important questions of energy planning, and Volumes 2 and 3 consider energy technologies with Volume 3 focusing solely on nuclear technologies.

Although I have not read Volume 2, Volume 3 will appeal to a much more limited audience than Volume 1. The level of presentation is inconsistent with some topics presented on a level understandable to a beginning science student whereas other sections require considerable mathematical maturity, with the latter being the rule. There also seems to be an imbalance of emphasis. Nuclear burner reactors are discussed in considerable detail, but very little space is given to breeder reactors. At the same time, the discussion on nuclear fusion is twice that on the burner and breeder reactors combined. There is also a discussion on nuclear safety which is based primarily on the Rasmussen report.

Possibly the most interesting chapter in the book is the last one, which deals with energy policies. Here the problems of overpopulation, air pollution, land development, etc., are discussed with a particular emphasis on the importance of monitoring worldwide energy use. Here many pertinent questions are posed, but indicative of our present level of understanding, few answers are given.

For one who wants a detailed discussion of the many facets of nu-

clear burner reactors and nuclear fusion, this book is worth studying, but it should not be considered for general reading on the subject. And although it is written as a textbook, it would seem more appropriate to classify it as a reference book.

M. C. Day, *Louisiana State University*

**Aroma Research. Proceedings of the International Symposium on Aroma Research, Zeist, the Netherlands, May 26-29, 1975.** Edited by H. MAARSE and P. J. GROENEN (Central Institute for Nutrition and Food Research TNO). Pudoc, Wageningen, the Netherlands. 1975. 245 pp. \$22.00.

This soft-cover collection of 20 papers in English by European authors evidently represents only the skeleton of the symposium, the declared purpose of which was to "provide ample opportunity for thorough discussion and informal contact within a relatively small group of participants (about 50)".

The papers presented fall into four principal categories: formation of aroma compounds in foods; relation between instrumental and sensorial analysis; factors governing the emanation of volatile compounds from an odorous substrate; the future of aroma research. The tabulation of heterocyclic flavor constituents and the discussions on the biogenesis and formation of flavors during processing constitute the most thoroughly documented subject areas. The bulk of the material consists of allusions to the published literature, and it is a good bet that the novel research presented will eventually find its way into other technical publications. Fewer than half of the papers relate to chemical transformations, and only one of these incorporates an experimental section (although graphs and charts are numerous).

Barring an overriding interest in the symposium itself, most chemists will probably find the scope of this work too narrow to justify its cost.

Keith T. Buck, *Frankincense Company, Inc.*

**Membrane Separation Processes.** By P. MEARES (University of Aberdeen). Elsevier Scientific Publishing Co., Amsterdam and New York. 1976. vii + 600 pp. \$96.25.

This book provides carefully delineated accounts of membrane separation processes that are sufficiently near full-scale development. It begins with a chapter by P. Meares on the physical chemistry of transport and separation by membranes, then continues with 13 chapters written by other experts on the following (authors in parentheses): liquid permeation through polymers (H. D. Spriggs, N. N. Li), ultrafiltration (W. F. Blatt), electro dialysis (G. S. Solt), piezodialysis (F. B. Leitz), hollow fibres in reverse osmosis, dialysis and ultrafiltration (B. Baum, W. Holley, Jr., R. A. White), separators and membranes in electrochemical power sources (J. A. Lee, W. C. Maskell, F. L. Tye), ion-selective membrane electrodes (R. Bloch, E. Löbel), water desalination by reverse osmosis (F. L. Harris, G. B. Humphreys, K. S. Spiegler), separation of gases by selective permeation (S. A. Stern), hydrocarbon separation by liquid membranes (R. P. Cahn, N. N. Li), and treatment of aqueous wastes and foods (D. C. Sammon). Membrane processes relating to living systems involving enzymes (D. Thomas, S. R. Caplan) and biomedical applications (C. R. Gardner) are also discussed.

The chapters appropriately provide materials, models, and mathematical treatments which describe the basis for each membrane separation process. References to the literature primarily cover the period from 1963 to 1974. The book should be useful to physical scientists engaged in membrane process research and to bioscientists, who are interested in applications of membrane processes in living systems.

John S. Baran, *Searle Laboratories*

**Scanning Electron Microscopy. 1976. Volume I.** Edited by OM JOHARI (Illinois Institute of Technology Research Institute). IIT Research Institute, Chicago, Ill. 1976. xvii + 782 pp. \$28.00.

This is Volume I, covering instrumentation and nonbiological topics, of the two-volume Proceedings of the 1976 Symposium on Scanning Electron Microscopy sponsored by IITRI. This volume contains over 90 papers which were presented in sessions devoted to general applications and techniques, physical applications of scanning transmission electron microscopy, fabrication and inspection of microelectronic devices, and studies of particulate materials. All papers were carefully edited and reviewed, and there seems to be an unusually large number which are particularly interesting, stimulating, and useful. In addition,

there are extensive bibliographies on cathodoluminescence studies with the SEM and on forensic applications of SEM.

W. C. Bigelow, *University of Michigan*

**The HMO Model and its Application. 1. Basis and Manipulation.** By EDGAR HEILBRONNER (University of Basel) and HANS BOCK (University of Frankfurt). Translated by WILLIAM MARTIN (Union College) and ANTHONY J. RACKSTRAW. John Wiley & Sons, New York, N.Y., Verlag Chemie, GmbH, Weinheim, Germany. 1976. xv + 454 pp. \$39.50.

This book is a translation of the first of a three-volume set (the second has answers to problems; the third, Hückel calculations) published in 1968. It follows the philosophy of Edgar Heilbronner, with a strong emphasis on quantum chemical models and their utility. It is practical rather than theoretical in its aims.

A number of books on quantum chemistry at roughly this level have been published. Each is rather personal, reflecting the interests and tastes of the author. This book is a part of the trend, emphasizing those aspects with which Heilbronner and his students have been especially concerned. Consequently, some important areas are handled better here than in other texts.

The book has 12 chapters covering basic principles, the Hückel method, perturbation theory, and numerous applications including photoelectron spectra and symmetry-controlled reactions. There is a strong emphasis on physical principles throughout, with applications of correlation diagrams in at least five different contexts (including particles in a box). This is an excellent introduction to the utility of correlation diagrams.

The translation is acceptable if somewhat Germanic in places. The references have been updated, some to 1972, and thus are more recent than those in the original. The answers, Vol. 2, would be useful, even without translation.

This book will be valuable to the reader who wishes to understand some of the applications and implications of the HMO method. It has some special insights to offer in this area.

John I. Brauman, *Stanford University*

**Handbook of Analysis of Organic Solvents.** By VACLAV SEDIVIC and JAN FLEK (Prague Institute of Hygiene and Epidemiology). Translated by HARRY SOMMERNITZ. Wiley/Halsted, New York, N.Y. 1976. 455 pp. \$42.50.

The book is comprised of three parts: General Principles, The Individual Solvent Classes, The Appendices. General Principles consists of five chapters dealing with sampling, determination of basic physical properties, procedures for analyzing unknown samples, quantitative analysis of two- and three-component mixtures, and application of gas chromatography to the analysis of solvents. The Individual Solvent Classes, which accounts for approximately 60% of the book, consists of 16 chapters on different solvent classes and the individual solvents in each class. Physical constants and chemical properties and methods useful for identification and quantification are given for more than 200 individual solvents. The Appendices consist of tabulated data on the boiling points of solvents and their azeotropes, density, refractive index, dispersion, dielectric constant, vapor pressure, mutual miscibility, and trade names.

This book would be of questionable value to most U.S. laboratories where IR, UV, and GC are routinely used and where NMR, LC, Raman, and mass spectroscopy are rapidly becoming more common. Most U.S. readers would consider this book a compilation of classical methods of analysis very reminiscent of their qualitative organic analysis course in college. Valuable analytical methods such as IR, UV, and Karl Fischer water titration are not even mentioned, and the authors refer to GC as a "recent" technique. In spite of the listing of over 200 solvents, important solvents such as acetonitrile, dimethyl sulfoxide and dimethylacetamide are not included.

The Appendices is the most valuable part of this book. The trade name index is good and the vapor pressure data at different temperatures are also useful. There are much better books on solvents available, although this book could serve as a secondary source.

Gordon DeWall, *Burdick & Jackson Laboratories, Inc.*

**Art in Biosynthesis. Volume I.** By DARSHAN RANGANATHAN and SUBRAMANIA RANGANATHAN (Indian Institute of Technology, Kanpur). Academic Press, Inc., New York, N.Y. 1976. xi + 249 pp. \$11.00.

This is a type of book treasured by the scientist who needs a com-

plete, ready reference source. The particular subject, biosynthesis, is neatly portrayed and summarized. Biosynthetic pathways are depicted in a concise fashion that assumes that the reader is not a stranger either to the science of organic chemistry or to the phenomena of biosynthesis. While there is the minimum of text, the sequence of structures in the schemes provides an instant conceptualization of the processes. Most readers will find this adequate. Original references to hypothetical schemes as well as experimental verification are adequately provided. A unique glossary of key and generally applicable metabolic transformations provides a kind of survey course of more fundamental biochemical events.

Examples of biosynthetic routes are presented for a wide variety of compounds including vitamins, alkaloids, steroids, terpenes, antibiotics, and prostaglandins. The molecular scope ranges from ammonia to vitamin B<sub>12</sub>.

Errors seem to be infrequently encountered. However, a measure of caution is in order. For example, one is concerned that the authors have created the impression that penicillins are biosynthetic intermediates (as sulfoxides) to cephalosporins. While this has been suggested, and chemically substantiated in the laboratory, efforts to establish an in vivo relationship have failed to do so.

It is clear that this volume must be regarded, as the authors surely intend, as a presentation of overall schemes. If one is interested in the details of a conversion, the references provided must be consulted.

The book will be valuable in most libraries as a ready reference and the authors are to be commended for their successful creation of a tactical thesaurus of biosynthetic pathways. As the subtitle ("The Synthetic Chemist's Challenge") suggests, the book may well serve to stimulate the organic chemist to develop synthetic concepts related to Nature's own guidelines.

Joseph E. Dolfini, *Merrell-National Laboratories*

**Topics in Applied Physics: High-Resolution Laser Spectroscopy. Volume 13.** Edited by K. SHIMODA (University of Tokyo). Springer-Verlag, New York, N.Y. 1976. xii + 378 pp. \$39.80.

Molecular spectroscopists working at microwave or radio frequencies have in the past considered themselves to be the enviable practitioners of high resolution spectroscopy. Spectroscopists working in the IR or visible regions were not included in this blessed group. At such high frequencies, resolution was limited either by instrumental factors or ultimately by the Doppler effect. But the laser has dramatically changed this. The techniques of laser spectroscopy not only permit the instrumental limitations of a conventional spectrometer to be bypassed, but also permit line structures within the Doppler width to be resolved by employing recently developed techniques of nonlinear spectroscopy. The era of MHz and kHz resolution at optical frequencies is here.

This volume is devoted to a discussion of the principles of this rapidly developing field along with examples and applications. Shimoda provides an introductory chapter and exposition of line broadening and narrowing effects. This is followed by discussions of atomic beams (Jacquinot), saturation spectroscopy (Letokhov), high resolution studies of methane and methyl halides (Hall and Magyar), three level spectroscopy (Chebotayev), quantum beats and time-resolved spectroscopy (Haroche), and the very recent technique of Doppler-free two-photon absorption spectroscopy (Bloembergen and Levenson).

This is a timely volume by researchers intimately associated with the field. Their enthusiasm is apparent at times. Beginning researchers, students preparing advanced seminars or term papers, teachers of graduate spectroscopy courses, and just anyone interested in catching up with the developments in this field will find this an extremely useful source book.

Robert L. Kuczkowski, *The University of Michigan*

**Memoirs of a Minor Prophet. 70 Years of Organic Chemistry. Volume I.** By SIR ROBERT ROBINSON, O.M., F.R.S. Elsevier Scientific Publishing Co., Amsterdam and New York. 1976. viii + 252 pp. \$18.95.

The memoirs of Sir Robert Robinson span more than 70 years of his distinguished career and have been compiled in two volumes. Volume I covers his early background, his education, and his career up to his appointment as Waynflete Professor of Chemistry at Oxford University. The title of the work refers to a remark by Professor Hans vonEuler in which he characterized Sir Robert as a "minor prophet".

His early education was strongly influenced by W. H. Perkin, Jr., at the University of Manchester from whom he received the stimulus leading to his subsequent accomplishments. He remained at Manchester as a postgraduate assistant from 1905 to 1912 in association with Perkin, J. L. Simonsen, C. Weizmann, George Barger, J. F. Thorpe, and A. L. Lapworth, among others.

In 1912 he was called to the newly created Chair of Organic Chemistry, Pure and Applied, at Sydney, Australia where he remained until 1915, when he was named the first Heath Harrison Professor of Organic Chemistry at Liverpool University, where he remained for 5 years. At Liverpool he was closely associated with the carbohydrate school of Hirst and Haworth. After 2 years at St. Andrews, he returned to Manchester as Professor of Organic Chemistry until 1928, when he went as Professor of Organic Chemistry at University College at the University of London until 1930.

Throughout the book his investigations in a wide variety of fields are discussed. These embraced, among others, natural products (alkaloids, anthocyanins, and anthocyanidins and brazilin among others), reaction mechanisms, and development of an electronic theory of organic chemistry. A complete bibliography of Sir Robert is appended.

It is somewhat unfortunate that considerable polemic discussions occurred, particularly with Ingold and E. Hückel and that greater acknowledgment of the contributions of others has not been made.

Throughout the volume biographical sketches of co-workers are scattered, and I found these exceedingly interesting. Sir Robert was an ardent mountaineer, and one entire chapter is devoted to his achievements throughout the world.

In summary the volume gives a clear picture of this golden age of organic chemistry. A number of typographical errors, largely among the structural formulas, were noted. Inasmuch as Sir Robert was totally blind at the time of writing, the formulas were drawn by assistants, which may account for these.

**Robert C. Elderfield**, *The University of Michigan*

**Vibrational States.** By S. CALIFANO (University of Florence). John Wiley & Sons, Inc., New York, N.Y. 1976. xii + 335 pp. \$39.95.

This is a theoretical discussion of vibrational potential functions and spectroscopy at an advanced level. The topical outline includes the classical and quantum mechanical description of molecular vibrations, internal coordinates, group theory, selection rules, potential functions, and anharmonicity. This parallels in many respects the classic texts on the subject, and it should prove valuable to teachers and students for its alternative explanations and examples of the basic concepts. In contrast to other treatments, this work provides an introduction to the quantum field description of the interaction of radiation with matter. This provides a fundamental approach to one photon processes and the multiphoton interactions of increasing interest to spectroscopists. Other topics covered more extensively than usual include coordinate transformations, construction of symmetry coordinates and redundancies. Finally, the chapter on the anharmonic oscillator is a thorough introduction to the subject including newer developments in the last decade.

Overall, this is a self-contained text well suited for instruction on the fundamental theory of vibrational potential functions without examination of the original literature. Nevertheless, references to the original discussions are numerous including citations to important and related topics which are not extensively covered. This factor along with the generality of the theoretical treatment adds another valuable dimension to the exposition.

**Robert L. Kuczkowski**, *The University of Michigan*

**The Hydrogen Bond: Recent Developments in Theory and Experiment.** Edited by P. SCHUSTER (Universität Wien), G. ZUNDEL (Universität München), and C. SANDORFY (Université de Montréal). North-Holland Publishing Co., Amsterdam. 1976. viii + 1549 pp. (in 3 volumes). \$173.75 per 3-volume set.

This three-volume set constitutes a major undertaking to cover in a single work important developments in experimental results and theory of hydrogen bonding. There is a total of 29 chapters contributed by 36 authors, three of whom contributed to two chapters each.

Volume I, entitled Theory, contains an introductory chapter (E. Lippert) plus six chapters which deal with the following aspects of the theory of hydrogen-bonded systems: energy surfaces (P. Schuster), calculations of vibrational spectra (P. Janoschek), proton motions (J.

Brickmann), model studies on proton correlations (E. Weidemann), dynamical properties (G. L. Hofacker, Y. Maréchal, and M. Ratner), and H-bond statistics (J. W. Perram).

Volume II, entitled Structure and Spectroscopy, is divided into two sections. The first part consists of four chapters dealing with investigations on structure and stereochemistry of hydrogen bonds. These include x-ray and neutron diffraction studies (I. Olovsson and P.-G. Jönsson), neutron diffraction studies of  $\alpha$ -amino acids (Th. F. Koetzle and M. S. Lehmann), the hydrated proton in solids (J.-O. Lundgren and I. Olovsson), and angular dependence in H-bond interactions (W. A. P. Luck). The second part is on vibrational and resonance spectroscopic studies of hydrogen bonds and comprises seven chapters. These are on vibrational spectroscopy (D. Hadzi and S. Bratos), anharmonicity (C. Sandorfy), hydrated proton species in crystalline compounds (J. M. Williams), easily polarizable hydrogen bonds (G. Zundel), long-wavelength vibrational spectroscopy (W. G. Rothschild), high resolution NMR studies (E. E. Tucker and E. Lippert), and magnetic resonance studies (R. Blinc).

Volume III consists of several sections under the general heading of Dynamics, Thermodynamics, and Special Systems and contains eleven chapters. Under dynamics of hydrogen-bonded systems are chapters on incoherent neutron scattering experiments (J. A. Janik), dielectric properties (L. Sobczyk, H. Engelhardt, and K. Bunzl), and nuclear magnetic relaxation in H-bonded liquids (H. G. Hertz and M. D. Zeidler). Other chapters are on matrix-isolation studies (H. E. Hallam), on ferroelectric investigations (V. H. Schmidt), and on coherent neutron scattering for observations on collective proton motions (H. Stiller). Under thermodynamics, there are chapters on spectroscopic and calorimetric studies (A. D. Sherry) and on vapor pressure studies (H. Wolff). The last three chapters are on hydrogen bonds in systems of adsorbed molecules (H. Knözinger), in liquid water (W. A. P. Luck), and in ice (E. Whalley).

From the above listing, it is apparent that not all phases of this extensive subject have been covered, as is acknowledged by the editors in their preface. Rapid developments in some fields, according to the editors, made it inappropriate to include them at this time, e.g., hydrogen bonding in excited states. The important area of hydrogen bonding in molecular biology also is omitted in the present work. The editors state that this topic is sufficiently extensive to warrant a separate volume, but it is not clear if they intend to undertake adding this and other topics in later volumes.

This is an excellent collection of chapters on the whole. Not only are data presented in detail, but critical evaluation is given as well. The review of the literature by and large extends into 1974, with some updating through Notes Added in Proof. This work is bound to become a standard reference for those interested in hydrogen bonding in particular and in molecular association in general. One unfortunate drawback is the rather high price which undoubtedly will limit purchase.

**Milton Tamres**, *University of Michigan*

**The Methodology of Connective Tissue Research.** Edited by DAVID A. HALL (University of Leeds). Joynson-Bruvvers Ltd., Oxford. 1976. 292 pp. \$20 (hardcover); \$13 (paperback).

This is a laboratory handbook which provides very detailed instructions on the most important preparative and analytical techniques currently used in connective tissue research. Included are details for the isolation and purification of collagen and elastin, the fractionation and preparation of glycosaminoglycans, the preparation and estimation of activity of some relevant proteolytic enzymes, and the analysis of collagen fractions and their degradation products. Each section of the book provides a thorough description of those techniques judged as being the most generally useful and reliable. Related information on earlier methods is also given, and there are, of course, extensive bibliographies. The book contains a wealth of information, much of which would be very difficult to locate in the original literature. It seems to have been painstakingly prepared and will be extremely useful to the large and varied group of scientists doing research on connective tissue.

**J. E. Mark**, *University of Michigan*

**Analytical Aspects of Mercury and Other Heavy Metals in the Environment.** Edited by ROLAND W. FREI (Sandoz Ltd.) and OTTO HUTZINGER (National Research Council, Halifax). Gordon and Breach Science Publishers, Inc., New York, N.Y. 1975. vii + 196 pp. \$19.50.

This book is the first volume in a series that collects papers from environmental journals. There is no comment or criticism on any of the papers. This volume contains twelve papers from *International Journal of Environmental and Analytical Chemistry and Toxicological and Environmental Chemistry Reviews*.

The first half of the book is concerned with mercury and organomercury compounds and their determination in air, water, and biological tissues. The first chapter provides a good overview of the actual mercury problem. The second is an in-depth review of methodologies of mercury analysis with 238 references. The rest of the articles in the first half are concerned with a specific procedure. These papers cover flameless atomic absorption, gas chromatography, mass spectra, and neutron activation.

The next three papers deal with the analysis of lead. The first is the determination of airborne lead by atomic absorption. The second utilizes the addition of  $^{212}\text{Pb}$  and subsequent extraction with lead diethyl dithiocarbamate to determine trace amounts of dissolved lead. The third is a paper on analysis of biological tissue by anodic stripping polarography. This method is also applicable to cadmium, copper, and zinc. It is a fairly recent addition to the field of toxic metal determination even though it is relatively straightforward and uses simple apparatus.

The next paper, coauthored by the editor, deals with the analysis of antimony by flameless atomic absorption. This method should be of particular interest to the food dye industry. Following it is a paper authored by the editor that deals with determination of lighter transition metals. The next paper deals with determination of the same in biological tissues.

The last paper is a very fine description and excellent review of neutron activation analysis. It has 170 references and an in-depth description of the uses and methodology of the technique.

Overall, the only merit of the book over the original publications is that the papers are assembled in one place. If you wish only one or two of the papers, it would probably be better to go to the original journal.

Patrick Noland, *University of Missouri—Rolla*

**Comprehensive Analytical Chemistry. Volume V.** Edited by G. SVEHLA (Queen's University of Belfast). Elsevier Publishing Co., New York and Amsterdam. 1975. xiv + 383 pp. \$51.95.

This volume continues that part of the Wilson and Wilson series dealing with spectroscopic methods of analysis and consists of chapters on emission spectroscopy (by T. Kantor), microwave spectroscopy (by J. Sheridan), and electron microscopy (by J. Beretka). Generally, the tone of the volume is descriptive although each chapter contains some treatment of spectroscopic principles, as well. References are grouped at the end of each chapter; there is no general compilation or author index. Coverage of the literature is rather sparse with few references more recent than 1971.

In view of the fact that these areas of spectroscopy have been in a state of rapid development during the last few years, this volume is already outdated and would be less useful than the several good review articles available in the journal literature.

G. A. Rechnitz, *State University of New York—Buffalo*

**Topics in Applied Physics: Interaction on Metal Surfaces.** By R. GOMER (University of Chicago). Springer-Verlag, New York, N.Y. 1975. x + 310 pp. \$33.60.

This is a very timely publication as the subject of surface phenomena, particularly surface chemistry, is a very rapidly developing field. Because the field is so large, the editor has chosen to concentrate on metal surfaces and interactions thereon, but to include a chapter on catalysis since this particular application area of surface science is of such high intrinsic importance. The authors of the seven chapters in this book are all well known and respected in their fields. The subject matter in this book is directed toward fundamental phenomena in contrast to some other recent publications in this field which are oriented much more toward surface analysis. Careful reading of this book would be of particular value to any chemist just entering or contemplating entering the field of research in surface phenomena. The book can also provide useful perspective for a scientist currently involved in surface analysis. While there is very little in this book on actual practical applications of surface techniques, the fundamental phenomena discussed can provide valuable insight useful in interpreting data for practical problem solving.

While many chemists will have some difficulty with the mathematical treatments, particularly in the chapters on theory of electronic properties of surfaces and theory of chemisorption, Professor Boudart's chapter on concepts in heterogeneous catalysis uses language familiar to chemists. Chapters on chemisorption, desorption phenomena, and photoemission and field emission spectroscopy will also be readily intelligible to chemists.

William M. Riggs, *Physical Electronics Industries, Inc.*

**Comprehensive Analytical Chemistry. Volume VI.** Edited by G. SVEHLA (Queens University of Belfast). Elsevier Publishing Co., New York and Amsterdam. 1976. xiv + 555 pp. \$76.50.

This volume of the series is entirely devoted to Analytical Infrared Spectroscopy and was written by K. Kiss-Eröss of the Technical University of Budapest; it should, therefore, be viewed as a monograph. The orientation of this volume is frankly analytical, with heavy emphasis being placed on the practical aspects of infrared spectroscopy as related to both qualitative and quantitative analysis. The book also contains a large number of data tables and sample spectra which should be useful to practitioners in the field. The author has included information and diagrams on American, British, German, Russian, Japanese, and other instrumentation, thus lending an international tone to the book.

The subject index appears to be better than average, but there is no author index. More than 1700 references are grouped at the end of the book in numerical order with coverage up to approximately 1970.

G. A. Rechnitz, *State University of New York—Buffalo*

**Coulometric Analysis.** By E. BISHOP (University of Exeter). Volume IID of "Comprehensive Analytical Chemistry". C. L. Wilson and D. W. Wilson, Ed. Elsevier Publishing Co., New York and Amsterdam. 1975. xxviii + 673 pp. \$99.95.

In this vast undertaking, Professor Bishop not only treats the usual topics of coulometric principles, apparatus, methodology, and applications but has also investigated the historical origins of the field and given a critical appraisal of the electrochemical behavior patterns which may be encountered. All of this has been accomplished at a high level of scholarship and with a nice blend of the mathematical and descriptive sides of the topic.

Owing to the broad scope of the book, the final volume necessarily represents many years of effort with an arbitrary literature cut-off in 1969, except for a brief update section through 1973. Well over 2000 references are quoted and, in many cases, discussed critically; unfortunately there is no author index and the references are merely listed in numerical order at the end of the book. There is also a useful appendix dealing with relevant data processing methods.

One cannot help but be impressed with Bishop's erudition and effort. The book is highly recommended to all serious students of the topic; unfortunately, the pricing of the book will inevitably limit its appeal.

G. A. Rechnitz, *State University of New York—Buffalo*

**Tunable Lasers and Applications.** Edited by A. MOORADIAN (MIT, Lincoln Laboratory), T. JAEGER, and P. STOKSETH (Norwegian Defence Research Establishment). Springer-Verlag, Berlin, Heidelberg, and New York. 1976. viii + 404 pp. \$24.95.

This book presents the proceedings of the Loen Conference, Norway, 1976. The papers are organized into eight chapters, covering the highlights of recent advances in tunable lasers and their applications.

The first chapter treats tunable, high-energy sources in the vuv-visible region, including dye lasers, harmonic generation in gases, four-wave sum-mixing, and rare-gas halide lasers. The last two topics are covered in some depth. Various methods of generating tunable infrared radiation are discussed in the second chapter. These methods include semiconductor diodes, spin-flip lasers, nonlinear mixing in chalcopyrites,  $\text{LiNbO}_3$  parametric oscillators, and tunable high-power Raman lasers utilizing high-pressure  $\text{H}_2$  and liquid  $\text{N}_2$ . Applications include atmospheric pollutant absorption spectra, two-photon absorption spectra, and sulfur isotope separation.

The third chapter presents a good overview of laser-driven chemical reactions and isotope separation. There is a detailed account of the demands placed on laser development by uranium isotope separation. The photophysics and photochemistry of formaldehyde are discussed



in quite some detail, and evidence for laser-stimulated surface-reactions is presented. The fourth chapter is devoted to the nonlinear excitation of molecules, mainly the dissociation of SF<sub>6</sub> by intense radiation. Applications in industrial chemistry of molecular excitation to high vibrational states by lasers are discussed.

A thorough treatment of laser-induced collisions, with numerous potential applications, is the highlight of the fifth chapter. Other topics include the application of picosecond laser pulses to the measurement of vibrational relaxation in liquids and the observation of optical transients by laser frequency switching. The problems of atmospheric photochemistry and the role of tunable lasers in this area of research are summarized in the sixth chapter.

The chapter on photobiology comprises three specialized papers, which, however, reveal the great potential for lasers in biology. The topics include techniques and results on the use of resonance Raman spectroscopy to study the molecular basis of vision, laser-induced fluorescence of biological molecules applied to the study of complex formation, and techniques of fluorescence spectroscopy applied to biopolymers.

The final chapter addresses a number of important spectroscopic applications. The various methods of high-resolution spectroscopy are surveyed, including applications of tunable far-infrared lasers in the spectroscopy of solids and low-density plasmas; the possibility of mineral prospecting via spectroscopic identification of surface gases is discussed; and coherent anti-Stokes Raman scattering (CARS) is discussed in detail, with recent results in continuous CARS courses, expected to permit ultra-high-resolution Raman spectroscopy.

This book is recommended to those developing tunable sources of coherent radiation and to those interested in industrial applications of these sources. Because it includes good background reviews, extensive references, and some very recent results, it is recommended as an excellent introduction to this area of research.

Eugene Stark, Jr., *Los Alamos Scientific Laboratory*

**Biochemical and Biophysical Perspectives in Marine Biology, Volume 3.** Edited by D. C. MALINS and J. R. SARGENT (U.S. National Marine Fisheries Service, Seattle Wash., and Natural Environment Research Council, Institute of Marine Biochemistry, Aberdeen). Academic Press, New York, London, and San Francisco. 1976. xiii + 447 pp. \$35.50.

This book has been designed as a reference book for advanced students and research workers. It contains articles on a wide variety of subjects beginning with a section on protein structure and the evolution of species which is followed by a highly technical presentation on the innervation of the electric organ of Torpedinidae. Other topics covered are biological membranes at high hydrostatic pressure, the structure, metabolism, and function of lipids in marine organisms, the steroids of marine algae and invertebrate animals, biochemical aspects of detoxification in the marine environment, and the biochemistry of toxic elements in aqueous systems. Each section includes a bibliography.

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

**Calculus for the Life Sciences, an Introduction.** By MURRAY KATZ (University of Arizona College of Medicine). Marcel Dekker Inc., New York and Basel. 1976. xii + 258 pp. \$13.75.

An excellent do-it-yourself book for learning calculus, this book also fills a great need for the biologist who wishes to apply calculus to problems in biology. A knowledge of algebra is assumed.

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

**Advances in Polymer Science, Volumes 18–21.** Edited by H.-J. CANTOW, et al. Springer-Verlag, Berlin. Vol. 18: 1975. 149 pp. \$29.70. Vol. 19: 1975. 146 pp. \$27.90. Vol. 20: 1976. 221 pp. \$28.30. Vol. 21: 1976. 151 pp. \$26.30.

These four volumes continue what has become one of the most useful and extensive series of review articles in the area of polymer science. As in the preceding volumes, the reviews have been carefully prepared and cover a very wide range of topics. Each volume bears a specific title, which is, however, sometimes quite arbitrary in that some of the collections of articles really do not fit under any one theme.

The titles and authors of the contributions in Volume 18 are "Long-Chain Branching in Polymers" (P. A. Small) and Confor-

mation-Dependent Properties of Synthetic Polypeptides in the Helix-Coil Transition Region" (A. Teramoto and H. Fujita). Volume 19 contains "Stable Organic Cation Salts; Ion Pair Equilibria and Use in Cationic Polymerization" (A. Ledwith and D. C. Sherrington), "The Cationic Isomerization Polymerization of 3-Methyl-1-butene and 4-Methyl-1-pentene" (J. P. Kennedy and J. E. Johnston), "Grafting on Polyamides" (E. B. Mano and F. M. B. Coutinho), and "Rigid Rods and the Characterization of Polyisocyanides" (F. Millich). Volume 20 contains "Syntheses, Conformation, and Reactions of Cyclic Peptides" (Y. Imanishi), "Properties of Liquid Crystals of Polypeptides—with Stress on Electromagnetic Orientation" (E. Iizuka), "ESR Studies on Polymer Radicals Produced by Mechanical Destruction and Their Reactivity" (J. Sohma and M. Sakaguchi), and "Catalytic Hydrolysis by Synthetic Polymers" (T. Kunitake and Y. Okahata). Finally, Volume 21 consists of the articles "Poly(isobutylene-co-β-Pinene): A New Sulfur Vulcanizable Elastomer" (J. P. Kennedy and T. Chou), "Ring-Chain Equilibria and the Conformations of Polymer Chains" (J. A. Semlyen), "Asymmetric Reactions of Synthetic Polypeptides" (S. Inoue), and "Study of Polymers by Inverse Gas Chromatography" (J.-M. Braun and J. E. Guillet).

J. E. Mark, *University of Michigan*

**Photographic Gelatin II.** Edited by R. J. COX. Academic Press, New York and London. 1976. xiv + 390 pp. \$29.75.

This volume is a collection of papers given at the Symposium on Photographic Gelatin held at Cambridge University in September of 1974. Of the 27 papers given, 11 are concerned primarily with the chemistry of gelatin and its impurities. Sixteen papers relate mainly to the physico-mechanical aspects of gelatin, with emphasis on the gelation phenomenon. Virtually no sensitometric data are reported that might correlate physical and chemical properties with sensitometric consequences.

This book, however, like the earlier volume published in 1972, is a useful "state-of-the-art" summary in the field of photographic gelatin technology by many of the best known experts in the world.

George H. Nawn, *Polaroid Corporation*

**Fundamentals of Organic Reaction Mechanisms.** By J. M. HARRIS (The University of Alabama in Huntsville) and C. C. WAMSER (California State University). John Wiley & Sons, Inc., New York, N.Y. 1976. vi + 384 pp. \$17.50.

This book is intended for students of organic reaction mechanisms at the senior undergraduate or first-year graduate level. While the reviewer does not feel that it covers the material with sufficient depth or rigor for his own, largely graduate, course in physical organic chemistry, it has attractive features for an undergraduate or a more qualitative graduate course. It is well written, and explanations are clear and easy to follow. Unfortunately, it is also quite uneven in the authoritativeness of its coverage.

It is at its best in discussions of specific organic reactions and their mechanisms. The nonclassical carbonium ion controversy is treated in a thorough, balanced, and up-to-date fashion. The chapter on free radicals is also particularly good. The coverage of all except pericyclic reactions in chapters on the common unstable intermediates leads to some strange bedfellows. All elimination reactions, including those proceeding via carbanions, are treated in the chapter on carbocations, and ester hydrolysis is to be found under carbanions! There are also occasional lapses in the coverage; the treatment of stereochemistry of elimination is 10 years behind the times.

The first chapter, which covers molecular orbital theory, spends too much time showing how to do the arithmetic in simple Hückel MO calculations. A single example, such as allyl, would do, with perhaps a brief discussion of the use of computers for more complex systems. The third chapter, on determination of organic reaction mechanisms, is particularly disappointing. Its perfunctory approach is barely above the level of a good modern sophomore text, and is not always accurate. There is no excuse, some 15 years after Melander's book and Westheimer's review, for the statement on page 111 that "The base-catalyzed elimination from 1-bromo-2-phenylethane shows a strong isotope effect ( $k_H/k_D = 7.1$ ), indicating that the C-H bond is nearly completely broken in the transition state."

This book is suitable as a text for some types of reaction mechanisms or advanced organic courses, but the instructor should be prepared to counteract its shortcomings.

William H. Saunders, Jr., *University of Rochester*