

Book Reviews

Compendium of Organic Synthetic Methods. Volume 2. By T. T. HARRISON and S. HARRISON (Syntex Research). John Wiley & Sons, Inc., New York, N.Y. 1974. xviii + 437 pp. \$13.95.

Volume 1 of this work, which appeared in 1971, has already been reviewed here (*J. Am. Chem. Soc.*, 95, 4772 (1973)). The present volume not only picks up the thread and carries it to mid-1974, but it expands the coverage by the addition of many earlier references and, most important of all, now includes a section on difunctional compounds. This section occupies fully half the book and is a feature that distinguishes this work from all similar ones. About 1000 examples of synthetic reactions that give rise to two functional groups (two of the same, or two different) are given. To make use of this section properly requires a rather special indexing arrangement, which the authors have constructed in the form of a cross-reference chart of the type found on many time tables for determining the train fare between any desired pair of cities. As in the first volume, reactions are illustrated by single examples, with reference and, usually, a yield, but nothing is mentioned about scope and limitations, or the effect of structure on yields. In this respect it differs from the Fiesers' "Reagents for Organic Synthesis" and Buehler and Pearson's "Survey of Organic Syntheses", and also, but less sharply, from Mathieu and Weill-Reynal's "Formation of C-C Bonds", whereas it differs in time-span from "Annual Reports in Organic Synthesis", as well as in price and comprehensiveness from Theilheimer's "Synthetic Methods". It has its own place, and is a welcome aid to the organic chemist.

Encyclopedia of Industrial Chemical Analysis. Volume 20: Index to Volumes 4-19. Edited by F. D. SNELL (Foster Dee Snell Inc.) and L. S. ETTRE (The Perkin-Elmer Corp.). Wiley/Interscience, New York, N.Y. 1974. xl + 679 pp. \$50.00.

This work, the individual volumes of which have been reviewed in this Journal as they appeared, has now been completed. A total of 370 authors have contributed 12,423 pages. Since the articles are arranged in alphabetical order of subject, an index is needed only for topics of lesser breadth. The index here provided is quite detailed, and its use is facilitated by an explanatory preface. The contents of Volumes 1 to 3 are not included in this General Index. Those volumes dealt with general analytical technique, and they have their own index at the end of Volume 3.

Advances in Preconcentration and Dehydration of Foods. Edited by ARNOLD SPICER (RHM Research Centre, High Wycombe, U.K.). Wiley/Halsted, New York, N.Y. 1974. x + 526 pp. \$60.00.

An international symposium in 1973 produced the twenty-six papers included in this volume. Emphasis is on the processing of convenience foods, with primary concern for the engineering aspects (there are no chemical equations, but there is much applied thermodynamics). One of the more intriguing papers is concerned with "whisky powders"; a Japanese firm has developed a method for preparing powders containing up to 60% alcohol, and claims that the whisky and brandy powders so obtained "should have a wide application in the food and confectionery industry". It should be a great stimulus to the imagination of the creative entrepreneur, and may well revolutionize the breakfast drink industry, the coffee break tradition, and the care and feeding of astronauts.

Fundamentals of Organic Chemistry. By C. DAVID GUTSCHE (Washington University) and DANIEL J. PASTO (University of Notre Dame). Prentice-Hall, Englewood Cliffs, N.J. 1975. viii + 1240 pp. \$18.95.

This book is a new entry into the competition for the introductory organic chemistry market. The authors have met the critical problem of how to deal with the pervading interrelations of the different parts of the subject by adopting a spiral organization, in which topics are introduced at a simple level and then, in a later

turn, returned to and built upon. There are four parts, of decreasing size: a survey of properties, structures, and simple reactions; a treatment of mechanism and the scope, limitations, and synthetic utility of organic reactions; natural products from carbohydrates to coenzymes; and special topics (nonbenzenoid aromatic compounds, orbital symmetry, and organic synthesis).

The size of the book is bound to be somewhat intimidating to the student, but the authors make it clear that they do not expect that all of it will be covered in any one course. A one-year course would be very thorough if it encompassed the first two parts; the last two are more suitable for supplementary reading, or for substitution of selected sections into the main pattern. The first thousand pages of the book would give a student an excellent foundation for further courses in chemistry.

The text reads easily, and the copious illustrations are clear and informative. A substantial group of problems is found at the end of each chapter. Each chapter also has a "Study Guide", an outline of the content. In many of the chapters, references are given to more advanced books. The index, which will probably be used more by the instructor than the student, is very detailed. The authors appear to have done their work thoroughly and well, and their book certainly deserves serious consideration. A true judgment of the quality of the book can only be gained by the experience of using it, and for that we must await the future.

Mycotoxins. Edited by I. F. H. PURCHASE (Imperial Chemical Industries Ltd.). Elsevier, New York, N.Y. 1975. xiii + 443 pp. \$44.25.

Mycotoxins, the poisonous substances found in lower fungi (as opposed to mushrooms and toadstools), are said by the editor to have been relatively obscure until the discovery of aflatoxin in the early 1960's, since which time interest has grown rapidly. The editor has induced a large and international group of experts to contribute twenty chapters, each of which focusses on a particular group of toxins, fungi, or diseases caused by them. The approach is multidisciplinary, and history, chemical properties, biosynthesis, occurrence, analysis, biological activity, and mode of action are all discussed. The chemistry is accurate but brief, and in most instances does not go far beyond description of the method of isolation and presentation of the structure. In some cases, some features of the structure proof may be touched on lightly, but generally this subject is omitted, as is chemical synthesis. The sections on biological aspects are generally longer, and provide a good orientation for the chemist, who will be treated to a rich collection of photographs of diseased livers along with the scientific facts.

This volume is very nicely produced, and it has a good subject index. Its coverage of the literature reaches into 1973, but a cursory glance turned up no later references.

MTP International Review of Science. Organic Chemistry Series One. Index Volume. Edited by D. H. HEY. University Park Press, Baltimore, Md. 1974. ix + 177 pp. \$12.50.

This important reference series is now completed with the publication of a comprehensive subject index.

Particle Growth in Suspensions. Edited by A. L. SMITH (Liverpool Polytechnic). Academic Press, London, 1973. viii + 306 pp. £7.00.

The proceedings of a symposium held by the Colloid and Surface Chemistry Group of Society of Chemical Industry in 1972 are collected in this volume. The eighteen papers deal mostly with crystal growth and aging of precipitates, and are reports of original research. They are well reproduced, with many photographic figures, but there is no subject index.

Residue Reviews. Volume 54. Edited by F. A. GUNTHER and J. D. GUNTHER. Springer Verlag, New York, N.Y. 1975. xi + 189 pp. \$19.80.

* Unsigned book reviews are by the Book Review Editor.

Two of the five chapters in this volume are devoted to the controversial and timely subject of lead in the environment. In their summary, W. Höll and R. Hampp point out that "98% of the lead in the ecosystem derives from the combustion of motor fuels". The effects of this lead on human health are discussed by R. M. and N. J. Bethea, who conclude "that while further accumulation of lead in the environment is unacceptable, there is no scientific basis for the air quality standard proposed by the EPA, and further studies are needed. The other two chapters are "Phthalate Esters: Occurrence and Biological Effects", by D. B. Peahall, and "Gas Chromatographic Determination of N-Containing Pesticides", by H. Maier-Bode and M. Riedmann.

Introductory Textbooks Received

Principles of Chemistry. By L. G. HEPLER (University of Lethbridge) and W. L. SMITH (Colby College). Macmillan Publishing Co., New York, N.Y. 1975. xiii + 609 pp. \$13.95.

A general chemistry text for students who have had high school chemistry, emphasizing problem solving and giving more than usual attention to electrochemistry, kinetics, and properties of solids.

Introduction to the Chemistry of Life. Second Edition. By H. D. EMBREE and H. J. DE BEY (California State University, San Jose). Addison-Wesley Publishing Co., Reading, Mass. 1975. xiv + 769 pp. \$10.95.

This book consists of a reprinting of the last 25 chapters of "Introduction to Chemistry" by Williams, Embree, and De Bey. It is concerned with organic chemistry and simple biochemistry, and is designed for "the person who wants to understand, but does not plan to contribute significantly to the advancement" of these subjects.

Introduction to Chemistry. By J. D. CUMMINS and M. A. WARTTELL (Metropolitan State College). John Wiley & Sons, Inc., New York, N.Y. 1975. ix + 323 pp. \$11.95.

A general chemistry text designed for a one-semester course for students with no chemical background.

General Chemistry: Principles and Structure. By J. E. BRADY (St. John's University) and G. E. HUMISTON (Englewood Cliffs College). John Wiley & Sons, Inc., New York, N.Y. 1975. xvii + 733 pp. \$14.95.

A text for a one-year course in general chemistry for students who need not have had prior exposure to chemistry. A special feature is the liberal use of stereoscopic illustrations; a stereo viewer is included in a pocket in the back cover.

Chemistry for Changing Times. Second Edition. By JOHN W. HILL (University of Wisconsin, River Falls). Burgess Publishing Co., Minneapolis, Minn. 1974. xviii + 456 pp. \$8.95.

This very much nontraditional text for a course for students who are not majoring in science has been brought up to date throughout, and now includes chapters on energy and on chemical toxicology. It still clearly conveys the message that chemistry is fun, is exciting, and is very important to understand.

Concerning Chemistry. By GENE D. SCHAUMBERG (California State College, Sonoma). John Wiley & Sons, Inc., New York, N.Y. 1974. x + 358 pp. \$7.95.

A softbound text for students who do not plan to go on with chemistry. It includes chapters on heredity and evolution, drugs, chemicals and food, pollution, nuclear chemistry, and a brief treatment of organic chemistry, but relatively little about traditional inorganic and physical chemistry.

Chemistry: A Structural View. Second Edition. By D. R. STRANKS, M. L. HEFFERNAN, K. C. LEE DOW, P. T. MCTIGUE, and G. R. A. WITHERS. Cambridge University Press, New York, N.Y. 1975. x + 516 pp. \$15.00 (cloth); \$7.50 (paper).

This text by a group of Australian chemists is an introduction to general chemistry with "major emphasis on the physico-chemical principles underlying both inorganic and organic chemistry." It differs from the earlier edition by the use of SI units, a substantial increase in the amount of organic chemistry, and a more detailed account of gaseous and heterogeneous equilibria.

Ab-Initio Valence Calculation in Chemistry. By D. B. COOK (University of Sheffield). John Wiley & Sons, New York, N.Y. 1974. ix + 271 pp. \$27.50.

This book will be of most interest to chemists who seek a clear exposition of the details of the Roothaan-Hartree-Fock procedure for finding and interpreting a linear-combination-of-atomic-orbitals molecular orbital self-consistent-field wavefunction. Any reader who has had a graduate-level quantum chemistry course should be adequately prepared to follow the mathematics used in this text.

The emphasis throughout is on showing the reader how, in practice, to perform calculations rather than on developing the more theoretical aspects. Sample programs are included for most of the steps in the calculations. Nevertheless, the text does an unusually good job of motivating various approximations and interpretations of results. A clear explanation of the practical difficulties of doing a valence-bond rather than molecular orbital calculation is given. Population analysis, localized orbital descriptions, open-shell systems, and use of molecular symmetry are all treated in detail.

The book does have a few statements with which one might quibble. The energy units adopted are infinite mass hartrees, but the energy conversion factors are incorrectly labeled as hydrogen atom units. The integral transformation procedure presented is not nearly the most efficient. A faster method for dealing with molecular symmetry has appeared in the literature since the book was written. On the whole, however, the book is to be commended for being well written and accurate.

Ernest R. Davidson, *University of Washington*

Natural Protein Fibres. By E. V. TRUTER (The University of Leeds). Barnes and Noble Books, New York, N.Y. 1973. 92 pp. \$12.00.

This text was written for undergraduate students majoring in textile chemistry at British universities. It is the first volume in a series of such texts, and I would hope that future volumes in the series would be better than the present offering. Of the seven chapters in the book, the first four are devoted to the most elementary aspects of amino acid chemistry. This material can be found in a good organic chemistry or biochemistry text, treated in a more lucid manner and greater depth. Chapter 5 consists of one and one-half printed pages and contains a tabulation of the amino acid content of silk and wool. Some obvious differences in the amino acid compositions are pointed out, and the method for protein hydrolysis is presented in a brief paragraph. Chapter 6 is devoted to a discussion of silk with the major emphasis on the method of sequence determinations. Stress-strain curves for three different kinds of silk are given without any background material on fiber mechanical behavior. Chapter 7 on wool has a slightly more comprehensive discussion of wool chemistry and mechanical properties. The load extension curves in this chapter have a different set of units than is given in Chapter 6 on silk, and this will assuredly confuse the novice. The text contains no discussion of the concepts and role of protein secondary and tertiary structure in relation to reactions and mechanical behavior of these fibers.

The overall impression is that the material is derived from a set of lecture notes that were not revised into a form suitable for a good textbook.

The publisher should be held accountable for publishing such a poor book and for charging the outrageous price of \$12 for 76 pages of textual material.

Robert Zand, *University of Michigan*

DNA Synthesis. By ARTHUR KORNBERG (Stanford University). W. H. Freeman and Co., San Francisco, Calif. 1974. xii + 399 pp. \$18.00.

This book will undoubtedly become a classic in the area of DNA synthesis. The complex subject of DNA replication is reviewed in a very concise and efficient manner. The added flavor of opinion, historical perspective, and critical evaluation which only an expert can provide contributes significantly to the book's overall value. Finally the book is current and topical. Much of the data cited still remain unpublished. This means that some time must elapse before it will be out of date. Hopefully the author will write another book at that time.

Biochemical aspects of DNA synthesis are emphasized. DNA polymerase I is discussed in considerable detail using excellent illustrations, tables, and just enough experimental data to conclusively illustrate a point. The puzzle of how this remarkable enzyme functions *in vivo* finally appears to be on its way to a solution. Convincing current data, some still unpublished, are reviewed to summarize how this enzyme could function as part of the DNA replication system (removal of the RNA fragment) as well as an editing and repair function for defective DNA. Other chapters of exceptional quality are on bacterial and phage-induced polymerases, replication in bacteria, and replication of DNA viruses. Significant progress toward understanding DNA replication in *E. coli* and many *E. coli* viruses has been achieved in the last five years. The summation of all these data in a concise, readable form is one of the outstanding features of this book. As is typical of the author, he very clearly differentiates *in vitro* facts from *in vivo* speculation on these subjects.

Perhaps the most timely chapter is the last, where the author calls attention to the realities of gene synthesis. In particular, he emphasizes how synthesis and manipulation of genetic material can be useful for studies on the organization and expression of chromosomes. Probably the most profound statement on this subject concerns the exaggerations associated with gene synthesis, exaggerations not only of the dangers in applying chemistry to correct genetic defects but also excesses in evaluating the positive potential of this approach.

The author succeeds in presenting his subject in a manner which is readable and on the whole not overly technical. The book could easily be used in an advanced biochemistry course on nucleic acid metabolism. For the informed scientist, adequate references are provided for critical evaluation of the literature.

It will be well received by readers wishing to have a better overview as well as scientists already involved in DNA synthesis.

Marvin H. Caruthers, *University of Colorado*

Thermal Analysis. By T. DANIELS (BIP Chemicals, Ltd., Warley, Worcestershire, England). John Wiley & Sons, New York, N.Y. 1973. 272 pp. \$17.50.

The author's stated purpose in presenting this work is "to outline the more important thermal analysis techniques, their instrumentation, and their applications, so that the reader can critically assess the approach most suited to his particular problems." This goal has been quite definitely achieved in this most concise and useful introduction to thermal instrumentation and methods. Indeed, the techniques of modern thermogravimetry (TGA), differential thermal analysis (DTA), thermomechanical analysis (TMA) and their differential analogs have been each delineated in outline form, including diagrams of instrumental variations between commercially available models, examples of thermal curves together with their interpretations, and examples of the use of simultaneous complementary techniques.

In addition, the author covers many of the lesser known techniques of thermal analysis including dynamic adiabatic calorimetry and temperature scanning techniques of resistance, conductance, magnetic susceptibility, and evolved gas analysis. The book is worth its purchase for exposure to these areas alone.

If a criticism is to be waged against this useful book, it is that in covering such a wide range of topics in a limited space some of the primary areas of thermal analysis have been left rather thinly covered. For example, a bare page and a half of text have been allotted to instrumentation for, and three pages for applications for differential scanning calorimetry (DSC). Furthermore, in general, the applications examples are primarily instrument demonstrations; and the bibliography does not reflect the large volume of useful publications over the last few years.

Notwithstanding the brevity, this work is clearly written, well organized, accurate, up-to-date, and a very useful acquisition for those involved with, or contemplating the purchase of, thermal analysis instrumentation.

Bruce Cassel, *The Perkin-Elmer Corporation*

Handbook of Spectroscopy. Volume 1. Edited by J. W. ROBINSON (Louisiana State University). C.R.C. Press, Cleveland, Ohio. 1974. 913 pp. \$50.00.

This volume contains tabulated data on five topics: X-Ray Spec-

troscopy (256 pp), ESCA Photoelectron Spectroscopy (260 pp), Flames Spectroscopy (45 pp), Atomic Spectroscopy (46 pp), and Emission Spectroscopy (34 pp).

The X-ray spectroscopy chapter includes major sections on characteristic X-ray emission lines and adsorption edges, adsorption cross-sections, and X-ray fluorescence and Coster-Kronig yields. There are shorter sections on electron impact ionization cross-sections, electron ranges, jump factors, and the crystals and films used in X-ray spectrometers.

The flames chapter gives the wavelengths of molecular species in flames and some data for the organic species on dissociation energies, radiative lifetimes, and a variety of spectroscopic constants.

Flame emission spectroscopy and electrical flames are covered in the chapter on atomic spectroscopy, as are atomic absorption and fluorescence. The chapter on emission spectroscopy contains a large amount of data on the detection limits of the various techniques and tabulates wavelengths and sensitivities of all elements.

The main interest of this volume to the reviewer is the 260-page collection of photoelectron spectroscopic data. Unlike the other topics covered, this collection cannot be extracted from a few previously published sets of data. It lists by element and compound in alphabetical order the data from 280 original references. There are three tables. The first gives valence level ionization potentials as found by ultraviolet photoelectron spectroscopy listing adiabatic, and vertical IP's, the proposed assignments, vibrational structure, and the reference. The second collects the few data taken on these same IP's by X-ray photoelectron spectroscopy. The third table lists the core-level energies found by XPS. Where several literature values are available, they are all quoted. The tables are not quite comprehensive, but nevertheless represent a monumental effort and provide an invaluable reference and data source for all those working in photoelectron spectroscopy.

C. R. Brundle, *IBM Research—San José*

Organometallic Reaction Mechanisms of the Nontransition Elements. By D. S. MATTESON (Washington State University). Academic Press, Inc., New York, N.Y., 1974. xii + 353 pp. \$24.00.

Matteson has provided a critical review in the field of organometallic reaction mechanisms of the nontransition elements. The coverage in this book is restricted to main-group metals and metalloids, including boron and silicon but not phosphorus. Up-to-date references are given at the end of each chapter. The author selects certain developments in the field and outlines a self-consistent set of interpretations of organometallic reaction mechanisms. Quite frequently errors and questionable conclusions in the literature are pointed out to the reader. This is a pedagogically sound approach and suggests that this book would be appropriate as a text for first year graduate students interested in organometallic reaction mechanisms. An effort has been made to keep descriptions of proposed transition states consistent with quantum mechanical principles at the level of qualitative molecular orbital description. The author avoids arrow pushing and emphasizes the use of stable compounds as models for transition state structures whenever analogies can be drawn. Considerable attention and a good description of electrophilic displacement of carbon-metal bonds are given in the first four chapters (total eight chapters) which include NMR studies of metal exchange and the replacement of metal cations (SE2 inversion and retention at carbon). Polar 1,2-additions and eliminations, carbene transfer agents, free radical and photochemical reactions, and free metal and metal anions complete this interesting book.

Peter B. Dervan, *California Institute of Technology*

Molecular Collision Theory. By M. S. CHILD (The University of Oxford). Academic Press, London and New York. 1974. x + 300 pp. \$22.00.

M. S. Child's "Molecular Collision Theory" is the fourth volume in a series of monographs on theoretical chemistry published by Academic Press. The intent of the author is to give an analytical framework for experimentalists and an introduction for theoreticians interested in molecular scattering, and he has succeeded very nicely in this intent.

To give the development of molecular scattering theory in a book of this moderate length but wide scope means that the treatment will be rather compact. The author has confined his attention to analytical methods and has simply indicated where numerical methods are appropriate. The contents include discussions of cen-

tral force elastic scattering from classical and quantum mechanical viewpoints. Elastic scattering theory is further developed in chapters concerned with phase shift calculations, including Born and JWKB approximations, and semiclassical theory of elastic scattering. General approaches to inelastic scattering by isotropic and anisotropic potentials are outlined, and approximations for the quantum inelastic transition probabilities, e.g., Born and distorted wave treatments, are given. Several models of inelastic scattering based on classical trajectories are developed, such as perturbation treatments and the sudden approximation. Semiclassical approximations to the S (scattering) matrix are discussed in detail. A relatively brief chapter concerned with reactive scattering and useful mathematical appendices conclude the book.

Considerable grounding in quantum mechanics is assumed, and, for example, the reader would find it useful to be familiar with continuum solutions to the Schroedinger equation and Green's function formalism (these topics are discussed in the appendices). The particular emphasis on recent developments in semiclassical treatments of molecular scattering helps to make this monograph a useful and up-to-date reference for chemists interested in molecular scattering theory.

Thomas R. Dyke, *University of Oregon*

Methods of Enzymatic Analysis. Volumes I-IV. Second English Edition. Translated from the Third German Edition. Edited by H. U. BERGMEYER (Boehringer Mannheim GmbH). Academic Press, New York, N.Y. 1974. lxxv + 2302 pp. \$56.00, each volume.

"Enzymatic analysis" as defined in these volumes is both the determination of enzyme activity and the use of enzymes to determine the concentration of metabolites.

Volume I contains a wealth of information on the basic principles and experimental techniques of enzymatic analysis. It includes a competent discussion of the principles of end-point, kinetic, and catalytic including "enzyme cycling" methods for metabolite determination and the determination of enzyme activities. Brief summaries of the major experimental techniques are given. This volume also contains an extended discussion of the use of enzymatic analysis in clinical medicine and an outstanding chapter on statistical analysis and quality control especially as applied to clinical laboratories.

Volume II is a collection of methods for the determination of enzymatic activities. Volumes III and IV cover enzymatic methods for the determination of metabolites. Each method is set forth in a standard form which includes the principle of the method, equipment and reagents needed, a detailed experimental protocol, the method of calculation, the accuracy and precision, sources of error, and specificity of the method. The majority of procedures involve the measurement of the difference in absorbance between NAD and NADH at 340 nm, although a number of fluorimetric, automated, and even some manometric procedures are given.

Each volume includes the table of contents and index to all four volumes, a valuable feature. These volumes constitute an outstanding reference work of value for all who work with enzymes.

Albert Himoe, *Baylor College of Medicine*

Atomic Spectrometric Analysis of Heavy-Metal Pollutants in Water. By DAVID C. BURRELL (Institute of Marine Science, University of Alaska). Ann Arbor Science Publishers, Inc., Ann Arbor Mich. 1974. xi + 331 pp. \$24.50.

In the preface to this book, the author states that one of the principal objectives of the book is to consider the analytical aspects of potential metal pollutants in natural bodies of water as a part of "the total environmental picture." To achieve this goal, several chapters are dedicated to a useful discussion of natural water systems and the sources and distribution of heavy metal pollutants. Another chapter is devoted to sampling and storage techniques and preliminary treatment procedures which have been selected to provide analytical results representative of the sampled environment rather than the sampling or analytical procedures used.

The remainder of the book is used to describe atomic spectrometry (atomic absorption, emission, and fluorescence). Individual chapters compare the different techniques and describe radiation sources and detection systems, sample atomization techniques, interferences, and means of handling and interpreting the analytical

data. While the author has done an excellent job of reviewing the literature on these topics through 1972 and part of 1973, it is doubtful as to whether or not the "working analytical chemist" (to whom the book is addressed) is provided with sufficient information to distinguish between novelty and usefulness for a number of the techniques described.

The author has not included analytical procedures for the determination of heavy metal pollutants in this volume. Instead, the final chapter contains summary descriptions of the atomic spectrometric methods which have been used for these determinations with appropriate references cited for additional information. References are also given for other analytical techniques, including colorimetry, anodic stripping voltammetry, specific ion electrodes, neutron activation analysis, and polarography.

Jack D. Kerber, *The Perkin-Elmer Corporation*

The Structural Chemistry of Phosphorus. By D. E. C. CORBRIDGE (University of Leeds). Elsevier Scientific Publishing Co., Amsterdam, The Netherlands. 1974. xiii + 542 pp. \$96.20.

Imagine a book that takes off where Wells or Cotton and Wilkinson begin their discussions of structures of phosphorus compounds, and discusses not just a few phosphorus compounds of inorganic consequence, but all types of phosphorus compounds, and goes on for 425 text pages using 2649 references. Imagine a book that is a source for crystal structures of, and reaction data for, a huge number of compounds, and is written to snare the curiosity of the expert and the beginner, the initiate and the novice. Imagine this work as a one-of-a-kind book by an expert in phosphorus chemistry, a book not like any volume of Grayson and Griffith or Kosalapoff and Maier, and then if you can imagine all this, imagine paying nearly a hundred dollars for the privilege of having your imaginings made concrete, and there you have Corbridge's "The Structural Chemistry of Phosphorus."

The title of the book is a perfect reflection of its content; the amount of structural data and parameters is staggering. But for all the information on bond lengths and angles, there is little Corbridge has to say about bond strengths. Also, the amount of interpretation of data is really minimal, considering the number of compounds whose structures are presented, although for Corbridge to have discussed fully every one of the compounds mentioned would have been folly, and would have necessitated expanding the book at least fivefold. The theme of the book, if there is any unifying theme, is neatly packaged data, gleaned during an obviously long period of time.

The Table of Contents gives an idea of the breadth of the author's assemblage. The chapters are: Introduction (11 pp); Phosphorus, the element (12 pp); Phosphides (40 pp); Oxides, sulfides, and selenides (16 pp); Metallic orthophosphates (46 pp); The condensed phosphates (45 pp); Phosphate esters and non-metallic phosphates (28 pp); Substituted phosphates (42 pp); Oxyacids, hydrogen bonding, and bond lengths in phosphates (24 pp); Hydrides, nitrides, halides, and phosphines (32 pp); Metal-phosphorus coordination complexes (33 pp); Phosphonitrilic compounds (33 pp); Isomerism and optical activity in phosphorus compounds (16 pp); Ring molecules and related organophosphorus compounds (34 pp); Cage structures (9 pp). The useful appendices include a list of unit cell and space group data, an infrared correlation chart, and a list of typical nmr shifts (³¹P only, no coupling constants). A subject index and a formula index are also included.

For such an ambitious project, the number of typographical errors is not particularly small, nor is the format especially uniform in tone; that is, great leaps from highly specialized data to conventional wisdom are made within the space of one paragraph. Personally, I think you would be better off with a good text in inorganic chemistry and the latest formula index from *Chemical Abstracts*.

Robert M. Kren, *University of Michigan—Flint*

Kinetics and Mechanisms of Polymerization Reactions. Applications of Physico-chemical Principles. By P. E. M. ALLEN (University of Adelaide) and C. R. PATRICK (University of Birmingham). Halsted Press (Wiley), New York, N.Y. 1974. xv + 596 pp. \$43.50.

This book presents an authoritative, careful account of the basic physical chemistry of polymerization reactions. It is unusual in two respects: the coverage of the fundamentals of physical chemistry

relevant to the subject at hand is much more thorough than is usually the case in such books, and the close parallels between polymerization reactions and reactions involving small molecules are particularly clearly pointed out. The emphasis is on areas in which experimental results are most extensive, namely chain addition reactions, particularly those involving vinyl monomers.

The first chapter is entitled "Basic Physical Chemistry of Polymerization Reactions" and covers those parts of thermodynamics, chemical kinetics, and liquid-state theory relevant to polymerization reactions. This and the following chapter, "Diffusion-controlled Reactions", constitute a review of fundamentals; they contain much information of importance to the study of both small molecules and macromolecules, and their formation in chemical reactions. Chapter Three, "Chain Reactions in Polymerization", is the first part of a very extensive treatment of "chain addition" reactions, in which the polymerization process proceeds through a free-radical, anionic, or cationic active center. It contains those aspects of chain polymerization which are now fairly well understood; most of the references cited in this chapter are at least 10-15 years old. This is followed by a rather general chapter on "Thermodynamics of Polymerization Processes". It consists primarily of the application of general thermodynamic principles to features of polymerization reactions such as ceiling temperatures, and equilibria in "living" (nonterminated) anionically prepared polymers. It also contains such standard information as heats and entropies of polymerization for various monomers.

Since the book does heavily emphasize chain addition reactions, Chapter Five provides some balance by discussing two important types of condensation polymerization. Its title is "Polyesterification and Polyamidation" and, although brief, does present the most important aspects of this type of reaction. Chapter Six is entitled "The Reactivity of Radicals and Ions and the Susceptibility of Unsaturated and Cyclic Compounds to Their Attack". It is concerned with empirical schemes used to correlate reaction rates with the known properties of the reactants, an obviously difficult but important problem.

The final chapter, "The Kinetics of Addition Polymerization", is the longest, and makes up over one-third of the book. It is in effect the second part of Chapter Three in that it now discusses those aspects of addition polymerization in which research is currently progressing very rapidly. Its major concern is with the nature of initiation, propagation, and competitive reactions and is probably as up-to-date as such a survey can be in this rapidly moving area. Included in the above chapters are four Appendices, numerous citations of the original literature, and a number of very useful tables of results; there is also an Index to Symbols and a Subject Index, but no Author Index.

The book is clearly written and notable in the care and rigor with which the topics are treated. It is an important contribution to the chemical literature and should help to close the gap which frequently separates chemists studying polymerization reactions from those studying only superficially different reactions on small molecules.

J. E. Mark, *University of Michigan*

Chemistry in Non-Aqueous Solvents. By BERNARD TREMILLON. D. Reidel Publishing Co., Dordrecht, Holland/Boston, Mass. 1974. 285 pp. FL.78.

The book is a translation of the French edition "La chimie en solvants non-aqueux" published in 1971. It is written by an internationally known authority on chemical reactions in nonaqueous solvents with broad experience in this field of research.

The book is divided into five chapters: I, Solvents and solutes; II, Acidity and hydrolysis phenomena; III, Other ion exchange systems with participation of solvent; IV, Oxidation-reduction phenomena; V, Correlation between properties in different solvents. It covers not only the conventional nonaqueous solvents (molecular liquids) but also discusses chemistry in molten salt solutions.

In recent years, increasing interest in the area of nonaqueous chemistry has resulted in the publication of numerous monographs and treatises devoted to this topic. However, in order to find an *introductory* discussion of chemistry in nonaqueous solvents, we have to go to the text of Audrieth and Kleinberg published in 1953! Thus the appearance of Professor Tremillon's text fills a very important need.

The scope of chemistry in nonaqueous solvents is so vast that no

monograph can hope to cover the entire range of pertinent material. In a short introductory text, the selection of topics becomes even more subjective, and it is doubtful whether any two "non-aqueous" chemists would ever be in complete agreement on the exact content of an introductory text or on the emphasis placed on various points. Nevertheless, there is no doubt that the book very adequately introduces the subject of chemistry in nonaqueous solvents to anyone interested in a broad overview of this sphere of research. A short and very select bibliography is given at the end of the text. Here again, the selection, of necessity, is rather subjective.

The translation, in general, is quite good, although at times too literal. Very elegant French sentences can sound sometimes very inelegant in English if translated verbatim.

Alexander I. Popov, *Michigan State University*

Methods in Free-Radical Chemistry. Volume 5. Edited by EARL S. HUYSER (Department of Chemistry, University of Kansas). Marcel Dekker, Inc., New York, N.Y. 1974. ix + 193 pp. \$22.50.

This compact volume consists of two chapters: "Abstraction of Halogen Atoms by Free Radicals," by Wayne C. Danen of Kansas State University, and "Molecule-Induced Radical Formation," by Judith A. K. Harmony of the University of Kansas. Both authors indicate that their references are limited (162 and 150 references, respectively). However, this feature is not a drawback, since their selections present an excellent foundation for anyone desiring to become more proficient in two very active fields of study.

Danen's review contains sections on mechanisms of halogen abstraction, thermodynamic and kinetic considerations, structure-reactivity relationships, and a short discussion on miscellaneous reactions that may play secondary roles in the overall reactions. A wide variety of organic compounds are considered, and tabulations and correlations are presented for absolute rate constants, relative rates of abstraction, Arrhenius and activation parameters, relative reactivities, and Hammett ρ values.

Harmony's review contains: (1) a survey of molecule-induced radical formation (MIRF) reactions involving unsaturated hydrocarbons, amines, and miscellaneous compounds; (2) a discussion of MIRF reactions in terms of nature of reactants, energetics, overall kinetic order, influence of reactant structure, and effects of experimental variables; and (3) mechanistic interpretation. Correlations are presented for effects of substituents on reaction efficiencies, thermodynamic functions, yields, ionization potentials, kinetic order, and ionic charge.

Both chapters are explicit and lucid. Voluminous quantities of information are analyzed succinctly, and the results are presented in condensed form. Characteristics in common in the references are deftly distilled to produce products that contain unifying features of the reference material. The editorial style is pleasing, and the surveys are highly readable. This volume would be a valuable addition to the library.

Fred Sicilio, *Texas A&M University*

Practical Clinical Hematology. Interpretations and Techniques. By PAUL L. WOLF, PATRICIA FERGUSON, IRMA T. MILLS, ELIZABETH VONDER MUEHLL, and MARY THOMPSON (Stanford University). John Wiley & Sons, New York, N.Y. 1973. xviii + 468 pp. \$17.00.

A great variety of books on hematology are available, ranging from elementary textbooks to highly specialized reference works. However, there are relatively few books of direct application to the individual hematologist or research worker desiring a specific means to measure a hematologic parameter. This book is the latest in an excellent series on methods and techniques in the Stanford clinical laboratory. The book assumes that the reader has received instruction in the theoretical aspects of hematology and is familiar with the equipment and operation of a hematology. The book proceeds to present what the authors feel is the best procedures for measuring specific hematologic parameters.

The book includes complete instructions for the performance of 108 clinical hematology procedures, arranged in alphabetical order from the "acid serum test for paroxysmal nocturnal hemoglobinuria" to the "Wrights-Giemsa Strain." Each procedure is presented in essentially the same or similar format: principle, reagents and equipment, specimen needed, procedure, comments, normal values,

references, and interpretation. Following the procedures is an Atlas of 127 black and white plates illustrating abnormalities of morphology in bone marrow and peripheral blood.

This book is clearly designed to be put to immediate and practical use. The authors have produced a highly practical and comprehensive procedures manual which will certainly prove of value to hematologists and research scientists. The superb illustrations will also prove invaluable in the training of students and should make this book of interest to hematology instructors.

Donald F. Logsdon, Jr., *U.S. Air Force Academy (DFLS)*

Fixation in Histochemistry. Edited by P. J. STOWARD (University of Dundee). Chapman and Hall, London. 1973. xii + 201 pp. \$16.00.

Fixation of tissues for examination by microscopes has long been a problem for histochemists and cytologists because of the profound changes which occur during the fixation process. This book, the first to focus exclusively on fixation, was an outgrowth of a symposium on improvements in fixation and tissue preservation held at Oxford in April 1972. The book presents the ideas of ten prominent histochemists and scientists on ways to resolve the problem of fixation.

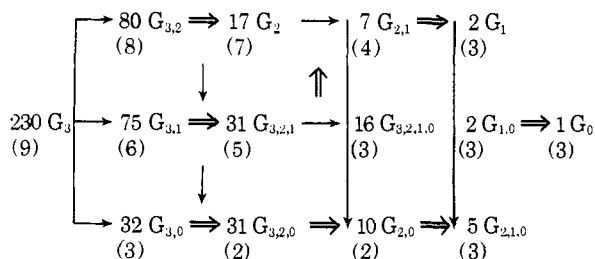
The book includes ten papers, a list of contributors, and a short subject index. The papers include: "Reactions of aldehydes with unsaturated fatty acids during histological fixation"; "Theoretical and practical aspects of glutaraldehyde fixation"; "Osmolarity of osmium tetroxide and glutaraldehyde fixatives"; "The effect of fixative tonicity on the myosin filament lattice volume of frog muscle fixed following exposure to normal or hypertonic ringer"; "The demonstration of acid phosphatase in *in vitro* cultured tissue cells. Studies on the significance of fixation, tonicity and permeability"; "Cytochemical evidence for the leakage of acid phosphatase through ultrastructurally intact lysosomal membranes"; "Improved preservation of alkaline phosphatase in salivary glands of the cat"; "Fixation and tissue preservation for antibody studies"; "Enzyme markers: their linkage with proteins and use in immunohistochemistry"; and "Fixation: What should the pathologist do?". The papers are illustrated with a number of useful photomicrographs and drawings. Each paper includes a list of references to aid in further evaluation of the particular method.

While this is not the final word on the problem of fixation, the hope is that this book will stimulate histochemists and other scientists to find ways to fully resolve the problem. All individuals concerned about fixation will find this an interesting and valuable book.

Donald F. Logsdon, Jr., *U.S. Air Force Academy (DFLS)*

Symmetry in Science and Art. By A. V. SHUBNIKOV (Academy of the Sciences, U.S.S.R., Moscow) and V. A. KOPTSIK (Moscow University). Translated by G. D. ARCHARD. Edited by D. HARKER. Plenum Press, New York, N.Y. 1974. xxv + 420 pp. \$35.00.

The first edition of this book (1940) was written by A. V. Shubnikov. At his request, V. A. Koptsik has here partly rewritten and generalized the first edition in the first nine chapters and has added three new chapters presenting the latest developments and current state of symmetry (Chapters 10 and 11), as well as some applications of symmetry in science and art (Chapter 12). The book is complete and intended to serve a wide need; depending upon content selection by the reader, the book is a popular introduction, a monograph, a textbook, or a reference. The introduction to symmetry is presented in Chapters 1-9 where the 230 geometrical space groups are introduced in the following format:



In this scheme, a single arrow denotes a transition to a subgroup; a double arrow denotes the effect of a cross section or a projection.

The numbers in front of the symbols (defined in the text) correspond to the number of distinct crystallographic groups. The number in parentheses under the symbol of a group is the chapter wherein that group is presented. The concept of symmetry in art is presented by including many noncrystalline examples of space groups; these are among the 234 figures in the book and include microorganisms, flowers, ink blots, paper cuttings, Lissajous figures, as well as ancient and modern works of art. For example, *Aurelia insulinda*, Figure 20, is an example of symmetry group $G_{3,2,0}$, possessing a fourfold symmetry axis.

Chapters 10 and 11 are intended for deeper study of symmetry. The former is a condensation of the elements of group theory into 28 pages; the latter chapter (44 pages) generalizes symmetry to include the antisymmetry operations of Shubnikov and the color symmetry operations of Belov, increasing thereby the number of allowable space groups, some of which are presented in the 22 tables of the text. The authors admit that only a few of the main areas of development of symmetry theory in recent years could be included in their book, and readers are referred to the 10 pages of bibliography for more extensive presentations of individual areas.

The forward for the English translation is written by S. C. Abraham (Bell Laboratories) who aptly summarizes the work: "... a major event in the development of symmetry theory and application, and the book promises to become the classic treatise in the field."

John C. MacDonald, *Fairfield University*

Problems and Solutions in Quantum Chemistry and Physics. By C. S. JOHNSON, JR., and L. G. PEDERSEN (University of North Carolina). Addison-Wesley, Reading, Mass. 1974. xx + 432 pp. \$7.95.

This is a collection of problems which should be very useful to anyone teaching or taking a course in advanced physical chemistry, spectroscopy, or quantum chemistry.

The book consists of twelve chapters which are entitled Atomic Physics and the Old Quantum Theory, Waves and Superposition, Postulates and Formalism of Quantum Mechanics, Simple Exactly Soluble Problems in Wave Mechanics, Angular Momentum, Perturbation and Variation Theory, Hydrogen-like Atoms, Electronic Structure of (Multi-electron) Atoms, Electronic Structure of Molecules, Radiation and Matter, Molecular Spectroscopy, and Scattering Theory. Each chapter begins with a short section describing the most important concepts to be covered, the relevant equations, and some standard computational techniques. This is followed by approximately twenty problems, of increasing difficulty, with detailed solutions. Also provided in each chapter are approximately ten additional "supplementary" problems, with answers but not solutions. There are also a number of Appendices on mathematical topics, a list of references (mostly standard textbooks) which are cited in the solutions to the problems, and a Subject Index. The book has been produced in an attractive format; although bound as a paperback, the pages are $8\frac{1}{2} \times 11$ " in size.

The problems in this collection seem to have been carefully selected and worked out, and the authors have produced what is certainly a very useful addition to the chemical literature. At the quoted price this is a real bargain, and it is a pleasure to recommend the book to anyone with even a passing interest in quantum chemistry and physics.

J. E. Mark, *University of Michigan*

Advances in Mass Spectrometry. Volume 6. Edited by A. R. WEST (B. P. Trading, Ltd., B. P. Research Center). Applied Science Publishers, Ltd., Barking, Essex, England. 1974. xxvi + 1091 pp. £25.

This volume comprises the plenary lectures and contributed papers presented at the 6th International Mass Spectrometry Conference held in Edinburgh, Scotland, September 10-14, 1973. The book contains manuscripts from nine of ten plenary lectures in addition to 124 contributed papers covering such topics as the biochemical applications of mass spectrometry, the relationship between information theory and mass spectrometry, organic molecule fragmentation mechanisms, instrumental developments, new mass spectrometric techniques, negative ion studies, inorganic applications of mass spectrometry, ion-molecule reaction studies, metastable ion studies, computer developments germane to mass spectrometry, and theoretical mass spectrometry developments.

The plenary lecture papers are outstanding reviews and give the reader an excellent account of the subject material. The quality of the contributed papers varies greatly. Some of the contributed papers contain no new information and even fail to cite references; other contributions such as the papers by Hunt, by Schulten and Beckey, and by Reeher and Svec are high-quality research reports and greatly enhance the volume's value. It is unfortunate that some of the discussions involving the plenary lectures, though not an official part of the conference, have not been published. Perhaps the conference organizers should consider this shortcoming in the next triennial conference. The discussions of the contributed papers are one of this reviewer's favorite sections and add greatly to the value of the book. The subject index of this volume is excellent, but the absence of an author index detracts from the book's value.

Overall, this volume is a valuable contribution to the mass spectrometry literature; it enables the readers to obtain an overview of mass spectroscopy research in 1973. Moreover, by comparing Volume 6 (1973) with Volume 5 (1970) of this series, research trends in mass spectroscopy are apparent.

Fred E. Saalfeld, *Naval Research Laboratory*

Specialist Periodical Reports: Nuclear Magnetic Resonance. Volume 3. Edited by R. K. HARRIS (University of East Anglia). The Chemical Society, London. 1974. xxx + 425 pp. £14.00.

This volume represents one in a larger series of over thirty different titles. Most of these are very extensive reviews written by a number of well-qualified specialists, but, if my check of several libraries is any indication, the series has been slow to catch on. Perhaps the regular coverage now being offered will help establish it as a standard reference set. There are twelve chapters which essentially cover all the literature from June 1972 to May 1973. The larger chapters are "Nuclear Shielding" (W. T. Raynes), "Nuclear Spin-spin Coupling" (R. Grinter), "Nuclear Spin Relaxation" (D. J. Tomlinson), "Spectral Analysis" (R. G. Jones), "Macromolecules" (I. D. Robb and G. J. T. Tiddy), "The Solid State" (W. Derbyshire), "Fourier Transform NMR" (D. Shaw), and "Chemically Induced Dynamic Nuclear Polarization" (P. G. Frith and K. A. McLauchlan). The last two chapters listed here introduce topics not discussed in the two previous volumes; most of the other chapters excellently dovetail their formerly written counterparts. Since it is almost exclusively a long table, the chapter on spectra analysis seems inappropriate in a book otherwise written in narrative. To a lesser degree the chapter on macromolecules seems to violate the prevailing style.

The volume is promoted by the Senior Reporter and the publisher as being both comprehensive and critical. It is certainly comprehensive, but there is a minimum amount of critical discussion. Only some of the chapter authors (called reporters) have been critical and then only in sections. Being critical however, is a most difficult task and, in fact, for practical reasons, perhaps an impossible one. But for anyone seriously interested in nuclear magnetic resonance, I would recommend this volume as valuable because it is thorough and current.

John G. Stevens, *University of North Carolina—Asheville*

Mechanical Properties of Polymers and Composites. Volume 2. By L. E. NIELSEN. Marcel Dekker Inc., New York, 1974. xi + 300 pp. \$28.75.

This volume of the two-part set is composed of four chapters. The first focuses on the basic effects of external, molecular, and morphological parameters on the stress, strain, and strength behavior of polymer solids. Temperature, molecular weight, orientation, and crystallinity are examples of some of the topics discussed. The second chapter is brief and focuses on the less commonly discussed properties as hardness, fatigue, wear, scratch resistance, etc. The last two chapters concern polymer composites, the first emphasizing particulate-filled polymers while the latter is directed at treating fiber-filled polymers. Both of these chapters discuss composite strength and rheological behavior, the aim being to relate properties to the actual structure of the material.

The text is written in a coherent and easily readable manner. While a few errors exist in the presentation of figures, the book is of good quality in its present form.

Garth L. Wilkes, *Princeton University*

Medicinal Chemistry. Volume 4-III. Psychopharmacological Agents. Edited by MAXWELL GORDON (Bristol Laboratories) with thirteen contributors. Academic Press, New York, N.Y. 1974. xii + 403 pp. \$28.50.

In the preface the editor indicates that work carried out in past decades warrants updating of Volumes I and II and that notable progress has been made in relating various amines in the central nervous system to the mental state.

Chapter 1. The editor presents an introduction and review of twenty years of progress including a discussion of the status and current problems in the treatment of mental disorders in the U.S.

Chapter 2. "Biological Factors in the Affective Disorders and Schizophrenia", by F. K. Goodwin and D. L. Murphy, discusses the affective disorders of depression and mania, pharmacological evidence concerning brain amines in affective illness, problems in interpreting pharmacological data, studies with compounds that affect brain catecholamines and brain serotonin, assessment of metabolites in urine and cerebrospinal fluid, brain tissue studies, amine-related enzymes, and a detailed discussion of schizophrenia. These studies continue to emphasize the requirements for seeking out the biological antecedents of psychiatric disorders. A detailed discussion of research strategies is presented. The most comprehensive data are those which relate neurotransmitters with abnormal mental functioning.

Chapter 3. "Antipsychotic Agents (Tricyclic)", by C. L. Zirkle and C. Kaiser, covers the tricyclic psychotropic agents, therapeutic effects which include extrapyramidal symptoms and metabolic or endocrine effects, mechanism of action, effects on the central catecholaminergic systems and the cyclic AMP systems, distribution and metabolic fate, testing methods as related to structure-activity correlation, tricyclics with six- and seven-membered central rings, and finally the relation between structure, physical properties, and activity. The latter section, of interest to the medicinal chemist, further shows that antipsychotic drugs are lipophilic and accumulate at interfaces and cell membranes. The structural and stereochemical factors are presented which maximize activity. Also significant is surface activity, ionization constant, and ability to donate an electron to form a relatively stable radical cation. The undesirable effects of therapy with antipsychotics are adequately presented, such as tardive dyskinesia and Parkinsonism-like syndrome. There is optimism that the increasing investigation of monoaminergic pathways and drug effects will lead to more effective or selective antipsychotic drugs.

Chapter 4. "Butyrophenones and Diphenylbutylpiperidines", by P. A. J. Janssen, presents the structural features of butyrophenones derived from 4-aminobutyrophenone which are associated with high neuroleptic activity. However, although a great number of secondary and tertiary amines of this type have been reported, none seems to be more potent, longer acting, more specific, or less toxic than the nine prototypes discovered earlier.

Chapter 5. "EEG Applications in Psychopharmacology", by M. Fink, offers the thesis that the need for improved methods of predicting psychoactive activity has led to the search for new evaluation methods. Presented in this section is information that demonstrates that "drugs which alter human interactive behavior do so by changing cerebral functions and these changes are reflected in the EEG measures of frequency, amplitude, variability, and pattern." Observations on earlier drugs (fenfluramine, cyclazocine, doxepin) and recent compounds are examined. Also discussed is the use of EEG as an index of CNS bioavailability.

Chapter 6. "Chemistry and Pharmacology of the 1,4-Benzodiazepines", by L. O. Randall et al., discusses chemistry, drugs in clinical investigation, 2-aminobenzophenones, substitution in position 7, structure-activity relationships, metabolism, biochemical effects, psychopharmacology, neuropharmacology, and future developments.

Chapter 7. "Antidepressant Drugs", by J. H. Biel and B. Bopp, offers an overview, structure-activity relationships of tricyclics and monoamine oxidase inhibitors, pharmacology of non-MAO inhibitors, mechanism of action, screening methods, EEG effects, and the clinical activity of antidepressants. Up to a few years ago the chances seemed slim for a therapeutic breakthrough; however, a number of apparently unrelated events are presented which indicate a change in this belief.

V. H. Maddox, *Parke, Davis & Company*