Book Reviews

Experimental Organic Chemistry. By Michael P. Doyle and William S. Mungall (Hope College). John Wiley & Sons, Inc., New York. 1980. xvii + 490 pp. $17.95.

Doyle and Mungall have written a fine laboratory manual for the 1980s. It undoubtedly will be adopted for many organic chemistry laboratory courses and deservedly so. The health effects of organic chemicals and laboratory economy are stressed in all of their experimental procedures. Many of the experiments are designed to teach the principles of organic qualitative analysis by using both classical techniques and modern instrumental methods. The experiments are varied enough so the laboratory teacher who uses this text can choose experiments illustrating newer material as presented in recent organic chemistry textbooks as well as important classical organic chemistry. Some of the experiments were developed by the authors for this textbook and seem to be well chosen.

David H. Kenny, *Michigan Technological University*

Photometric and Fluorometric Methods of Analysis—Nonmetals. By Foster D. Snell (Foster D. Snell, Inc.). Wiley-Interscience, New York. 1981. xiv + 818 pp. $80.00.

In some respects, because of atomic absorption, many analytical chemists consider the problem of cation analysis as solved. Since no such universal instrumentation exists for nonmetal analysis, this compilation is a most welcome contribution. It summarizes the major literature on anion analysis for the last 25 years and provides condensed procedures which include sample pretreatment, reagents, and appropriate wavelength criteria for spectrophotometric or fluorometric measurements for actual sample analysis ranging from such diverse materials as air, baby food, oil-feed brine, etc. to "Zircaloy". The directions in most cases are sufficient to permit the determination and are supplemented with more than 3000 literature citations. The index, fortunately, is most complete (103 pages).

Each chapter is essentially a small monograph on the determination of the most common anion, oxyanion, or anion species of the following elements: phosphorus, silicon, boron, the halogens, sulfur, selenium, tellurium, nitrogen, carbon, and oxygen. Also included is the determination of ammonia, water, hydrazine, hydroxylamine, carbon disulfide, carbonyl sulfide, oxygen, and ozone. The work is of supurb quality and highly recommended and without question will be a necessary purchase for libraries and analytical laboratories. It is a book that is needed and will be used by chemists.

Peter F. Lott, *University of Missouri—Kansas City*

Ion-Selective Electrode Reviews. Volume 2. Edited by J. D. R. Thomas (University of Wales, Institute of Science and Technology). Pergamon Press, New York and Oxford. 1981. v + 261 pp. $56.00.

This book is the bound form of the journal *Ion-Selective Electrode Reviews*, Volume 2, No. 1 and 2, first published in 1980. It consists of six chapters covering important areas of the theory, development, and application of ion-selective electrodes (ISEs).

Chapter 1 is a review of piezoelectric crystal detectors written by G. G. Guilbault. Although these devices are not related to ion-selective electrodes, the topic is interesting and well presented. The chapter begins with a brief introduction of the theory and instrumentation required for piezoelectric measurements followed by a survey of analytical applications.

The second chapter, written by M. Mascini, provides a discussion of the theory and application of the various methods used in ISE measurements. The methods covered include the direct method, known addition and subtraction, Gran's plot, and multiple standard addition. The advantages and limitations of these methods are discussed and practical examples of their application are given. This chapter provides a guide to the selection and optimization of the best method for a particular analysis, and should be invaluable to anyone involved with practical ISE measurements.

In Chapter 3, G. J. Moody and J. D. R. Thomas review an important application of ISEs, i.e., the use of sodium and chloride electrodes in the sweat electrolyte test for the rapid screening of cystic fibrosis. An appraisal of ISE sweat analysis data is provided, as well as a discussion of potential problems with the measurement. The results of three recent screening programs based on ISE sweat chloride measurements are also given.

Chapter 4, written by J. Gulens, is a discussion of surface effects on the response characteristics of precipitate-based copper, halide, and silver sulfide electrodes. Discrepancies in the literature concerning the lower detection limits and interferences of these electrodes are explained in terms of alterations in the nature and composition of the electrode surface due to redox or other chemical reactions with species in solution. Optimum methods of electrode preparation and measurement conditions to minimize these effects are described.

Chapter 5 is a comprehensive review of the application of ISEs in drug analysis. The determination of both inorganic and organic compounds is discussed.

The volume is concluded with a compilation of recent titles prepared by G. J. Moody and J. D. R. Thomas. This listing provides a convenient reference to the ISE literature (1979 through early 1980), which is divided into several areas, e.g., Electrode Development and New Electrodes, Mechanistic and Theoretical Aspects, and Application of ISEs.

This book contains a series of well written ISE reviews, covering a number of diverse topics. It should be of interest not only to specialists in the field but also to scientists in other disciplines, e.g., clinical and pharmaceutical chemistry.

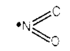
Robert K. Kobos, *Virginia Commonwealth University*

Introduction To Paint Chemistry. Second Edition. By G. P. A. Turner (ICI Paints Division). Chapman and Hall Publishers, London–New York. 1980. 229 pp. $19.95 hardcover; $12.50 paperback.

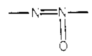
This book is not written for anyone reading this journal. Even though the first part covers inorganic and organic chemistry it does so in an inconsistent, confusing, and superficial manner. The second part should be useful to a paint technician with no higher education. The sentence structures and syntax are good; the fog index is low; and the coverage is wide.

Inconsistencies in dot-dash usage are found on p 35 ($CH_2{=}CH{\cdot}CH_2CH_3$) and elsewhere in structural forms; in blue-violet and violet blue designations of the same part of the spectrum on one page (p 79); and in blue shown to the left of red in color addition and to the right of red on subtraction (p 81). A section on functionality and one on polymerization appear in the chapter on solid morphology.

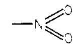
Confusing statements and structures abound. On p 42 one finds



but this pales in comparison to $N{\equiv}N{=}O$ on p 14 and



on p 77. Later (p 78) one reads that



is a chromophore because of high *localized* electron density. The context shows that the error is not typographical.

Other evidence that confusion exists in the mind of the author is his statement that hydrogen peroxide dissociates homolytically because it is symmetrical (ignoring the type of dissociation that sodium peroxide undergoes).

Superficiality is especially noted in the chapter on solids which provides some useful insights on the effect of crystallinity on the suitability of a polymer as a coating resin. The entire subject with all its subtleties is covered in 13 pages. Color, which follows, covers basics of radiation, reflection, refraction, and diffraction in 6 pages; color principles and chemistry complete the chapter in another 6 pages. Part 2, on the applied science of paint, takes up only 136 pages.

Even where the statements are reasonably accurate the examples chosen are atypical at best, misleading at worst. The already mentioned structure of nitrous oxide was given as an example of a variable valency on p 13. Turn the page and learn that core electrons in an atom provide a negative screen around the nucleus which reduces its power of attraction for electrons. This statement, made in connection with electronegativity, gives the opposite impression of what is meant. HCl is shown to dissociate copiously on p 18 without water. SO_3 is used as the example of a gas on p 18, even though it boils at 44.8 °C. And C–H was the model for a nonpolar bond on p 21. The difference in color of CuS-

O_4·$5H_2O$ (blue) and $CuCl_2$·$2H_2O$ (green) was attributed on p 78 to the ligand, not to a fundamental structural difference with different ligand-filled splittings. In passing, one is told that the color of transition metals is due to "special electrons".

The chapters on paint appear to follow traditional lines and therefore would not likely displace the excellent series on coatings technology published and updated by the Federation of Societies for Coatings Technology in Philadelphia. One can be forgiven for refusing to read on. If he does, he will learn fragments about dry film properties, drying, pigmentation, and solvents, in that order. The reverse sequence would be more logical. Lacquers, emulsions, and nonaqueous dispersions share a 13-page chapter, despite the importance of each, considered individually.

This book can be recommended only to a noncritical reader at the technician level.

Raymond R. Myers, *Kent State University*

Reviews in Biochemical Toxicology. Volume III. Edited by E. Hodgson (North Carolina State University) and J. R. Bend and R. M. Philpot (National Institute of Environmental Health Sciences). Elsevier Holland North, New York. 1981. ix + 368 pp. $49.50.

The continued growth of research and the emergence of several new graduate-training programs in biochemical toxicology lend support to the editors' previously stated view that "Although the emphasis is still on testing for chronic toxicity, we remain firm in our conviction that progress in this and other areas of toxicology must spring primarily from increased knowledge of the fundamental mechanisms involved in the poisoning and detoxication processes."

Volume III contains 10 papers by 21 contributors, assigned to 6 topics: Xenobiotic-Metabolizing Enzymes, Biochemical Toxicology of Organs and Organ Systems, Toxic Compounds, Modes of Toxic Action, Methodology of Biochemical Toxicology, and Comparative Toxicology. An extended subtitle index but no subject index is provided. Of particular interest to chemists are reviews on the Biochemical Toxicology of Benzene (30 pages, 125 references) and on Aromatic Hydrocarbons: Metabolism by Bacteria, Fungi and Algae (40 pages, 153 references).

Benzene has a long history of extensive use in industry, first as a volatile solvent and later as a starting material for the synthesis of other chemicals. The manufacturers of paints and plastics have been among the heaviest users. It is also used as an antiknock agent in gasoline as a replacement for alkyl lead compounds. Hazardous occupational exposure may occur via inhalation. Chronic exposure has been reported to result in bone-marrow damage in animals and humans and has been associated with the development of aplastic anemia and leukemia in humans. However, duration and levels of benzene exposure are often lacking in retrospective epidemiological studies. Although benzene was negative for mutagenic activity, its presumed initial metabolite, benzene oxide, was mutagenic for *S. typhimurium* (the Ames test).

The authors review studies on the metabolism of benzene in experimental animals and humans, and in vitro. Benzene is rapidly absorbed and distributed, and may be metabolized via an epoxide to phenol in both the liver and bone marrow, followed by conversion to pyrocatechol and/or hydroquinone. Participation by the liver is essential in producing toxicity. The mechanism of benzene-induced hemopoietic toxicity is also discussed.

Metabolism via enzymatic oxidation also occurs for other aromatic hydrocarbons, such as biphenyl, naphthalene, phenanthrene and anthracene, benz[*a*]pyrene and benz[*a*]anthracene. The relative stereochemistry of dihydrodiols formed by different biological systems is important as evidence for the reaction mechanisms involved.

A review of the metabolic interaction of hydrocarbons with mammalian lung discusses the mechanisms responsible for detrimental effects to the lungs following exposure to aliphatic, alkylated aromatic, and hydrocarbons (45 page, 163 references).

The metabolic activation and detoxication of aflatoxins are also reviewed (37 pages, 147 references). Epoxidation of aflatoxin B_1, a mold metabolite, is believed to be responsible for its potent carcinogenicity in animals and probably in man.

Marguerite L. Leng, *The Dow Chemical Company*

Molecular Interactions. Volume 2. Edited by H. Ratajczak (University of Wroclaw, Poland) and W. J. Orville-Thomas (University of Salford, UK). John Wiley & Sons, New York. 1981. xxiii + 627 pp. $110.00.

The twelve reviews in this volume are by an international cast of workers from a variety of disciplines: Proton Transfer and Ion Transfer Complexes, by Th. Zeegers-Huyskens and P. Huyskens; The Kinetics of Exchange and Proton Transfer Processes in Hydrogen-bonded Systems in Inert Media, by G. S. Denisov, S. F. Bureiko, N. S. Golubev, and K. G. Tokhadze; Kinetic Studies of Micelle Formation in Surfactants, by J. Gormally, W. J. Gettins, and E. Wyn-Jones; Structural Aspects of Hydrogen Bonding in Amino Acids, Peptides, Proteins, and Model Systems, by S. N. Vinogradov; Hydrogen-bonded Ferroelectrics and Lattice Dimensionality, by R. Blinc; The Significance of Charge Transfer Interactions in Biology, by M. A. Slifkin; Dipole Moment, Dielectric Loss, and Molecular Interactions, by C. P. Smyth; Nuclear Quadrupole Resonance Studies of Molecular Complexes, by L. Guibê and G. Jugie; Mössbauer Effect Studies of Molecular Complexes, by M. Pasternak and T. Sonnino; Electrical Conductivity of Solid Molecular Complexes, by K. Pigon and H. Chojnacki; Photoelectron Spectroscopic Studies of Molecular Complexes, by I. H. Hillier; and Properties of Molecular Complexes in the Electronic Excited States, by N. Mataga.

The first volume of this series dealt with theoretical aspects and vibrational problems. This second volume is perhaps of interest to a broader segment of the scientific community since it deals with the significance of hydrogen bond and electron donor–acceptor interactions in molecular biology and solid-state physics. It also is concerned with selected methods of studying electronic structures and properties of molecular complexes. The reviews and the bibliographies presented provide a very good reference for chemists, physicists, or molecular biologists who have recognized the need for more detailed knowledge of molecular interactions in their investigations.

Stanley C. Neely, *University of Oklahoma*

Carbohydrate Chemistry. Volume 12. A Specialist Periodical Report. By: Senior Reporters—J. F. Kennedy (University of Birmingham) and N. R. Williams (Birkbeck College, University of London); Reporters—B. E. Davison, I. M. Morrison, R. J. Ferrier, C. M. Sturgeon, and R. J. Sturgeon. The Royal Society of Chemistry, London. 1981. xiv + 624 pp. $143.00.

This 12th volume of the series covers the new literature in the field of carbohydrate chemistry available to authors between January and December of 1978. Over 1000 references are cited in Part I and almost 2400 publications are reviewed in Part II.

Part I, representing one third of the book, deals in the first 19 chapters with chemistry of mono-, di-, and trisaccharides and their derivatives. These compounds include free sugars, glycosides, ethers and anhydro sugars, acetals, esters, halogenated sugars, amino sugars, miscellaneous N, S, Se, and P derivatives, deoxy sugars, unsaturated derivatives, branched-chain sugars, aldosuloses, dialdoses, diuloses, sugar acids and lactones, inorganic derivatives, alditols and cyclitols, antibiotics, nucleosides, and the synthesis of optically active noncarbohydrate compounds. Three chapters treat physical and analytical methods.

Part II, concerned with macromolecules, covers, after a brief introductory chapter, general methods of analysis and structural methods, plant, algal, and microbial polysaccharides, glycoproteins, glycopeptides, proteoglycans, and animal polysaccharides. A significant portion is then devoted to enzymes, glycolipids, and gangliosides, as well as to the chemical synthesis and modification of oligosaccharides, glycoproteins, glycopeptides, glycolipids, and enzymes.

Many readers will appreciate the references to *Chemical Abstracts*, as supplements to the citations of papers published in less accessible journals. Also very helpful is the cross-reference system between chapters used throughout the book. One minor ambiguity may be mentioned here: because "dpm" is already in wide use as the abbreviation for "disintegrations per minute", it might not have been the best choice to abbreviate "dipivaloylmethanato" also as "dpm".

The efforts of the two new Senior Reporters and their co-workers have led to a concise, well-organized survey of new literature on carbohydrate chemistry, presented in a readable form. The authors and publisher deserve praise for continuing to produce these high-quality, invaluable Reports.

Josef Nemec, *St. Jude Children's Research Hospital and University of Tennessee Center for the Health Sciences*