

## Book Reviews

**Chemistry and Toxicology of Pyrrolizidine Alkaloids.** By A. R. Mattocks (Medical Research Council Laboratories). Academic Press: New York. 1986. x + 393 pp. \$88.00. ISBN 0-12-480570-1.

It is difficult to imagine a more thorough review of a class of natural products encompassing the disciplines of chemistry and toxicology than the excellent treatise presented in this book. Topics of particular interest to chemists which are covered include the isolation and analysis of the pyrrolizidine alkaloids, their spectroscopic and other properties which lend to their structural analysis, a survey of the synthetic efforts devoted to this important class of alkaloids, and a review of the chemical reactivity which is ultimately responsible for the bioactivity. Especially helpful to natural product chemists is an extremely detailed listing of the sources of the pyrrolizidine alkaloids with all the structural variations found to date. The biosynthesis of these compounds is not presented, but references are given for work in this area.

The review of the toxicology, beginning with the metabolic activation, is likewise thorough and an invaluable reference source for workers in this field. Chapters detailing known and even speculated toxic and other biological actions in animals (both livestock and laboratory animals) and in humans are given. While the hepatotoxicity of the alkaloids is the biological activity of primary importance, other reported effects, such as mutagenicity, carcinogenicity, and other modes of action, are also discussed. Perhaps the only point not presented in great detail is a molecular analysis of the chemical interactions between the toxic metabolites and the cell components responsible for the expression of biological activity. A brief chapter which summarizes suspected chemical pathways, however, is presented. In sum, this book is excellent, providing "all you need to know" about pyrrolizidine alkaloids.

John K. Snyder, *Boston University*

**Drug Development: From Laboratory to Clinic.** By Walter Sneader (University of Strathclyde). John Wiley and Sons: Chichester. 1986. viii + 115 pp. \$17.95. ISBN 0-47191-116-X.

This short volume describes the process of developing a pharmaceutical compound, beginning with how discoveries are made in the laboratory and ending with the clinical trials process. Some mention is made of post-marketing activities, although these are not the main focus of this work.

The book reinforces its concepts throughout by citing (without company affiliation) the history of various medicinals which illustrate the topic of interest. For instance, in the chapter on toxicity testing, thalidomide is noted as an example of a drug whose teratogenicity only became apparent after it was widely prescribed as a mild sedative to aid pregnant women in combatting morning sickness in the first trimester of pregnancy. The resulting birth deformities led to the new requirement of substantially more toxicity testing prior to the granting of an IND (Investigational New Drug) license to begin human trials of a drug candidate.

Other controversial topics are also mentioned. Some examples include the debate on the use of laboratory animals in toxicity testing, the fate of orphan drugs, and the pros and cons of "trial by the news media".

On all counts, this book succeeds in describing the perilous journey that a potential drug must undergo prior to approval by the appropriate government agencies. The book is very readable and should prove invaluable to the college or graduate level student who is considering a career in the pharmaceutical industry. Nontechnical workers in the pharmaceutical field will also benefit from this clear presentation of just what a drug candidate must undergo to become a medicine of the future. This could foster a greater understanding of what their particular contribution to the pharmaceutical industry is.

James A. Thomas, *Warner Lambert Co.*

**Instrumental Methods in Electrochemistry.** By R. Greef, R. Peat, L. M. Peter, D. Pletcher, and J. Robinson (University of Southampton). John Wiley & Sons: New York. 1985. 443 pp. \$110.00. ISBN 0-470-20199-1.

This book is an outgrowth of an annual graduate-level short course in electrochemical methods by the Electrochemistry Group at Southampton University. This excellent text goes well beyond the lecture notes for that course which were available under the title of "Advanced Instrumental Methods in Electrode Kinetics". The material in the present text should be particularly useful to graduate students studying electrochemistry as well as academic and industrial chemists who are interested

in utilizing electrochemical techniques.

The organization of the book, which includes 11 chapters, is based upon successive chapters which deal with fundamentals and techniques on an alternating basis. Chapter 1 is an introduction to the fundamental concepts of electrochemistry, while Chapter 2 discusses steady-state and potential-step techniques. Chapter 3 is an excellent exposition on the fundamentals of electron transfer and Chapter 4 considers convective electrochemical techniques. Chapter 5 discusses theories of the electrical double layer while Chapter 6 represents a thorough treatment of the ubiquitous potential-sweep techniques. A particularly timely subject, electrocatalysis, is discussed in Chapter 7 followed by a treatment of AC techniques in Chapter 8. The fundamentals of electrocrystallization are discussed in Chapter 9 while Chapter 10 deals with spectroelectrochemistry techniques. Finally, Chapter 11 is a practical treatment on the design of electrochemical experiments. Of particular interest to students of electrochemistry is that this text treats the above fundamental principles and techniques using a minimum amount of mathematics (which is by no means a small feat!). The result is a text which is quite easy to read; however, it is also more empirical and less analytical in its treatment of electrochemistry than other recent texts on this subject.

The book references the literature reasonably well with an average of 40 citations per chapter. Thus, most practicing electrochemists, as well as those who are planning on utilizing electrochemical methods in their research, should have a copy of the text on their bookshelves. The style of the text makes it an excellent companion text to Bard and Faulkner's "Electrochemical Methods, Fundamentals and Applications". If it were not for the cost, I would suggest it as an accompanying text to Bard and Faulkner for students taking graduate courses in electrochemistry.

Duane E. Bartak, *University of North Dakota*

**Inorganic Syntheses. Volume 24.** Edited by Jeanne M. Shreeve (University of Idaho). John Wiley and Sons: New York. 1986. xxii + 391 pp. \$47.50. ISBN 0471-83441-6.

The latest volume of this excellent series maintains the same high standards set by previous volumes and is a must for library and more extensive personal collections.

Chapter one is devoted exclusively to fluorine chemistry, including the synthesis of a variety of main group fluorine compounds and several transition-metal fluoride complexes. Chapter two is concerned with various aspects of main group chemistry including indium, aluminum, mercury, and thallium organometallics and a section on organoselenium superconducting solids. Chapter three will be of primary interest to true organometallic aficionados. This section includes group four Cp and Cp\* complexes and a variety of other transition-metal species. Chapter four is again concerned with transition metals but is broader in its coverage and includes dinitrogen complexes of iron, lithium insertion compounds based on vanadium disulfide and rhenium trioxide, ethylene complexes of Pt(0), and several Cr(III) and Rh(III) complexes. The final chapter describes the synthesis of a whole variety of transition-metal triflate complexes and will no doubt prove an extremely handy and valuable collection for people interested in these materials and their employment as synthetic reagents.

Overall, the coverage of this volume is wide and it will surely have something to please any of a variety of tastes.

G. Christou, *Indiana University*

**Applications of Dynamic NMR Spectroscopy to Organic Chemistry.** By Michinori Oki (University of Tokyo). VCH Publishers: Deerfield Beach, FL. 1985. xii + 423 pp. \$92.50. ISBN 0-89573-120-7.

With the advent of recent innovative pulse sequences, nuclear magnetic resonance (NMR) spectroscopy has become even more useful in determining the structure of complex organic molecules. As the author of this book points out, information about organic molecules beyond structural information can be obtained if a nucleus in the molecule can exist in two different magnetic environments and if the nucleus exchanges between these two environments on a time scale of  $10^{-9}$  s or slower. The additional information, obtained by what the author terms dynamic NMR spectroscopy, is the rate of exchange between the two environments and can be used to estimate thermodynamic activation barriers and to probe possible reaction mechanisms.

The first chapter (40 pages) contains a very brief review of the spin-exchange method, concentrating primarily on classical, continuous wave, line-shape analysis to extract exchange rates. Newer pulse methods to

measure exchange rates are not covered. The remainder of the book is an extensive collection of the applications of dynamic NMR to organic chemistry, as advertised by the title. Chapters 2 through 6 (245 pages) review studies done on rotation about chemical bonds, Chapter 7 (37 pages) reviews conformational changes in ring compounds, Chapter 8 (57 pages) reviews rotation and inversion in amine and imine compounds, and Chapter 9 (42 pages) reviews applications to chemical reactions in which bonds are broken. The book is a good reference work and is recommended to organic chemists who wish to probe the dynamical aspects of organic compounds.

James A. Dix, *State University of New York*

**Topics in Current Chemistry. Volume 133.** Guest Editor: A. de Meijere. Springer-Verlag: New York, 1986. 163 pp. \$59.50. ISBN 0-387-16307-7.

Volume 133 in this fine series focuses on the synthesis and reactions of functionalized cyclopropanes and cyclobutanes. Professor B. M. Trost presents the first chapter, which is entitled "Strain and Reactivity: Partners for Selective Synthesis", in which he reviews the preparation and utilization of cyclopropanes. The review covers the area quite thoroughly and focuses extensively on sulphonium cyclopropylides and metallated phenylthiocyclopropyl ethers. Metallated trimethylsilylcyclopropyl ethers are not covered, however. The discussion of conversions to oxaspiranones, vinylcyclopropyl alcohols, cyclobutanones, cyclopentanones, and cyclohexanones is well organized and is illustrated with many useful examples. In addition, several total syntheses are retroanalyzed with respect to the application of these interesting methodologies. These exercises are quite useful in emphasizing key points. The author also explains how terminology such as secoalkylation and geminal alkylation applies in this area.

The second chapter entitled "The Application of Cyclobutane Derivatives in Organic Synthesis" is authored by Henry N. C. Wong, Kin-Lik Lau, and Kam-Fai Tam from the Chinese University of Hong Kong and the Department of Applied Science, Hong Kong Polytechnic. This chapter covers the wide variety of ways to form and react cyclobutanes and is quite complete. It covers, for example, the de Mayo reaction, 2 + 2 photocycloadditions, dichloroketene additions, and various rearrangements and fragmentations which occur with cyclobutanones. Some items which are covered in the first chapter are re-covered in this chapter, but for the most part it is unique and interesting material.

This volume is a useful review of the chemistry of three- and four-membered carbocycles and should not be overlooked by the academic or industrial synthetic organic chemist.

Thomas N. Nanninga, *Warner Lambert/Parke Davis Research*

**Stratospheric Ozone Reduction, Solar Ultraviolet Radiation and Plant Life.** Edited by R. C. Worrest (Oregon State University) and M. M. Caldwell (Utah State University). Springer-Verlag: Berlin, Heidelberg, New York, 1986. ix + 374 pp. \$72.00. ISBN 0-123-45678-9.

This is a state-of-the-art Proceeding of the NATO Advanced Research Workshop on The Impact of Solar Ultraviolet Radiation upon Terrestrial Ecosystems: 1. Agricultural Crops. The workshop was held at Bad Windsheim, Germany, September 27-30, 1983. Although its release time was well after the Workshop, the Proceedings still represent the state of the art in most respects. It is clear that a national/international concern exists as to the possible consequences of releases of high quantities of nitrogen oxide (NO) and chlorofluorocarbons (primarily C1) on the stratospheric ozone layer. The primary concern regards O<sub>3</sub> depletion with a resultant increase in UV radiation reaching the surface of the earth, primarily UV-B with radiation from 290-320 nm. It is clear from the proceedings that disagreement continues as to whether an O<sub>3</sub> depletion may occur at existing levels of anthropogenic releases; further, if O<sub>3</sub> depletion should occur there is mixed information as to whether the increased levels of UV-B could cause definitive losses in terrestrial systems (e.g., plant growth and production).

The first four papers discuss the physical aspects of the system. The first paper deals with the chemical agents and reactions associated with O<sub>3</sub> production and depletion in the atmosphere. The second paper addresses models and their predictions of stratospheric O<sub>3</sub> decrease or increase on the basis of anthropogenic emissions. The third paper focuses on computation of the spectral distribution and intensity of solar UV-B radiation. The fourth paper describes Volume 1 of a new UV-B handbook which serious research scientists will acquire to assist the development of acceptable experimental designs.

Papers five through eight cover problems related to the development of relevant dose statistics for use in dose-response calculations (papers 5 and 8) and to the identification of appropriate action spectra for use with specific biological systems (papers 6 and 7). These two issues overlap and are a primary concern to scientists working on the "problem". The action spectrum includes both the spectrum per se and the amount

of energy at each wavelength.

Papers nine through twenty-five report results of the effect of UV-B radiation on biological, primarily plant, systems. Several papers address theoretical assessments of damage and utilize modeling efforts. A number of papers highlight different repair mechanisms that might protect organisms from damage or reduce the severity of the damage. Other papers address the effects of UV-B on photosynthetic activities. Papers were divided between those reviewing pertinent research papers and those reporting results from their own research laboratories. Most research with plant systems has been done in controlled environment or greenhouse facilities where the principal objective was to determine possible effects of UV-B radiation. These studies did not attempt to duplicate sunlight conditions. Several papers reported results from field studies where supplemental lighting from UV-B sources was used to simulate different levels of UV-B associated with several percentages of stratospheric ozone depletion.

The final paper by Adams discusses data requirements for making economic assessments. It is clear from the papers contained in this document that insufficient data exist to make an economic assessment.

The proceedings are well organized and the various papers well developed. They should be considered as presenting the current state of the art. As such, they will find their way to the bookshelves of those seriously concerned with the potential problems of reductions in stratospheric ozone.

Walter W. Heck, *Agricultural Research Service USDA, at North Carolina University*

**Phase Diagrams. A Literature Source Book, Supplement 1.** By J. Wisniak (Ben-Gurion University of the Negev). Elsevier Scientific Publishing Co.: Amsterdam, Oxford, Tokyo, and New York, 1986. X + 1035 pp. \$205.50. ISBN 0-444-42613-2.

This volume is the first supplement to the two-volume set published in 1981 by Elsevier in the "Physical Sciences Data Series". Those two original volumes with the same title and author referenced literature from 1900 through 1980. They were reviewed in this journal in 1982 (*J. Am. Chem. Soc.* **1982**, *104*, 2950). The present supplement covers literature from 1981 through 1985.

The volumes list components of binary and multicomponent systems for which phase-diagram data have been published. The listings are in a format which make it simple for the practicing scientist or engineer to ascertain whether a given system has been investigated and to find the literature reference, along with the *Chemical Abstracts* number in most cases, in the back of the volume. Systems are multiply listed by each component using the same formula order as the *Chemical Abstracts* formula indexing so that a user can start with any component and scan for all systems containing that component. Chemical names corresponding to the formulae are printed out and a number indexes the reference at the end of the volume in the alphabetized (by first author) bibliography. There are more than 4700 literature citations for the 5-year period covered. With the availability of computerized searches of abstracts for the recent years covered by the supplement, the relative convenience of this tabular format compared to automated searches would have to be judged according to the user's application.

Hartland H. Schmidt, *University of California, Riverside*

**Chemistry and Physics of Baking. Materials, Processes, and Products.** Edited by J. M. V. Blanshard (University of Nottingham), P. J. Frazier (Dalgety UK Ltd., Cambridge), and T. Galliard (RHM Research Ltd., High Wycombe). The Royal Society of Chemistry: London, 1986. viii + 276 pp. \$39.50. ISBN 0-85186-995-5.

This book contains the proceedings of an international symposium organized by the Food Chemistry Group of the Royal Society of Chemistry and the School of Agriculture of the University of Nottingham. It was held at the School of Agriculture, Sutton Bonington, April 10-12, 1985. Twenty papers are included in three sections which are titled as follows: basic constituents of baked products, fundamental interactions: consequences, control, and developments in processes and products. References and an index are included. The print is typeset.

M. C. W. Smith, *Ann Arbor, Michigan*

**Proven Profits from Pollution Prevention. Case Studies in Resource Conservation and Waste Reduction.** By Donald Huisingsh, Larry Martin, Helene Hilger, and Neil Seldman (Institute for Local Self-Reliance, Washington, D.C.). Institute for Local Self-Reliance: Washington, D.C., 1986. iii + 316 pp. \$26.50. ISBN 0-917582-47-0.

The 46 case studies contained in this book support the argument that waste minimization cannot only improve environmental quality but can also increase profits for business. This book will be of interest to anyone concerned with environmental problems. References are included.

M. C. W. Smith, *Ann Arbor, Michigan*