

cyclophane yield becomes maximum and decreases as n increases, probably because of decreasing entropic advantage.

According to Caldwell's predictor ($\tau(r_c) = 12.1$ for styrene),⁹ styrene 2 + 2 photocyclodimerization should occur smoothly. But

(4) A typical preparative procedure is as follows: 1,4-bis(*p*-vinylphenyl)-butane (**1b**, 637 mg, 2.43 mmol) was irradiated in dry and N₂-degassed benzene (400 mL) under a nitrogen atmosphere by a 400-W high-pressure mercury lamp through Pyrex filter. After 38 h the reaction mixture was concentrated by evaporation and treated with an excess amount of diborane in THF to change the unconsumed monomer to more polar and higher molecular weight materials, from which *cis*-1,2-ethano[2.4]paracyclophane (**2b**) was easily isolated by column chromatography (SiO₂, cyclohexane/benzene). Yield after recrystallization from methanol was 68.9%. For the synthesis of monomers, see the following papers: (a) Nishimura, J.; Ishida, Y.; Hashimoto, K.; Shimizu, Y.; Oku, A.; Yamashita, S. *Polym. J.* **1981**, *13*, 635. (b) Nishimura, J.; Hashimoto, K.; Okuda, T.; Hayami, H.; Mukai, Y.; Oku, A. *J. Am. Chem. Soc.* **1983**, *105*, 4758. (c) Nishimura, J.; Okuda, T.; Mukai, Y.; Hashiba, H.; Oku, A. *Tetrahedron Lett.* **1984**, *25*, 1495. (d) Nishimura, J.; Yamada, N.; Okuda, T.; Mukai, Y.; Hashiba, H.; Oku, A. *J. Org. Chem.* **1985**, *50*, 836. (e) Nishimura, J.; Yamada, N.; Horiuchi, Y.; Ueda, E.; Ohbayashi, A.; Oku, A. *Bull. Chem. Soc. Jpn.* **1986**, *59*, 2035.

(5) In Supplementary Material.

(6) Staley, S. W.; Dustman, C. K.; Linkowski, G. E. *J. Am. Chem. Soc.* **1981**, *103*, 1069.

(7) ¹H NMR spectroscopic analysis of the isomer mixture shows at least three components.

experimental data of the *intermolecular* reactions under direct irradiation,¹ accumulated so far, seem not to support clearly the prediction, probably due to the side reaction like polymerization. In the present intramolecular reaction, we demonstrated fully that the styrene 2 + 2 photocyclodimerization is indeed a facile process, in which the highly reactive excited intermediate can be trapped intramolecularly and effectively before intermolecular side reactions can compete.

Detailed mechanistic and further synthetic work is now in progress and will be reported elsewhere.

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Supplementary Material Available: Analytical and ¹H NMR spectroscopic data and NOESY spectra (7 pages). Ordering information is given on any current masthead page.

(8) Nozaki, H.; Otani, I.; Noyori, R.; Kawanishi, M. *Tetrahedron.* **1968**, *24*, 2183.

(9) Caldwell, R. A. *J. Am. Chem. Soc.* **1980**, *102*, 4004.

Book Reviews*

Advances in Enzymology. Volumes 121, 125, 126, 132, 133, and 134. Series edited by S. F. Colowick and N. O. Kaplan. Academic Press: Orlando. 1986. Volume 121: Edited by J. J. Langone and H. V. Vunakis. xxxiv + 947 pp. \$85.00. ISBN 0-12-182021-1. Volume 125: Edited by S. and B. Fleischer. xxx + 788 pp. \$85.50. ISBN 0-12-182025-4. Volume 126: Edited by S. and B. Fleischer. xxx + 832 pp. \$85.00. ISBN 0-12-182026-2. Volume 132: Edited by G. DiSabato and J. Everse. xxvii + 717 pp. \$75.00. ISBN 0-12-182032-7. Volume 133: Edited by M. A. DeLuca and W. D. McElroy. xxvii + 649 pp. \$75.00. ISBN 0-12-182033-5. Volume 134: Edited by R. B. Vallee. xxxi + 748 pp. \$79.50. ISBN 0-12-182034-3.

The bibliographic avalanche represented by this series is a serious challenge and difficult to keep abreast of. Each volume contains a large number of short papers, which are reports of original research and reviews, all nicely set in type and well illustrated. Volume 121 is Part I of Immunochemical Techniques: Hybridoma Technology and Monoclonal Antibodies. Volumes 125 and 126 are Parts M and N of Biomembranes: Transport in Bacteria, Mitochondria, and Chloroplasts. Volume 132 is Part J of Immunochemical Techniques: Phagocytosis and Cell-Modulated Cytotoxicity. Volume 133 is Part B of Bioluminescence and Chemiluminescence. Volume 134 is Part C of Structural and Contractile Proteins: The Contractile Apparatus and the Cytoskeleton. Each volume has its own author index and subject index.

Analytical Applications of Lasers. By Edward H. Piepmeier (Oregon State University). John Wiley & Sons: New York. 1986. xiii + 703 pp. \$89.95. ISBN 0471-87023-4

Laser-based methods are having a revolutionary impact in analytical chemistry as well as in many other fields. Although it would be virtually impossible to completely review all of the many applications of lasers in chemical analysis, *Analytical Applications of Lasers* gives remarkably good, up-to-date, and representative coverage of these rapidly progressing and wide-ranging efforts. As Volume 87, it is a fine addition to the series of monographs *Chemical Analysis*.

Written for people with a scientific background, the book was intended to be educational and present some of the most recent advances in the field; in general, it succeeds well. An introductory chapter is intended to acquaint the reader without a background in laser science with the basic principles of laser operation and nonlinear optical phenomena, but otherwise the individual chapters are meant to stand alone. Unfortunately, the introductory chapter is probably too advanced for those who are not already familiar with the concepts which are presented, and too brief to give further insight to others with some knowledge of laser science. It serves the purpose, however, to introduce the reader to ter-

minology and to point out what concepts are important for further study, and while it is lean on references, there is a useful bibliography.

The book chapters are written by experts in each area and are well coordinated; the book has a good index. The editor has not imposed a uniform style on the individual authors, however, and a few of the chapters have suffered thereby, leaning toward being less instructive and more of a listing of comparative characteristics of various techniques or of published results. Examples are Chapter 2 on atomic and ionic fluorescence in flames and plasmas and Chapter 6 on infrared absorption spectroscopy. It is also disappointing that more material was not included on nonlinear methods.

In general, however, the book is an excellent source for scientists with some knowledge of lasers who wish to learn more about particular applications, and the chapters are well referenced. I enjoyed reading the entire volume through, including chapters covering topics outside my own immediate scientific interests. Particularly good were Chapters 3, on laser-enhanced ionization in flames, 4, on detection of small numbers of atoms and molecules; 7, on cryogenic spectrometry; 12, on intracavity-enhanced spectroscopy; 13, on the thermal lens effect; and, although short on applications, 14, on picosecond spectroscopy. The book would be valuable both as part of a personal library and as a reference text for graduate level courses. Its value to students also makes it a book that should be obtained by graduate institutions.

Steven R. Goates, Brigham Young University

Thermal Analysis. Third edition. By W. W. Wendlandt (University of Houston). John Wiley and Sons Inc.: New York, NY. 1986. xviii + 814 pp. \$89.95. ISBN 0471-88477-4

This book is Volume 19 of the *Chemical Analysis* series of monographs on techniques and applications of analytical chemistry. Thermal analysis (TA) techniques addressed include thermogravimetry (TG), differential thermal analysis (DTA), differential scanning calorimetry (DSC), evolved gas detection and analysis (EGD, EGA), thermophotometry, including reflectance spectroscopy, infrared spectroscopy, thermoluminescence and oxyluminescence, and some of the lesser employed and/or supplementary TA techniques including thermomechanical methods, thermoelectrometry, thermosonometry, thermomagnetometry, and accelerating rate calorimetry (ARC). In addition, chapters covering computer applications and addressing TA nomenclature are provided.

The general format is to introduce each TA technique, discuss the factors that affect the output or are potential sources of error, and then outline what information can be derived from the technique with specific references to important and/or eloquent adaptations to the "usual" experimental apparatuses. The discussion of each technique is ended with a representative survey of the literature in order to introduce the reader to the spectrum of problems which have been solved by a particular

*Unsigned book reviews are by the Book Review Editor.

technique. As outlined in the preface, the third edition includes (1) new applications of TG, DTA, DSC, EGD, and EGA, (2) more detailed discussions of the less common techniques, (3) rewritten sections on EDG/EGA, miscellaneous techniques, and purity determinations via DSC, and (4) descriptions of commercially available TA instruments, including microcomputer applications.

The book is generously illustrated with many examples of TA curves and detailed drawings of experimental apparatuses. The use of summary tables and figures illustrating the effects of changing variables on TA curves coupled with a clear and concise writing style make this volume easy to read and understand. Although by Wendlandt's own admission no attempt was made to include an exhaustive literature summary, this volume contains over 1500 citations including several from 1985. In addition to providing an invaluable reference work for the analytical chemist, it presents a thorough introduction for anyone peripherally interested in TA techniques.

Donald L. Hall, *Virginia Polytechnic Institute*

Mein Lebensweg als bioorganischer Chemiker. By Theodor Wagner-Jauregg. Wissenschaftliche Verlagsgesellschaft mbH: Stuttgart, F.R.G. 94 pp. DM 24.00. ISBN 3-8047-0825-0

During a long and eventful life spanning more than eight decades, Theodor Wagner-Jauregg experienced tremendous advances in science against a background of extreme political and military turbulence. His career in organic, biological, and medicinal chemistry took him from Vienna to laboratories in Munich, Zürich, Heidelberg, Frankfurt, Edgewood (Maryland), and back to Europe in the Swiss pharmaceutical industry. Following early research on polymers and mixed polymers of isoprene, his isolation of riboflavin stimulated a life-long interest in biologically active substances. He made valuable contributions to research on drugs for tuberculosis and leprosy, antispasmodics, nerve gases, and antiinflammatory agents.

This is a very personal as well as scientific biography, and the reader will enjoy descriptions of life in central Europe and in America, as well as impressions and anecdotes of many outstanding scientists. After the isolation of riboflavin in Heidelberg, any yellow-colored raw material attracted interest as a potential source. A coded sample of urine was submitted with other materials to Paul György for biological testing. The latter soon returned to complain vehemently that "the animals won't drink it. We tasted it and it tastes horrible!" Wagner-Jauregg's recollections of his psychiatrist father Julius and his chemical mentors Richard Willstätter and especially Richard Kuhn (all Nobel prize winners) are fascinating, while American readers will enjoy a short encounter with Louis F. Fieser just after World War II in occupied Germany.

This book will appeal to chemists who read German and are interested in the history of chemistry. It could also prove useful in University courses in Scientific German.

William B. Lawson, *New York State Department of Health*

Progress in Inorganic Chemistry. Volume 34. Edited by S. J. Lippard (Massachusetts Institute of Technology). John Wiley & Sons: New York. 1986. vi + 701 pp. \$95.00. ISBN 0471-81948-4

This volume contains a total of seven contributions covering a broad spectrum of topics. A. H. Cowley and N. C. Norman outline the present status of compounds of heavy main group elements containing double bonds, i.e., Si=Si, Ge=Ge, Sn=Sn, P=Si, P=P, P=As, P=Sb, or As=As (63 pages). This interesting and fairly new area of studies has expanded dramatically in less than a decade. It promises further surprises and illustrates that main-group chemistry is alive and well. Noteworthy, the contribution contains even some 1985 references! The stereochemistry of Sb(III) halides and related compounds is summarized by J. F. Sawyer and R. J. Gillespie. The 49-p article is filled with significant structural data, emphasizes the impact of lone pairs on geometrical aspects, but seems to be lacking some general conclusions. An authoritative review of the chemistry of pyrazole-derived ligand systems, the most important of which are the poly(1-pyrazolyl)borates, is given by S. Trofimenko. In conjunction with an earlier (1974) review by the same author it gives essentially complete and up-to-date information (here: 96 pages with 866 references!) on these widely used materials. Syntheses and properties of polyhedral metallaboranes containing eight or more vertices are presented in great detail (224 pages, about one-third of the entire volume) by J. D. Kennedy. Similar to the preceding contribution, if the present compilation is used in conjunction with an earlier (1984) article, it gives an exhaustive picture of metallaboranes. The electrochemistry of metalloporphyrins in nonaqueous media is discussed by K. M. Kadish (171 pages). The material is grouped nicely by the type of metal ions involved but also reflects structure-reactivity relationships.

A brief (19 pages) consideration of equilibrium aspects on the interaction of dioxygen species with metal ions by H. Taube is quite thought-provoking. Finally, a survey of gas-phase reactions of transition-metal ions with organic molecules centers on the chemistry of first-row transition-metal ions but is well-grouped and includes appropriate consideration of historical aspects (J. Allison, 50 pages).

Kurt Niedenzu, *University of Kentucky*

Topics in Current Chemistry. Number 132. Biomimetic and Bioorganic Chemistry. II. By J. Franke (Universität Bonn), A. Gärtner (Universität Tübingen), H. Nishide (Waseda University), F. P. Schmidtchen (Universität München), E. Tsuchida (Waseda University), F. Vögtle (Universität Bonn), and U. Weser (Universität Tübingen). Edited by F. Vögtle and E. Weber. Springer-Verlag: Berlin, GDR. 1986. 175 pp. \$52.00. ISBN 3-540-16023-X

The book consists of a series of four monographs with the common theme of bioorganic chemistry. One problem with the book that bears mention is that it is replete with rather serious grammatical and typographical errors, detracting from the presentations. Without careful editing, many readers will find this text difficult reading.

The first monograph, by Gärtner and Weser, is an extensive review (345 references) of superoxide dismutase. Structural and kinetic studies of the enzyme are contrasted with similar studies of model inorganic compounds.

Tsuchida and Nishide review recent progress on the use of porphyrin complexes as oxygen carriers in the second monograph. Although complexes have been prepared that reversibly bind oxygen and are resistant to irreversible oxidation, they do not presently appear to be compatible as blood substitutes in animals.

Schmidtchen reviews the progress in preparing polyammonium organics as catalysts and enzyme mimics in the third monograph. Criteria are provided for the evaluation of the catalytic potential of these substances. Although substantial progress has been made in this area, the rate enhancements obtained by these catalysts are still extremely modest when compared to enzymes.

The last monograph, by Franke and Vögtle, complements that by Schmidtchen, in that the binding specificity of various host/guest interactions in aqueous solution, and the manner in which this information is obtained, is reviewed. A number of potential applications for ligand-specific organics beyond artificial enzymes are suggested.

John V. Schloss, *E. I. du Pont de Nemours & Co.*

Radiochemical Methods. By William J. Geary (Sheffield City Polytechnic, UK). John Wiley & Sons: New York. 1986. xix + 229 pp. \$19.95. ISBN 0471-91118-6

This little volume is one of an extended series of basic textbooks on analytical chemistry produced by the "Analytical Chemistry by Open Learning" project in the UK. Prefatory sections explain its mission, and how to use the "Open Learning" format. Seventeen specific sections organized into five chapters begin with a general discussion of nuclear properties, types, and laws of nuclear decay and proceeds to specific discussions of three published papers (reproduced in their entirety) giving examples of radiochemical methods which were discussed in the previous chapter. Each section begins with an overview, contains one or more practical problems (called "self-assessment questions" or SAQ's), and concludes with a summary and a list of objectives for the student. Following the main body are answers to the SAQ's, and several tables of physical constants, SI prefixes, etc. A periodic table graces the inside back cover.

In general, the material is presented clearly and concisely, particularly the introductory chapters on principles of radioactive decay, and the later chapters on radioanalytical methods and new applications. However, chapters on the preparation and availability of radiochemicals and on practical aspects (i.e., counting methods) tend to be perfunctory, which perhaps is a necessary sacrifice to brevity in areas with many facets to be considered. Also, some errors in calculations and misstatements are present, especially in the sections on statistical and instrumental counting errors. The self-assessment questions are of rather variable quality, some being challenging and pertinent to the discussion and others being either trivial or irrelevant (or both). A few errors also pop up in these questions, some of which are not obvious and might confuse the student.

Overall, however, the textbook is easy to use, is clear and concise, and provides a good foundation for radiochemical methods of analysis for the technician needing such a background. It would also be suitable as a practical introductory manual of radioisotope techniques for the chemistry student.

Harry C. Winter, *The University of Michigan*