

Table I. Asymmetric Double Michael Addition:^a **1** + RMgBr-CuI (1:1)

entry	R	product	yield, ^b %	[α] _D , ^c (deg)	% de ^d
1	CH ₂ =CH-	2a	94	-49.1	>99
2	CH ₃ -	2b	92	-36.8	>99
3	CH ₃ CH ₂ -	2c	77	-38.1	>99
4	C ₆ H ₅	2d	40	-62.1	>99

^aConducted with 6-mol equiv of the reagent in ether at -20 °C for 1 h. ^bFor the product purified by SiO₂ column chromatography. ^cIn CHCl₃ at 25 °C. ^dDetermined by ¹H (500 MHz) and ¹³C (126 MHz) NMR spectral analysis.

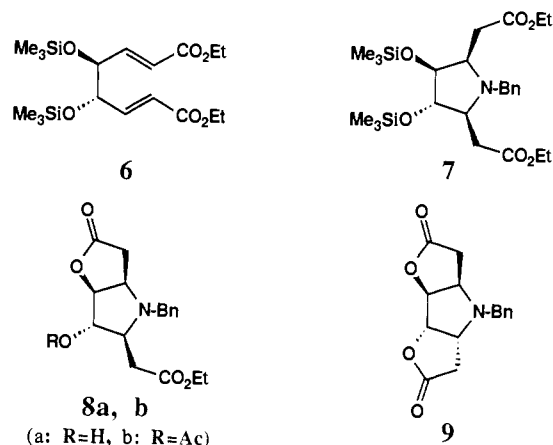
bis-lactone **9** being detected.¹⁴ These findings are clearly consistent with the above-mentioned consideration for the steric course of the reaction mediated by the carbon nucleophiles.¹⁵

If we resort to the π -face differentiation tactics developed in this work, other possible electrophilic, nucleophilic, and concerted processes to **1** and related structures will be rewarded with exceptionally high selectivity, which are currently our major concern.

Acknowledgment. We thank The SC-NMR Laboratory of Okayama University for high field NMR experiments (500-MHz

(14) Acetylation of **8a** [4-(dimethylamino)pyridine/Ac₂O/Et₃N/CH₂Cl₂] gave the corresponding stable acetate **8b**, the structure of which was confirmed by ¹H NMR as mentioned above and mass spectroscopy.

(15) Determination of the actual conformation for **1** must await clear-cut physical evidence. Nevertheless, all the results witnessed in this study seem to make the type B rotamer still less likely as a reacting form.



for ¹H and 126-MHz for ¹³C). The partial financial support by a Grant-in-Aid for Scientific Research from the Ministry of Education, Science, and Culture, Japan (63303009), is gratefully acknowledged. We deeply appreciate Dr. K. Tamao (Kyoto University) for the valuable discussions and encouragement.

Supplementary Material Available: Synthesis, spectral data (¹H NMR, ¹³C NMR, IR, and HRMS), and copies of representative NMR (¹H and ¹³C) spectra for **1**, **2a**, and **8b** including typical COSY, HETCOR, and NOE difference spectra (18 pages). Ordering information is given on any current masthead page.

Book Reviews*

Phase Equilibria in Binary Halides. By V. I. Posypaiko and E. A. Alekseeva. Compiled and edited by H. B. Bell (University of Strathclyde). Translated from Russian by B. Indyk. IFI/Plenum Data Company: New York, 1987. xxv + 470 pp. \$38.00. ISBN 0-306-65211-0.

This book is a recast translation of a Russian three-volume collection of detailed information on binary molten-salt phase diagrams. The format is condensed from the original by presenting data on the invariant points, methods of study, and reference numbers in tabular form. In addition, only the halide phase diagrams from the original are included. Detailed figures are given for 287 of the approximately 1200 phase diagrams covered and detailed tabular data are given for only a small number of systems. The 1628, largely Russian, references span the period from 1867 to 1975. No critical assessment of multiple and inconsistent data sets was attempted, and it is left to the reader to choose between different liquidus temperatures and melting points in such cases.

This volume presents a wealth of valuable data in a relatively compact easy-to-read format. Some of these data are difficult to find outside of the U.S.S.R. The tabular form has the advantage of presenting data more accurately than can be read from a phase diagram, but it also has the disadvantage of giving less detail. However, detail can be found in the original references, when available. The editing appears to be good. There are some slips however with, for example, one reference by Thoma appearing three times in the reference list and a small number of compound entries that have the wrong stoichiometries.

This book should be a valuable desktop reference for those working with molten salts and a desirable reference in technical libraries where high-temperature chemistry and pyrometallurgy are significant pursuits.

Milton Blander, Argonne National Laboratory

Major Industrial Hazards: Their Appraisal and Control. By John Withers (Loughborough University). John Wiley and Sons: New York, 1988. xv + 241 pp. \$57.95. ISBN 0-470-21067-2.

Recently there have been a number of publications that have addressed hazardous materials. In this new work, this topic is explored in a concise but complete and detailed manner.

Major Industrial Hazards can be broken down into three parts: risk, assessment/measures, and precautions. Risk is analyzed in terms of

individual risk, public perception of risk, and acceptable risk. The major industrial risks are classified and specific case histories are presented. Explosive, fire, toxic, and nuclear hazards and waste disposal problems are examined. Public policy and legislation are discussed, but the scope is limited to the United Kingdom's system. An excellent chapter examines the management of industrial hazards, placing into perspective risk and the needs for proper controls.

The second part of the text explores assessment and measures of risk. In these chapters, the quantification of a release through different models proposed by Davenport, Kletz, and Fawcett is discussed. Cremer and Warner studies are described and results are given. Next, quantification of dispersion is investigated and specific materials such as LNG, propane, ammonia, chlorine, butane, and hydrogen fluoride are referred to because of their unique properties and large volumes of shipment. A very interesting chapter examines the chances of fire and explosion, and the subsequent chapter explores the damages from the fire and radiant heat, nuclear radiation, and various toxicological concerns. The final chapter in this part deals with the assessment of risk impact on a local population. Here Withers shows the parameters of various methodologies, timing, population density, and population composition.

The last segment of the text is what I believe sets it apart from other books in the field of hazardous materials and is by far this text's strength. The final three chapters deal with transportation risks, mitigation of hazards, and the costs/benefits of risk prevention. Other texts leave the topic of hazard evaluation after providing the reader with only an introduction of the controls necessary for mitigation. Withers goes into design and construction procedures of packaging, maintenance, education and training, and emergency plans to mitigate the hazards. But he then explores the risk associated with hazards that have a high probability of affecting the most people, for example, during a public-transportation accident. He has also provided the cost/benefit analysis for employees, the cost of saving a life, and the benefits to society of doing this analysis correctly.

This book would be an excellent addition to the library of any hazardous materials specialists, laboratory technicians, and operators of installations involved with processing and transportation of hazardous materials. The text is written in a style that managers would find very effective in furthering their understanding of the concepts of risk, means of mitigating the risks of handling hazardous materials, and the benefits

*Unsigned book reviews are by the Book Review Editor.

of providing comprehensive programs for their employees.

Thomas J. Haas, *United States Coast Guard Academy*

Advances in Chromatography. Volume 27. Edited by J. Calvin Giddings (University of Utah). et al. Marcel Dekker: New York and Basel. 1987. xviii + 359 pp. \$79.75. ISBN 0-8247-7770-0.

This very useful series contains articles written by acknowledged experts in a variety of chromatography subfields that provide good starting points for serious investigators seeking to develop a background in a specific area quickly. The topics in this volume include an excellent overview of the successful approaches to the resolution of enantiomers by hplc written by the most successful investigator in this area W. Pirkle of the University of Illinois, an excellent overview of the physicochemical basis for adsorption phenomena in chromatography by V. Berezkin of the USSR, and a current overview of the use of derivative in gas chromatography by K. Imai of the University of Tokyo. Other topics include micellar chromatography, analytical affinity methods, the use of hplc in endocrinology, the gems of unsaturated aliphatic compounds, and the use of modified silicas in TLC and HPTLC.

This is clearly a "library series" for most researchers but personal ownership may be indicated in the case of investigators wishing to have at hand volumes with chapters of particularly immediate significance. The quality of the articles in this volume is quite high, continuing a tradition of such quality.

C. H. Lochmüller, *Duke University*

Introduction to Industrial Chemistry. By H. L. White (Ciba-Geigy Corporation—Retired). John Wiley & Sons: New York. 1986. xiv + 247 pp. \$39.95. ISBN 0-471-82657-X.

This book is designed to be a text for a third- or fourth-year undergraduate chemistry course. Suggested prerequisite courses include general, analytical, and organic chemistry. The author makes no attempt to cover industrially important polymers and indicates that these should be addressed in a separate course.

Chapter One is a general rationale for the text, focussing on course organization and special content. Chapter Two is devoted to major inorganic chemicals (phosphoric acid and phosphates, ammonia, sulfuric acid, nitric acid, sodium hydroxide, and chlorine). Following a chapter devoted to industrial products prepared by fermentation processes, the presentation of organic chemical manufacture begins, appropriately, with a discussion of petroleum processing and refining operations in Chapter Four. Current manufacturing methods including process conditions and reaction mechanisms are given for the major organic chemicals derived from ethylene (vinyl chloride, acetaldehyde/butanol/acetic acid, methanol, vinyl acetate, ethylene oxide, ethylene glycol, styrene, propionaldehyde, and ethanol); propylene (acrylonitrile, propylene oxide, phenol/acetone, butyraldehyde, and 2-propanol); butenes (butadiene, hexamethylenediamine, *tert*-butyl alcohol, butylated phenols, and methyl ethyl ketone); benzene (cyclohexanol/cyclohexanone, adipic acid, caprolactam, and aniline); toluene (benzene, xylenes, styrene, and toluene diisocyanate); xylenes (terephthalic acid, phthalic anhydride, and maleic anhydride); and methane (formaldehyde, methylamines, methyl methacrylate, hydrogen cyanide, chlorinated methanes, formic acid, and acetylene).

The next four chapters are outstanding and could only be written by a person with considerable, broad industrial experience. Chapter Five deals with scale-up from laboratory to pilot plant to commercial production; the reader is made aware of the many practical considerations that must be addressed in any such endeavor to include interfacing with management and safety data sheet preparation. Chapter Six points out the many factors that influence cost calculations, which are so vitally important for any commercial process. Chapter Seven is an excellent chapter concerning environmental and pollution issues of industrial processes, with excellent discussions of the origins and effects of major air, water, and soil pollutants. Chapter Eight concerns equipment of large scale with excellent diagrams that enable the reader to appreciate the special problems of conducting chemical operations on a large scale.

Following what is a somewhat superfluous chapter dealing with principles of distillation, extraction, and crystallization, Chapter Ten is devoted to examples of industrial pesticides, pharmaceuticals, and detergents. The discussion is excellent with regard to specific pesticides and their manufacture, mode of pesticidal action, and associated environmental problems. Very brief attention, however, is given to pharmaceuticals and detergents, and this is unfortunate, because both industries employ two to three times the number of chemical employees as the pesticide industry (cf. *Chemical and Engineering News*). Chapter Eleven is an effective, succinct discussion of industrial catalysts. The last chapter discusses the various careers for chemical professionals observed within the author's experience in a medium-sized, organic specialty chemical manufacturing plant. There is no mention of other roles for chemical

professionals that exist in a very large, diversified company such as in patent, education and training, marketing, human resources, and government interfacing functions.

I highly recommend the book for its intended purpose of familiarizing the undergraduate with the chemical industry. The book is full of excellent references to literature that university libraries have in their possession, e.g., *CHEMTECH*. As recommended by the author, in order to present an accurate and well-balanced picture of the chemical industry and its employment opportunities for chemical professionals, it is important for any course using this book as a text to be supplemented by material devoted to polymer science and major industrial polymers, or the latter should be covered in a separate course. One slight problem I have with the text is that although it is fairly common practice for authors to organize organic chemical manufacture starting with ethylene, propylene, etc., as is done with this text, I feel that the huge diversity of chemical products makes this derivation from ethylene, propylene, etc., to be not particularly useful. I would rather see a certain number of the high-volume organic chemicals covered with no attempt to trace their origins to ethylene, propylene, etc. Regardless of the tactic employed, however, the author is reasonably successful in covering the important organic chemicals; of the 46 specific chemicals discussed, 25 of these are listed among the top 30 organic chemicals based on volume (cf. *Chemical and Engineering News*.)

Steven M. Heilmann, *3M Company*

Advances in Biochemical Engineering. Biotechnology. Volume 38. Lignocellulosic Materials. Edited by A. Fiechter (Institut für Biotechnologie, Eidgenössische Technische Hochschule ETH Hönggerberg, Zurich). Springer-Verlag: Berlin and New York. 1989. 158 pp. \$69.50. ISBN 0-387-50163-0.

Of the three articles that are included in this volume two are concerned with lignocellulosic materials. One evaluates the use of thermophilic bacteria while the second discusses acid or enzymatic hydrolysis as well as the production of cellulase, ethanol, furfural, and C₅-hydrolysates. Some possible uses for lignin are also discussed. The third article is titled Modelling, Identification and Control of the Activated Sludge Process. References are included. Biochemical engineers will find the material in this book useful.

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

Alkaloids: Chemical and Biological Perspectives. Volume 6. Edited by S. William Pelletier (University of Georgia). John Wiley & Sons: New York and Chichester. 1988. xv + 542 pp. \$110.00. ISBN 0-471-60298-1.

Alkaloids constitute a difficult-to-define, highly diverse group of nitrogen-containing secondary metabolites produced by microorganisms, plants, and (less commonly) animals. Many individual alkaloids have attracted particular attention because of their striking biological activities, because of the challenges they have provided to chemists concerned with structure determination and with synthesis, or because they pose interesting biosynthetic problems. Chemotaxonomists concern themselves with the distribution of alkaloids, and chemical ecologists are often interested in discovering their *raison d'être*.

The present volume, which represents the sixth in what has turned out to be an annual series of monographs on alkaloids under the skilled editorship of S. William Pelletier, represents a fine addition to the extensive literature on this subject. Its five chapters are entitled "Chemistry, Biology, and Therapeutics of the Mitomycins" (W. A. Remers and R. T. Dorr), "Alkaloids of *Tabernaemontana* Species" (T. A. van Beek and M. A. J. van Gessel), "Advances in Alkaloid Total Synthesis via Iminium Ions, α -Aminocarbonions, and α -Aminoradicals" (D. J. Hart), "The Biosynthesis of the Protoberberine Alkaloids" (C. W. W. Beecher and W. J. Kelleher), and "Quinoline, Acridone, and Quinazoline Alkaloids: Chemistry, Biosynthesis, and Biological Properties" (M. F. Grundon). Each chapter provides what appears to be quite thorough coverage of the relevant literature, with references as recent as 1987 in some cases, and at least into 1985 in others. True to the series title, some of these chapters discuss not only chemical and biological data but also medical and even clinical results. At the other end of the scale, the chapter on total synthesis is really an essay on a group of intriguing reactions that have found application in a variety of alkaloid syntheses. It is unlikely that any one reader will find all of this material equally interesting, but a wide range of scientists may find individual chapters very useful.

If there is any master plan to the selection of these particular chapters, it is not apparent. Nevertheless, the cumulative impact of the series of volumes is clearly greater than the sum of its parts. All of the authors deserve high praise for their painstaking labors in gathering facts together from a very wide range of sources and for their presentation of discussions in a clear and interesting manner. The addition of an author index to

supplement the subject and organism indices that are provided in this monograph would be most welcome in future volumes in this valuable series. Members of the natural products community can be grateful to Professor Pelletier for assembling a team of outstanding authors and for producing another tasteful, diversified volume.

Jerrold Meinwald, *Cornell University*

The Language of Biotechnology. A Dictionary of Terms. By John M. Walker and Michael Cox (Hatfield Polytechnic). American Chemical Society: Washington. 1988. viii + 255 pp. \$49.95. ISBN 0-8412-1489-1.

The authors define biotechnology as the practical application of biological systems to the manufacturing and service industries and to the management of the environment. Many disciplines are involved, each with their own language. This dictionary attempts to define routinely used specialized terms in the various areas of biotechnology. Definitions are carefully worded and the illustrations neatly drawn. It will be a useful book for anyone who needs to bridge the gaps between the numerous fields of biotechnology.

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

Biotechnology and Food Industry. Proceedings of the International Symposium held in Budapest, Hungary, October 5-9, 1987. Edited by J. Holló (Hungarian Academy of Sciences) and D. Törley (Technical University of Budapest). Akadémiai Kiadó: Budapest. 1988. xix + 707 pp. \$69.00. ISBN 963-05-5228-0.

A variety of topics were included in this symposium. Biomass, diagnostic tests, genetic engineering, physiology, enzymes, microorganisms, and technological applications are among the subjects that were discussed. Indices are included.

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

Perfumery. The Psychology and Biology of Fragrance. Edited by Steve Van Toller and George H. Dodd (University of Warwick). Chapman and Hall: London and New York. 1988. xx + 268 pp. \$49.95. ISBN 0-412-30010-9.

Therapists, persons involved in the perfume industry, particularly in marketing, and the general reader will find this a useful and fascinating book. It is divided into five sections. Part one provides a zoological, historical, and chemical perspective to the use of perfumes and scents. Included in part two are chapters devoted to the reaction of children and animals to odors and the use of perfume in social and organizational settings such as employment interviews. Discussions of the psychological and physiological effects of odors as well as fragrance therapies are included in parts three and four. Part five titled *The Consumer and Perfume* is concerned with such topics as the psychology of fragrance selection, how to sell perfume, and fragrance education. Extensive references and indices are included.

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

Biotechnology Focus. Volume I. Fundamentals, Applications, Information. Edited by R. K. Finn (Cornell University) et al. Oxford University Press: New York. Hanser: Munich. 1988. viii + 436 pp. \$85.00. ISBN 3-466-15070-6 (Munich); 0-19-520769-6 (New York).

This is the first in a series of volumes whose purpose is to provide access to biotechnology research and development in Europe. This book is divided into three sections. The first is research and development, which is further divided into fundamentals, methods, and technical application. Topics covered include carbon monoxide oxidizing bacteria and extremely thermophilic microorganisms, as well as bioreactors and computers. The second section, applied biotechnology, contains articles on genetics, chiral compounds, and the immobilization of whole cells. The third or information section contains new developments, research and education, institutions, market, and industry. Particularly useful are lists of gene centers, collections for microorganisms, and institutions connected with biotechnology activities, as well as a list of journals. This series will be useful for biotechnologists and biochemical engineers as well as anyone interested in the progress of biotechnology in Europe.

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

Horizons of Biochemical Engineering. Edited by Shuichi Aiba (Formerly at Osaka University, now retired). Oxford: Oxford and New York. 1988. x + 374 pp. \$98.00. ISBN 0-19-856196-2.

This book looks at the brief history of biochemical engineering and also looks forward to future prospects. It contains 26 papers that cover a variety of activities in biotechnology as well as a number of mini-reviews of current topics. General topics covered include physiology and kinetics, DNA technology, metabolites, measurement, control and design, and the environment. Among subjects not usually covered in books of this kind are the measurement of effective cells in fermenting media, the

production of *Bacillus thuringiensis* insecticides, degradation of xenobiotics during waste water treatment, and biogeochemical processes. References and an index are included. This book is typeset and includes carefully prepared illustrations. It will be useful to biochemical engineers and biotechnologists.

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

Advances in Heterocyclic Chemistry. Volume 44. Edited by A. R. Katritzky. Academic: San Diego and New York. 1988. vii + 396 pp. \$85.00. ISBN 0-12-020644-7.

The first of the four chapters in this volume, by C. K. McGill and A. Rappa, is devoted to the Chichibabin reaction, by which a pyridine (or related) ring undergoes substitution of H by an amino group when heated with sodamide or other amine salt. It is a comprehensive review that covers mechanism, factors that influence the reaction, scope, and amine under pressure. The treatment differs from that of *Organic Reactions* in that there is no comprehensive tabulation of examples, and experimental procedures are not given, but it is otherwise thorough. The patent literature has not been neglected.

The second chapter (by V. J. Arán, P. Goya, and C. Ochoa), "Heterocycles Containing the Sulfamide Moiety", is concerned with the S,S-dioxides of five- and six-membered rings having the unit N-S-N in the ring and is thus largely taken up with 1,2,6-thiadiazine and 1,2,5-thiadiazole chemistry. A short section is given over to biological properties and other applications.

The ways to achieve site-selectivity when carrying out substitution reactions in aromatic six-membered nitrogen heterocycles (pyridines, pyridazines, pyrimidines, pyrazines, triazines, tetrazines) are reviewed in the third chapter (by D. L. Comins and S. O'Connor). Nucleophilic, electrophilic, and radical substitutions are included, and the literature is surveyed between 1982 and June 1987 (i.e., since previous reviews).

The last chapter (by L. I. Belen'kii) is a surprisingly long survey of the literature of heterocyclic chemistry in the form of reviews and monographs for the period 1979-1986. It is organized according to the type of ring. The extent of the survey can be appreciated for the fact that the table of contents alone occupies 6 pages. The subject has been treated previously in this series (1966 and 1979), and this chapter is considered as Part III.

Römpps Chemie-Lexikon. Band 6: T-Z. By Otto-Albrecht Neumüller. Franckh'sche Verlagshandlung, W. Keller & Co: Stuttgart. 1988. 752 pp. DM195.00. ISBN 3-440-04516-1.

With this volume, the eighth edition of this important encyclopedia reaches completion. The entries start with the Greek letter theta and then 2,4,5-T, and finish with Zytel (a thermoplastic polyamide), and they range in size from one line to about a page. The great value of this work continues to be its breadth of coverage, which includes fundamental science, applied science, medicine, and chemical industry, and its up-to-date timeliness. The entries are for substances, trade names, chemical firms, processes, prominent chemists, apparatus, abbreviations, etc. The quality and authoritativeness of the treatment is uniformly high. Although the text is in German, language is much less of a barrier than it might at first appear; English-German and French-German dictionaries are included as appendices. The majority of the entry terms are nearly the same in all technical languages, but these dictionaries enable the reader to locate those entries that differ in German.

Work has now begun on a ninth edition.

Science and Corporate Strategy. Du Pont R&D 1902-1980. By D. A. Hounshell (University of Delaware) and J. K. Smith, Jr. (Lehigh University). Cambridge University: Cambridge and New York. 1988. xx + 756 pp. \$39.50. ISBN 0-521-32767-9.

This book provides a remarkably candid analysis of research and development activities at Du Pont in the period from 1902 to 1980. The book reflects a Corporate commitment to record and share the history of Du Pont while at the same time evaluating the relative success of various technical and organizational strategies. Even the process used to generate the book reflects the openness and thoroughness with which the project was undertaken. The authors are historians who were given free access to Corporate records and resources. They were advised by two committees—one composed of academics and one consisting of R&D directors from Du Pont. The resulting analysis includes extensive detail that addresses the underlying rationale in decision making. This study is particularly important since current records-retention policies in most corporations make it unlikely that comparable information will be available in the future for other such examinations.

Decision making in R&D is partially judgmental. Areas such as project selection, organizational structures, internal versus external research, basic versus applied research, and the role of marketing in project selection are influenced by environmental, technical, leadership, and

political situations at the time. These factors are addressed in *Science and Corporate Strategy* within the framework of fundamental discoveries ranging from dynamite to nylon to Corfam. The book challenges the reader to consider what conditions and environment are most conducive to innovation. At the same time, this history of R&D reminds us of Du Pont's early recognition of the importance of supporting some fundamental research with less tangible benefits.

Science and Corporate Strategy provides a wealth of information that will be of interest to anyone involved in research, research management, and planning for research. Moreover, the effort to present the past as it actually occurred rather than viewing it through memories clouded by time makes this book a valuable addition to the history of science as well.

Myra Nicol Williams, *Merck Sharp and Dohme Research Laboratories*

Basic Gas Chromatography-Mass Spectrometry: Principles and Techniques. By F. W. Karasek and R. E. Clement (University of Waterloo). Elsevier: Amsterdam, Oxford, New York, Tokyo. 1988. viii + 202 pp. \$79.00. ISBN 0-444-42760-0.

Gas Chromatography-Mass Spectrometry: A Knowledge Base. By F. A. Settle, Jr. (Virginia Military Institute) and M. A. Pleva (Washington and Lee University). Elsevier: Amsterdam, Oxford, New York, Tokyo. 1988. Electronic Module consisting of three 5.25 in. diskettes and a 16 page Instruction Manual. \$144.75. ISBN 0-444-42761-9.

During the past 5 to 8 years, mass spectrometry has entered a new era. A technique that had been generally restricted to vapor-phase analysis is now projecting itself into the condensed phase following the emergence of thermospray and ionization by laser desorption or particle bombardment. Despite the proliferation of publications revolving around these methods, the value of GC/MS is probably appreciated more now than ever before. This is primarily due to the development and further evolution of routine commercial instruments. A cursory survey of the current literature reveals that easily 75% of mass spectrometry papers still are based on applications of GC/MS. The Book/Electronic Module combination reviewed here is a further example of this trend.

The book *Gas Chromatography-Mass Spectrometry* provides a comprehensive coverage of the field. The first three chapters, nearly one-third of the book, review the basics of gas chromatography and mass spectrometry. On the GC side this includes a discussion of injection techniques, conventional detection methods, and the fundamental principles of separations. The mass spectrometry review touches upon standard issues such as the pertinent ionization techniques (EI and CI), mass analysis in magnetic or quadrupole instruments, representative mass spectral fragmentations, isotope patterns, etc. Chapter 4 on the combined GC/MS system is probably the main strength of the book. The authors focus on the present state-of-the-art of GC/MS and, as a consequence, minimize overlap with the other definitive book on GC/MS (McFadden, Wiley 1973). The discussion of gas flow under vacuum is informative as is that of the GC/MS interfaces. Naturally, the development of capillary gas chromatography since the McFadden book has revolutionized the whole coupling process and is appropriately highlighted. Computers have taken over in GC/MS for the past several years and the authors have placed a strong emphasis in the consideration of their features. Particularly effective is the coverage of the principles of various mass spectral search systems. The discussion is clear, concise, and informative. It is unfortunate that consideration of GC/MS is limited to the Finnigan and Hewlett-Packard systems but, at least from a pedagogical point of view, this is certainly adequate. A number of practical issues are addressed in conjunction with the "case studies" presented in Chapter 5. Two environmental and one biological example are given. The utility of HPLC for sample cleanup prior to GC/MS analysis is also considered in this section, as are the general principles of MS/MS.

This is a useful and self-contained instructional book. It can be used as a textbook in courses given in industry for technician-level chemists being trained as mass spectrometer operators or as reference text in Instrumental Analysis. Unfortunately, it is not error-free. Two specific mistakes caught the eye of this reader. The mass balance in the reaction depicting the tropylium ion formation is wrong (one extra H in the right-hand side of the equation, p 60). There is also a verb missing on the sixth line of page 138 as well as some other parts of the same sentence. The print is generally clear and easy to read and the figures are well reproduced.

The electronic module, "GC/MS, A knowledge Base", represents a relatively novel approach to introducing a user to the basics of the field. The information is contained in three diskettes and requires an IBM-PC with one or two disk drives, or one disk drive and a hard disk. The module is generally easy to use even for someone who is not accustomed to accessing information in this manner. Instructions for use of the module become clear after the necessary initial "adjustment" period. Data are presented in three basic modes: an index file, a more structured

"tree mode" for the beginner and via "key words". I found the "Index" mode convenient. Nevertheless, it still is not easy to make the transition from studying or leafing through a book to seeking information via the electronic module. I found it generally rather time consuming to search through the various File numbers or to load and reload the three diskettes until I could locate a certain item of interest. The "key words" mode is very handy and the authors have managed to include a lot of useful information in the data bank. In particular, many practical aspects of GC/MS are conveniently summarized. There is information complementary to the text and much of it is presented at a more basic level. Finally, the capability to produce a printout of any given file is a desirable feature of the module.

The module "...is designed to provide rapid access to current information on GC/MS..." and "...serve as' a separate supplement to the book". I am more inclined to think that its greatest value lies in the capability to incorporate more up-to-date information rapidly and keep the reader and GC/MS user abreast of the field. This is, in fact, one of the intents of the authors and is a commendable plan. For the time being, however, and this may well be a biased reaction stemming from a generation gap, it still feels more comfortable to "leaf" through the text.

Paul Vouros, *Northeastern University*

Stereoselectivity of Pesticides. Biological and Chemical Problems. Chemicals in Agriculture. Volume 1. Edited by E. J. Ariens (University of Nijmegen), J. J. S. van Rensen (Agricultural University, Wageningen), and W. Welling (Institute for Pesticide Research, Wageningen). Elsevier: Amsterdam and New York. 1988. x + 544 pp. \$171.00. ISBN 0-444-42853-4.

This volume is a collection of 18 chapters devoted to a rather broad discussion of important issues related to the stereochemical aspects of agricultural chemicals. The book commences with a chapter on the importance of pesticides in agriculture, followed by a brief introduction to the fundamentals of stereochemistry. The latter chapter should serve as a reasonable primer on the topic of stereochemistry for those who have not had or have forgotten sophomore organic chemistry. The third chapter is a general overview of stereospecificity as applied to drugs and pesticides. Eight subsequent chapters cover a variety of more specific topics, including the stereochemical aspects of organophosphates, pyrethroids, photosynthetic inhibitors, fungicides, antifeedants, pheromones and juvenile hormones, and the action of herbicides and pesticides. The last seven chapters complete the coverage of major topics with one contribution on the stereoselectivity of biotransformations of xenobiotics, one chapter devoted to analytical (chromatographic) techniques for stereochemical analysis, another concerning the influence of stereochemistry on quantitative structure-activity relationships, and three chapters on various aspects of the synthesis of chiral agricultural chemicals. The book concludes with a commentary on the practical implications of the stereoselectivity of pesticides. The number of references following each chapter varies from one to 200.

Overall the volume is well conceived and the subject matter is treated quite well, with at least some treatment of most of the major issues in the field. Unfortunately, as is often the case with books consisting of contributed chapters, the quality of the contributions varies wildly, from quite good to almost incomprehensible. It is evident that some authors took considerably more care than did others and that the editors used only the lightest touch to enforce a uniform quality. In spite of a number of shortcomings, the quality of the science, which on average is good, and the timeliness of the subject, which is excellent, should make this volume a good addition to the agricultural chemists' bookshelf. In addition, it is a useful reference for the biochemists and bioorganic chemists who wish to acquaint themselves with current concerns in the design of agricultural chemicals.

Richard N. Armstrong, *University of Maryland*

Methods in Molecular Biology. Volume 4. New Nucleic Acid Techniques. Edited by John M. Walker (Hatfield Polytechnic). Humana: Clifton. 1988. xvi + 560 pp. \$49.50. ISBN 0-89603-127-6.

Within the last 5 years, techniques involving the manipulation of nucleic acids have been applied to an increasing number of problems in basic research, clinical research/diagnosis, and agricultural research. These techniques are no longer the exclusive domain of the molecular biologist but are being applied by the cell biologist, enzymologist, and behavioral scientist, to name a few from a growing list. A large increase in the number of molecular biology technical manuals is evidence for great demand by researchers, whose primary expertise is not molecular biology, for concise and clearly written procedures. The contributors and editor of this volume (and series) have clearly recognized this need and have successfully met their objective to introduce techniques to researchers who have no previous experience with the technique. Where

this volume succeeds, and many other fail, is that sufficient space is devoted to each technique. Each chapter (technique) contains the following: (1) Introduction, which discusses the theory and potential uses of the technique; (2) Materials; (3) Method, which are all clearly and concisely written; (4) Notes, which expand on details in either of the previous sections, or of possible modifications and/or alternatives; and (5) References, which allow first time users access to more information. Each chapter is illustrated, if appropriate, and examples are often given.

The techniques covered in this volume include gene library construction and screening, blotting and hybridization techniques, manual DNA synthesis and oligo purification, *in vitro* translation, mammalian transfection and gene expression, and an extensive section (10 chapters) on plant related techniques ranging from *in vitro* nuclear transcription to plant tissue culture. Also covered are some simple day-to-day procedures that seem to be somewhat unnecessary here. Unfortunately, only one chapter is devoted to the detection of protein-DNA interactions. Described is a method for footprinting with DNase I. Because many of the biological phenomena being studied today involve interactions between nucleic acids and protein, a more extensive section related to this would have been very useful. Such techniques such as hydroxyl radical footprinting, prealkylation interference, and other techniques pertaining to protein-DNA and protein-RNA interactions are some examples that are widely used yet difficult for the first time user to master.

This book is largely successful at introducing the first-time user to sophisticated techniques that are very useful in contemporary research problems. It presents enough information so that the worker will have an understanding of the procedure and confidence that the procedure will work. This book would be valuable in an academic lab where new students and postdocs will be exposed to a variety of techniques that they may not have previously encountered.

Alan N. Brunelle, *BioTechnica Int. Inc.*

Undergraduate Instrumental Analysis. 4th Edition. By James W. Robinson (Louisiana State University). Marcel Dekker: New York and Basel. 1987. xviii + 640 pp. \$34.75. ISBN 0-8247-7406-x.

This book is to serve as a text for an undergraduate instrumental analysis class. It is quite suitable for this purpose, especially for non-chemistry majors. The presentation style does not rely heavily on the student's background in other aspects of chemistry. Thus, it would be a useful text for students interested in medical or biological applications.

One problem that any text on analytical instrumentation must address is the extensive breadth and depth of this field. There is literally too much material to cover in one semester. Robinson's book has made an attempt to cope with this problem by making every chapter self-contained. Each chapter discusses the fundamentals, instrumentation, interpretation, and application of a single or a few related techniques. This approach adds some redundancy to the coverage of topics such as Beer's law and optical instrumentation. However, it enhances the book's appeal as a reference considerably. It is very easy to look up any topic of interest and read a short, cohesive chapter.

Chapter 1 of this book presents an excellent summary of analytical chemistry and its instrumentation. Of particular value are the brief summaries of all the major methods of instrumental analysis. This brief summary alone contains an incredible amount of the important aspects of the course. Chapter 1 also contains the descriptions of errors and sampling.

Chapter 2 discusses the introductory topics of spectroscopy and lays the groundwork for future chapters by discussing the concepts of quantized absorption, the Beer-Lambert law, and the topic of calibration. In the section on calibration, the possibility of spectral overlap and interferences are discussed. Techniques such as baseline correction and standard addition are developed in suitable detail. Chapter 3 is a natural extension of Chapter 2 and is devoted to single- and dual-beam optics. Of special note is a table on the detection limits of the various spectroscopic techniques.

Chapters 4 through 12 outline the variety of optical techniques. These chapters are organized in the order of longest to shortest wavelengths. In many ways, this order is extremely unfortunate. Immediately after discussing prisms and dual-beam instruments, the author exposes the student to the topic of NMR spectroscopy. This order, coupled with an extremely short (4 paragraphs, no illustrations) description of Fourier-transform NMR, creates some confusion and misconception on how the NMR experiment is best performed. However, in Chapter 4, the author does present a useful discussion on the interpretation and example applications of NMR spectra.

The other chapters on spectroscopy are presented in a solid fashion. Among these, the discussion of UV-visible spectroscopy, such as its detectors, diode array instruments, and its interpretation, stands out as above average. In the other chapters, there is a definite lack of emphasis on the relative importance of the more modern approaches. For example,

although Fourier-transform IR is discussed, the reader does not gather the impression that this is an important area. Instead, most of the discussion and diagrams are based around prism designs. No mention is made of computer-matching of spectra, although it is the dominant approach in both IR and mass spectrometry. Topics such as attenuated total reflectance and photothermal beam deflection are mentioned but not explained in sufficient detail to be understood, while such common techniques as diffuse reflectance are missing entirely. Perhaps the worst chapter in the book is Chapter 8, on Colorimetry. This topic is not substantially separated from preceding sections on UV-vis spectroscopy. The CIE tests and visual color response are noticeably absent.

Atomic spectroscopy is handled somewhat better than IR, but there are still noticeable absences. No mention is made of nebulizers or their design, even though this is a critical area. Also missing is any statement of the interferences from easily ionized elements. Finally, the ICP is mentioned only as an afterthought, belying its actual importance.

Immediately following spectroscopy is a chapter on surface analysis. The techniques of ESCA, Auger, Ion scattering, and SIMS spectroscopy are all mentioned in good detail. The preceding chapter on X-ray instrumentation and diffraction lays the groundwork for many of the surface analysis techniques.

The chapter on chromatography is well written, especially with regard to gas chromatography. The author avoids the common error of emphasizing thermal conductivity over everything else. Instead, flame ionization, electron capture, and GC-mass spectroscopy are featured. Unfortunately, this good chapter on gas chromatography becomes diluted when LC, TLC, and electrophoresis are slapped on the end. These topics, indeed all of chromatography, are among the most important to analytical chemists and nonchemists. An undergraduate class would have to be supplemented with other materials in these areas.

The book closes on a very positive note with excellent discussions of thermal analysis and mass spectrometry. The coverage of thermal analysis is first rate, including both thermal and calorimetry techniques. There is a very useful comparison of sample properties that can be analyzed by thermal techniques and several illustrative examples. Mass spectrometry is also presented in a clear, concise, but thorough method. This section describes not only the magnetic sector instruments but also quadrupole, time of flight, and FTMS in an easily understood manner. Even more modern topics such as high-resolution MS and ICP-MS are given an appropriate level of discussion.

In conclusion, this instrumentation text provides a very solid basis for an undergraduate course. At times it is a bit dated in its descriptions, and it perhaps overemphasizes the optical techniques. Nevertheless, its modular chapters, comprehensive list of techniques, and good coverage of topics such as mass spectrometry make it useful as an undergraduate text.

David Honigs, *University of Washington*

Solubility Data Series (IUPAC). Volume 36. 4-Aminobenzenesulfonamides. Part III: 6-Membered Heterocyclic Substituents and Miscellaneous Systems. Volume 37. Hydrocarbons with Water and Seawater. Part I: Hydrocarbons C₅ to C₇. Volume 38. Hydrocarbons with Water and Seawater. Part II: Hydrocarbons C₈ to C₃₆. Volume 36: Edited by Anthony N. Paruta (University of Rhode Island) and Ryszard Piekos (Gdansk Medical Academy). Pergamon: Oxford and New York. 1988. xxx + 522 pp. \$120.00. ISBN 0-08-034710-X. Volume 37: Edited by David G. Shaw (University of Alaska) et al. Pergamon: Oxford and New York. 1988. xx + 528 pp. \$120.00. ISBN 0-08-029215-1. Volume 38: Edited by David G. Shaw (University of Atlanta) et al. Pergamon: Oxford and New York. 1988. xxi + 561 pp. \$120.00. ISBN 0-08-030737-X.

This series of critically evaluated data on solubilities is now augmented by two volumes on the hydrocarbons and one on sulfonamides. Hydrocarbons of all types are considered: aliphatic, alicyclic, and aromatic. The importance of reliable information on their solubilities in water becomes greater in direct relation to the prevalence of pollution of the environment from oil spills, industrial wastes, and automotive emissions. The volume of 4-aminobenzenesulfonamides is of obvious importance in medicinal chemistry. With Part III, herewith, the sub-series on them is complete to 1985.

These volumes may not be as easy to use as some might wish, but that circumstance seems to be unavoidable if one is to have the detail and evaluation that are outstanding characteristics of the series.

Electro-enzymology Coenzyme Regeneration. By K. Nakamura (University of Gunma), M. Aizawa (Tokyo Institute of Technology), and O. Miyawaki (The University of Tokyo). Springer-Verlag: Berlin and New York. 1988. VIII + 166 pp. \$105.00. ISBN 0-387-18519-4.

Biocatalysts have high catalytic efficiencies and often select substrate specificities. Hence, there is continuing development of ways to utilize enzymes for analytical and large-scale, industrial purposes. The mono-

graph by Nakamura et al. addresses in separate chapters, one on electro-enzymology and the other on coenzyme regeneration, two of the expanding elements in the use of immobilized biocatalysts.

As emphasized in the Preface and expounded in the text, enzyme engineering at present has been more limited to utilization of hydrolases, isomerases, and lyases rather than the even more numerous but complex coenzyme-dependent enzymes. Expanded usage of the latter, such as oxidoreductases, transferases, and ligases, requires the development of more specialized bioreactors and the means for regenerating and recycling the relatively expensive coenzymes.

In Chapter 1 written by M. Aizawa, there is first a consideration given to the electrochemical characterization and redox potentials of enzyme-coenzyme systems, followed by examples that extend to electrochemical processes coupled with enzyme reactions, electroanalytical applications, and bioelectrochemical energy conversions. Chapter 2 by O. Miyawaki and K. Nakamura addresses the problem of regenerating coenzymes during cycling of enzymes. Particular attention is given to three major dissociable cofactors, viz. nicotinamide adenine dinucleotide (NAD) and its phosphate (NADP) and adenosine 5'-triphosphate (ATP). Discussion with examples includes enzyme processes with coenzyme cycling, chemically modified coenzymes, and bioreactor system with continuous coenzyme cycling.

The text provides appropriate references, nearly 600, to primary work on the subject and reflects the expertise and contributions of the authors. There are numerous figures (79) that helpfully illustrate both experimental and practical points, and the tables (40) usefully collate much of the present information that bears on the subject. The index is less detailed and perhaps of less use.

Though rather specialized for general readership, the monograph is timely in attempting to focus on the theoretical and pragmatic considerations that should attend further progress in this important area of biotechnology.

Donald B. McCormick, *Emory University*

Books on Applied Subjects

Process Technologies for Water Treatment. Edited by Samuel Stucki (Asea Brown Boveri Ltd.). Plenum: New York and London. 1988. xxi + 239 pp. \$62.50. ISBN 0-306-43002-9.

This book is the outgrowth of the Tenth Brown Boveri Symposium and consists of nine contributed chapters that are advanced reviews. Such subjects as reverse osmosis, electrodialysis, electrochemical water treatment, treatment of water with ozone or UV, production of high-purity water, and management of water in power stations are treated.

Industrial Biocides. Critical Reports on Applied Chemistry. Volume 23. Edited by Kenneth R. Payne. John Wiley & Sons: Chichester and New York. 1988. viii + 118 pp. \$84.95. ISBN 0-471-91880-6.

In addition to the familiar use of biocides (a.k.a. disinfectants) in

medicine and in the household, their use in preventing bacterial degradation of lubricants and fuels, and the prevention of the corrosion that can result, has become of major importance. In six contributed chapters, the general subject is treated from different viewpoints: "Structure and Biology of Bacteria Relevant to the Action of Disinfectants", "Biguanides as Industrial Biocides", "Disinfectant Testing and Its Relevance in Practical Application", "The Phenomena of Resistance to Disinfectants and Preservatives", "Synergisms in Disinfectant Formulations", and "Disinfection with Peroxygens".

Soil-Water Interactions. Mechanisms and Applications. By Shingo Iwata (National Research Institute of Agricultural Engineering) and Toshio Tabuchi (Ibaraki University), with Benno P. Warkentin (Oregon State University). Marcel Dekker: New York and Basel. 1987. x + 380 pp. \$119.50. ISBN 0-8247-7767-0.

This book is designed to give a systematic account of the advances in understanding such subjects as flocculation and dispersion of soil particles, swelling and freezing of moist soil, water movement in soils, and uptake of water by roots. It is appropriate that this book has been written by Japanese soil scientists, for contributions to the subject have been particularly prominent from Japan. Much literature that is not readily accessible to Western readers is summarized in this book.

Volumes of Proceedings

Biologically Active Natural Products. Proceedings of the Phytochemical Society of Europe 27. Edited by K. Hostettmann (University of Lausanne) and P. J. Lea (University of Lancaster). Clarendon: Oxford. 1987. xi + 283 pp. \$75.00. ISBN 0-19-854196-1.

The 18 papers in this fully typeset book arose from a symposium held at the University of Lausanne in 1986. They are concerned with antimicrobial, antifungal, antimalarial, molluscicidal, cytotoxic, antitumor, and antineoplastic compounds, immunostimulants, liver-protective agents, etc. The subject index is substantial.

Rotational Dynamics of Small and Macromolecules. Lecture Notes in Physics 293. Edited by Thomas Dorfmueller (Universitat Bielefeld) and Robert Pecora (University of Stanford). Springer-Verlag: New York and Berlin. 1987. iv + 249 pp. \$24.20. ISBN 0-387-18688-3.

A "workshop" held at the University of Bielefeld in 1986 was the source of the 12 typescript papers in this volume. There is no index of any kind.

Eleventh International Conference on Raman Spectroscopy. Edited by R. J. H. Clark (University College London) and D. A. Long (University of Bradford). John Wiley & Sons: Chichester and New York. 1988. liv + 1034 pp. \$127.00. ISBN 0-471-92094-0.

This fat book is made up of the typescripts of 17 plenary lectures and no less than 458 contributed papers from a conference held in London in 1988. The papers are grouped into 20 sections, ranging from theory to new techniques and applications. There is only an author index.