Book Reviews*

Strategies and Tactics in Organic Synthesis. By Thomas Lindberg (Searle Research). Academic Press, Inc.: Orlando, FL. 1984. x + 370 pp. $57.00. ISBN 0-12-450280-6.

This book consists of a series of chapters by leading personalities in the field of organic synthesis. The authors provide some special insights into the synthetic logic and analysis which undergirded their experimental efforts. The chapters then go on to provide an account of the actual experimental findings. This portion of the particular chapters reads like the discussion section of a well-written full paper in a journal. The chapters conclude with prognostications about where the type of research might ultimately lead.

The field of organic synthesis has many constituencies. One "user group" is concerned with the preparation of bulk chemicals under sensible experimental conditions and at affordable cost. There is another group which relies on synthesis to generate new sorts of structures of theoretical or medicinal interest. Still another clientele perceives of synthesis as providing an excellent framework for heuristic advances in organic chemistry. By this point of view, the synthesis per se is less important than the new chemistry which evolves from the challenge. Finally, there is a group of the "faithful" which continues to be responsive to the challenge implicit in the total synthesis of natural products. To this group the successful realization of a synthesis of a complex natural product is, per se, a laudatory objective.

This book does not deal with the substantial problem of synthesizing industrial chemicals at reasonable cost. However, its selection of authors and chapters is such that all the other identifiable concerns of synthesis are appropriately addressed. Thus, Virgil Boekelheide (superphane synthesis) and Leo Paquette (the synthesis of dodecahedrane) provide penetrating insights into their historic accomplishments in the synthesis of unnatural products of not inconsiderable complexity. The beauty of this area is that the research gets started when the synthesis is complete. A most revealing insight into the construction of modified prostaglandins is offered by Josef Fried.

Rich accounts of the synthesis of natural products wherein the primary goal would appear to be that of testing new reactions for carbon–carbon bond formation and assessing the scope of stereochemical principles are provided by Philip Magnus (the synthesis of indole alkaloids), Satoru Masamune (the synthesis of tylanolide), the late Robert V. Stevens (tetrahydropyridinium chemistry), and K. Peter C. Vollhardt (in the context of his cobalt-mediated 2 + 2 + 2 cycloaddition reactions). Beautifully detailed accounts of the synthesis of highly complex natural products are provided by Rick L. Danheiser (the total synthesis of gibberellic acid), K. C. Nicolaou (synthetic adventures with endriandic acids), Martin F. Semmelhack (fomannocin and illudol), Amos B. Smith (jatrophone), Steven Weinreb (streptonigrin), and J. D. White (methynolide). This author group focusses primarily on the architectural issues associated with their stunning triumphs in the natural products area.

Each author has done a commendable job of bringing the reader into a sense of real interaction with the particular research effort. It is this "peek behind the curtain" which is the most valuable feature of the book and is, in fact, it's raison d'etre. There will no doubt be many skeptics who question the value of such an effort in the face of the already unmanageable information explosion. Do we really need another such series of accounts?

In the judgment of this reviewer, the answer of this question is decidedly yes. Indeed, the very unmanageability of the information explosion makes this type of service even more compelling.

One of the consequences of the information explosion is that it has given rise to a new breed of vigilante referees, whose primary concern in reviewing a paper seems to be to deprive it of any of the charm and character which might actually render it readable, let alone memorable. All this is done under the cry of economy. Much too little effort is made to identify those scientific advances which are sufficiently special that a reasonably full account of their intellectual evolution could benefit the readership.

Happily, Dr. Lindberg, acting through the imprimatur of a book editorship, has accomplished this most important objective. He has identified leaders in the field of synthesis and has given them the leeway to provide the readership with intellectually honest accounts of the nature of the scientific thought process behind their experimental triumphs.

This book should be read in its entirety by serious students of organic synthesis, which is to say, serious students of organic chemistry.

Samuel Danishefsky, *Yale University*

A Specialist Periodical Report. Volume 7. Biosynthesis. Senior Reporters: R. B. Herbert and T. J. Simpson. The Royal Society of Chemistry: London. 1983. IX + 223 pp. £33.00 ($59.00). ISBN 0-85186-553-4.

Volume 7, the last volume of this useful series meets the same high standards of the previous volumes. This edition covers the literature of 1979 through 1981 and contains the following four chapters: The Biosynthesis of Polyketides, by T. J. Simpson; Phenolic Compounds Derived from Shikimate, by P. M. Dewick; The Biosynthesis of C_5–C_{20} Terpenoid Compounmds, by J. R. Hanson; and The Biosynthesis of Alkaloids, by E. Leete. The last chapter makes up more than half the volume and, as in past practice, contains a useful summary table listing species studied, the labeled compound administered, and the labeled alkaloid isolated along with the literature citation. Unlike the previous volumes, this one is produced from photo-ready typed manuscripts; the reproductions, however, are clear and easy to read. The structural drawings are neat, carefully drawn, and well-reproduced.

Each chapter contains a good summary of the studies undertaken, results obtained, and any uncertainties or ambiguities still remaining. The report is an invaluable source for researchers in the area and a useful first search for anyone requiring an entry into the literature of biosynthesis. Therefore, it should be in all libraries devoted to chemistry, biology, and related subjects, as well as in the hands of investigators in the field. Future reviews of this subject, along with topics omitted from Volume 7 and materials previously covered in the Specialist Periodical Reports "The Alkaloids", "Aliphatic and Related Natural Product Chemistry", and "Terpenoids and Steroids", have been combined and are now published in the new periodical "Natural Products Reports" of six issues per year. This reviewer welcomes this timely change.

Raymond W. Doskotch, *Ohio State University*

Electron Spin Resonance. Volume 8. Edited by P. B. Ayscough (University of Leeds). The Royal Society of Chemistry: London. 1983. 509 pp. $106.00 (£59.00). ISBN 0-85186-821-5.

This Specialist Periodical Report continues the same general outline of previous volumes in the series. The title page indicates that the reviews cover the period June 1981 to November 1982, and the references at the ends of the chapters are consistent with this statement. The chapter on ENDOR and ELDOR covers Autumn 1979 to Autumn 1982. The special topic chosen for review in this volume (Chapter 1) is Laser Magnetic Resonance (LMR). The review includes a discussion of theory and experimental considerations and a list of the species that have been detected by LMR (D. K. Russell, 30 pp, 179 ref).

The chapter on theoretical aspects (A. Hudson, 15 pp, 93 ref) includes discussion of spectral analysis, spin relaxation, and applications of quantum chemistry. Ground and thermally excited triplets and photoexcited triplets are included in the chapter on triplets and biradicals (A. Hudson, 15 pp, 78 ref). After an absence from volume 7, the chapter on ENDOR and ELDOR is back (J. C. Evans and C. C. Rowlands, 25 pp, 207 ref). The chapter on transition-metal ions is the longest in the book (D. Gatteschi, 80 pp, 543 ref). A separate chapter covers inorganic and organometallic radicals (M. C. R. Symons, 47 pp, 211 ref). The chapter on organic radicals in solids includes both spectroscopic and mechanistic studies (T. J. Kemp, 29 pp, 153 ref). The information on structure and mechanistic studies of organic radicals in solution has been covered in a single chapter instead of the two chapters that were included in Volume 7 (B. J. Tabner, 67 pp, 322 ref). The applications in polymer chemistry that was the special topic chapter in Volume 7 is a regular chapter in Volume 8 and is expected to be continued. It includes sections on polymer degradation and mechanisms of polymerization (D. J. T. Hill, J. H. O'Donnell, and P. J. Pomery, 36 p, 180 ref). As in Volume 7, the discussion of spin-labeling studies is divided into one chapter on biopolymers (B. H. Robinson and A. H. Beth, 32 pp, 109 ref) and a second chapter on biomembranes (C.-S. Lai, 35 pp, 230 ref). The book concludes with chapters on metalloproteins (N. J. Blackburn, 32 pp, 121 ref) and applications in medicine (N. J. F. Dodd, 33 pp, 218 ref). The 32-page author index is valuable.

This volume continues the fine tradition of the specialist periodical reports in providing comprehensive coverage of the field. The book,

*Unsigned book reviews are by the Book Review Editors

unlike prior volumes, was produced from camera-ready copy, yet it still costs 21 cents per page. The variation in the readability of the print from chapter to chapter indicates that greater attention should be paid to the quality of the copy. If all of the chapters were as legible as the best of the chapters, the use of camera-ready copy would be no problem to the reader.

Sandra S. Eaton, *University of Colorado at Denver*

The Quantum Theory of Unimolecular Reactions. By H. O. Pritchard (York University). Cambridge University Press: New York. 1984. XV + 175 pp. $49.50. ISBN 0-521-257115.

The focus of this book is on the pressure and temperature dependencies of thermal unimolecular reactions. The author advances a master equation approach with quantum mechanical transition probabilities for activation, deactivation, randomization, and decomposition processes. Only a brief discussion of the actual calculation of state-to-state transition probabilities is presented. The reader searching for a complete quantum theoretical description of collision-free unimolecular decay from a well-defined energy state will be disappointed.

The strength of the text is in its thorough and clear discussion of unimolecular fall-off curves. The analysis of the factors which influence the fall-off shape such as first- and second-order randomization, collision efficiencies, and activation bottlenecks are particularly illuminating. The reader will also benefit from the definition of a collision-free environment, as well as the description of weak and strong collisions.

The author argues against the combined transition state/RRKM theory description of unimolecular kinetics. An obvious criticism of this approach is that, since transition state and RRKM theory have their roots in classical mechanics, they cannot be used to develop a foundation for a quantum theory of unimolecular kinetics. Instead of using RRKM theory to calculate the microcanonical unimolecular rate constant $k(E)$, it is proposed that $k(E)$ be determined from the Laplace transform of the Arrhenius expression for $k(T)$.

Overall this book is recommended for researchers with considerable expertise in unimolecular kinetics. It is too advanced for one requiring an introduction to the topic. After reading this book the reviewer wishes that a broader perspective of experimental results and quantum theoretical methods had been presented.

William L. Hase, *Wayne State University*

Organic Electronic Spectral Data. Volume 20. Edited by J. P. Phillips, D. Bates, H. Feuer, and B. S. Thyagarajan. John Wiley and Sons: New York. 1984. xiii + 1040 pp. $120.00. ISBN 0471-81808-9.

With this volume, the number of spectra compiled since the series was begun in 1957 has reached 450000, and the effort goes ever on. The format remains constant: compounds listed in formula-index order, with solvent, λ_{max} (ϵ), and reference given. It is concise and effective. Over 100 different journals have been searched for useful data published in the year 1978.

Electron Deficient Aromatic- and Heteroaromatic-Base Interactions. The Chemistry of Anionic Sigma Complexes. By E. Buncel (Queen's University, Kingston), M. R. Crampton (Durham University), M. J. Strauss (University of Vermont), and F. Terrier (ENSCP). Elsevier Science Publishers: Amsterdam and New York. 1984. vii + 499 pp. $115.50. ISBN 0-444-42305-2.

When a base reacts with certain aromatic compounds, a resonance-stabilized negative ion is produced. These ions, commonly called Meisenheimer or Jackson–Meisenheimer adducts (or σ complexes), are the subject of this book. Because Meisenheimer adducts are intermediates in one of the principal mechanisms of aromatic nucleophilic substitution, the S_NAr mechanism, the book also deals with this mechanism. However, the emphasis is on the structures and properties of the adducts themselves. Spectroscopic and X-ray studies are presented in an orderly way, based on the type of aromatic or heteroaromatic substrate. There are many tables of data, especially NMR data. A short chapter on theoretical studies is followed by the longest chapter in the book, entitled Structure and Reactivity, which, however, deals largely with the stability of these complexes and their ease of formation. This chapter is also both thorough and systematic. It discusses the effects on stability of the nature of the aromatic substrate, the ring substituents, and the base, among other variables.

The S_NAr mechanism itself is dealt with in the next two chapters, followed by a chapter on other reactions that can take place between an aromatic substrate and a base (e.g., electron transfer) and a final chapter on reactions of Meisenheimer adducts, with the emphasis on reactions other than those that lead to normal nucleophilic aromatic substitution products.

Although the style is not exciting, the book is clearly written and easy to follow. Unusually for a multiauthor work, the preface tells which author wrote each chapter. However, there are no glaring discrepancies in style. As is common these days, typewritten camera-ready copy was used (despite the high price of the book), but it is very clearly presented and creates no problem in understanding.

The only previous book in this area (Miller, "Aromatic Nucleophilic Substitution") appeared in 1968, and it is good to have this new one, which includes references into 1982. It will be most useful not only to workers in the field but also to any chemist who needs to know this subject.

Jerry March, *Adelphi University*

Practical Absorption Spectrometry. Techniques in Visible and Ultraviolet Spectrometry. Volume 3. Ultraviolet Spectrometry Group. Edited by A. Knowles (University of Bristol) and C. Burgess (Glaxo Operations UK Ltd.). Chapman and Hall: London and New York. 1984. XXII + 234 pp. $39.95. ISBNO-412-24390-3.

The UV Spectrometry Group in Great Britian has established working parties to produce monographs on the practice of UV–vis spectrometry. The previous volumes in the series are on "Standards in Absorption Spectrometry" and "Standards in Fluorescence Spectrometry". The present monograph has chapters on Absorption Spectrometry, Spectrometer Design, Light Sources and Optical Components, Monochromators, Detectors, Instrument Signal Processing, Interfacing Techniques, Cell and Cell Holders, Measuring the Spectrum, Numerical Methods of Data Analysis, Special Techniques, Automated Sample Handling, and The Maintenance of Instruments. In addition, there is a glossary of terms and abbreviations used in absorption spectrometry as well as a brief appendix with the characteristics of spectroscopic solvents, optical materials, and wavelength standards.

The stated objective of the book is "...to produce a readable book for the newcomer to UV–visible absorption spectrometry and perhaps to improve the technique of more experienced users". The authors also express the hope "that the result is a coherent whole that provides the kind of information that is not found in standard texts or in instrument manufactures' literature." It is questionable that this information can not be found in texts and in the manufacturers' literature and indeed in many cases with clearer presentations. For example, there are better treatments of the important topics of the selection of optimal instrument operating parameters as well as methods to improve signal-to-noise ratios. The power of some of the newer technology such as diode array detectors and the computerized processing of data might even better be gained through the manufactures' advertizing literature. However, the book does have the advantage of introducing the reader to the major diverse areas of interest in absorption spectrometry in a single concise manuscript.

J. E. Sinsheimer, *The University of Michigan*

Microwave Molecular Spectra. 3rd Edition. By Walter Gordy (Duke University) and Robert L. Cook (Mississippi State University). John Wiley and Sons: New York. 1984. xiv + 929 pp. $175.00. ISBN 0-471-08681-9.

This volume is Volume XVIII of the series "Techniques of Chemistry", under the general editorship of Arnold Weissberger. My copy of the 2nd edition has begun to exhibit considerable signs of wear and tear. This 3rd edition therefore makes a welcome and timely appearance.

The new edition retains the organization of its predecessor. Most of the clear exposition of the basic theory and principles which underpin high-resolution rotational spectroscopy remains largely unaltered. The treatise will continue to be an excellent source for self-tutorial on this subject for neophyte spectroscopists. Moreover, each chapter has been updated to include new developments and current topics. For example, the chapter on linear polyatomic molecules includes discussions on interstellar ions, radicals and long chain cyanides, quasi-linear molecules, and hydrogen bonded dimers. The chapter devoted to centrifugal distortion effects has more than doubled in length as befits the evolution of this topic from a specialty subbranch to a more or less routine consideration in a spectral analysis.

This updated version of the respected "standard in the field" will become widely used and appreciated by those requiring either some review of the basic theory of high-resolution rotational spectroscopy or an introduction to specific research developments in the field over the past 15 years. It is well written, relatively free of errors, and replete with interesting tables and illustration; it concludes with an extensive subject and author index.

Robert L. Kuczkowski, *University of Michigan*