Book Reviews

Organic Reactions. Volume 43. Edited by Leo A. Paquette. John Wiley & Sons: New York and Chichester. 1993. vii + 823 pp. $95.00 ISBN 0-471-58479-7.

Volume 43 of this useful series contains three new reviews: Carbonyl Methylenation and Alkylidenation Using Titanium-Based Reagents by Stanley H. Pine; Anion-Assisted Sigmatropic Rearrangements by Stephen R. Wilson; and The Baeyer-Villiger Oxidation of Ketones and Aldehydes by Grant R. Krow. Each provides extensive coverage of the mechanism, scope, and limitations of the reaction in question. Also included are detailed experimental procedures and tabular compilations of data from the literature; for the most part coverage is through the end of 1989.

Chapter 1 focuses on two types of reagents developed since the late 1970s for alkylidenation of organic carbonyl compounds, including their unique utility for the preparation of vinyl ethers. The Tebbe reagent is probably the best understood in mechanistic terms, but the review points out the potential value of the Takai zinc/dihaloalkane/titanium tetrachloride reagent for transfer of alkylidene groups other than CH_2. One concern is that many of the examples have been taken from communications, leaving some yields and reaction conditions poorly documented. This is understandable in light of the recent development of this chemistry, and is balanced by the utility of the reaction. The descriptions of reagent preparation and examples of experimental procedures are thorough and complete.

The second chapter is organized by reaction type. [3,3] and [1,3] rearrangements receive the bulk of attention, and cycloreversions and other sigmatropic topologies are included. The author successfully avoids the mechanistic controversy over whether any particular example is concerted or stepwise (though the subject is discussed) and centers on what a synthetic chemist needs to apply a particular reaction: conditions, selectivity, and limitations. One confusing aspect of the review is that some examples shown as side reactions in one section are later mentioned as primary examples in later sections; the numbering scheme ignores the earlier mention. Again, the experimental procedures are thorough and the tabular survey is well-organized.

The final and longest chapter is an update of an earlier review on the Baeyer–Villiger oxidation (Vol. 9, 1953). Given the extensive mechanistic work and additional applications in the past 30 years, such a revisit is justified. This is a long review (102 pages, plus the tabular survey), but it successfully lays out the selectivity seen in many different examples. A particular strength is how different synthetic strategies have been devised to take advantage of this reaction.

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Interpretation of Mass Spectra, Fourth Edition. By Fred W. McLafferty (Cornell University) and František Tureček (University of Washington). University Science Books: Mill Valley, CA. 1993. xviii + 371 pp. $27.00. ISBN 0-935702-25-3.

Previous editions of this book have become standard laboratory texts; this fourth edition will undoubtedly continue that tradition. The latest version reflects the input of a new coauthor, František Tureček, whose particular contributions have been to the revision of the chapters concerning theory and mechanism. The general style of this book is, however, substantially unchanged from earlier editions, and the underlying philosophy of the importance of the development of personal skills in mass spectral interpretation remains undiluted. One particularly attractive feature of the book is the separation of elementary and more detailed treatments of particular topics. Thus, for example, mechanisms of ion fragmentation are treated in an elementary manner in Chapter 4, which covers basic concepts such as charge-site and radical-site initiation of cleavages. The subject is revisited in Chapter 8, where greater attention is paid to thermochemical and steric considerations. The incorporation of such self-contained chapters is particularly helpful to the reader engaged in individual learning; it also enhances the value of the book as a supporting text for courses in mass spectrometry at several levels. Furthermore, organic chemists may refresh their memories on, for example, the fragmentations of particular compound classes without being concerned with more theoretical aspects such as quasi-equilibrium theory.

A hallmark of the book is the large number of examples, presented as "unknowns" throughout the text; the authors urge the reader to devote particular attention to the working of these examples as the most effective means to develop interpretative skills. A final chapter of the book is devoted to clear explanations of the interpretation of the spectra. The argument in favor of mastering spectral interpretation is particularly convincing when it comes from a senior scientist (Fred McLafferty) who has made seminal contributions to the development of computer aided interpretation of mass spectra and the use of mass spectral libraries. These latter aspects of the subject are given only brief coverage in this book, though it is sufficient to ensure the reader's awareness of their significance.

The first edition of this book appeared when the electron ionization technique was the standard method used in service to the synthetic organic chemist. Today the armamentarium of mass spectrometric techniques is much broader, and the chemist must select from and interpret the results of a number of different methods. In this broader context, McLafferty and Tureček's book has limitations. The newer techniques are described briefly, but the interpretation of data obtained using, for example, electrospray and matrix-assisted desorption ionization methods is not discussed. The contents of this volume should be supplemented by additional reading, but this is hardly a criticism and this book remains without equal as an effective starting point in the education of any chemist in the field of organic mass spectrometry.

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Selective Biocatalysis: A Synthetic Approach. By L. Poppe (Hungarian Academy of Sciences) and L. Novak (Technical University Budapest). VCH: Weinheim, Germany. 1992. xii + 319 pp. $126.00. ISBN 3-527-28372-2.

In the preface of this book the authors state that their purpose was to cover the increasingly important world of enzymes and cellular systems of use in chemical synthesis "through the eyes of the organic chemist." It could be argued that they have provided an even broader perspective that allows practioners of biocatalysis to appreciate the possibilities for biochemical routes to synthesizing complex, optically active compounds. As such, this is a valuable book for those considering biocatalysis from either vantage point.

The book does an excellent job of covering biocatalytic synthesis without leaving anyone out. For those not knowledgable about enzymes, the first chapter provides a brief but comprehensive background to enzyme use for *in vivo* and *in vitro*, even touching on some recent advances. For those less familiar with bioorganic chemistry, Chapter 2 covers stereochemical aspects of biotransformations through the use of effective schematics and concise text. The next three chapters cover hydrolases, oxidoreductases, and Baker's yeast, all of which have found acceptance as biosynthetic reagents for certain cases. Finally, the concluding chapter covers a number of enzyme types that have potential as biosynthetic catalysts, including lyases, aminotransferases, and aldolases.

The book serves as an excellent reference for this emerging field, containing over 1600 citations. The chapters are assembled with a minimum of text and frequent use of tables and figures to illustrate particular aspects of biosynthesis. The authors get to their point quickly, allowing the reader to extract useful insights and information rapidly; this also makes it possible to focus on certain parts of the text without having to assimilate all of the preceding sections. The book might also be useful for an introductory course in biocatalytic synthesis in that the authors take pains to cover each topic with clarity and provide sufficient introductory material to grasp each concept.

In summary, this is a very useful book that brings together concepts in stereoselective chemical synthesis and biotransformation. It is of use not only to organic chemists but also to biological scientists and chemical engineers. By making the relevant concepts and opportunities clear to each of these disciplines, the authors have made an important contribution and lowered the activation energy for consideration of this emerging technology.

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Chromatography of Mycotoxins. Techniques and Applications. Edited by V. Betina (Slovak Technical University, Bratislava, Slovakia). Elsevier: Amsterdam and New York. 1993. xiv + 440 pp. $180.00. ISBN 0-444-81521-X.

This book is part of the Journal of Chromatography Library Series and, as do the other volumes of the series, it provides practical and up-to-date guides to those who practice the subject matter. It is a good reference and guide for the isolation, identification, and quantitation of mycotoxins from many different sources including food and feedstuffs.

It is comprised of two parts, Part A: Techniques and Part B:

Applications. In Part A the principles of sample preparation, extraction, and clean-up and the established and prospective chromatographic techniques are discussed in relation to mycotoxins. The chapters on TLC and LC include many practical aspects of the techniques which are practiced as a matter of fact by seasoned users but not found in printed matter, making them excellent guides for students of chromatography. The chapters on immunoaffinity chromatography and enzyme-linked immunosorbent assay (ELISA) are excellent references for the natural products chemists who a e interested in exploring these techniques.

In Part B the vital data on thin-layer, liquid, and gas chromatography of mycotoxins which are scattered in the literature have been compiled. Applications are presented in three chapters, each devoted to one of the chromatographic techniques. The chapter on liquid column chromatography of mycotoxins contains two most valuable tables: (1) an updated list of mycotoxins and other secondary metabolites and their producers and (2) retention indices and UV data of fungal metabolites. Unfortunately the chemical structures of the mycotoxins and the other secondary metabolites are not included in these tables nor are they found in most of the chapters.

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Topics in Fluorescence Spectroscopy. Volume 3. Biochemical Applications. Edited by Joseph R. Lakowicz. Plenum Press: New York. 1992. xiv + 390 pp. $79.50. ISBN 0-306-43954-9.

This is the third in a series of three volumes aimed at providing a thorough perspective on the use of fluorescence spectroscopy in biological systems. There are five chapters which cover in detail applications of fluorescence spectroscopy to studies of proteins (Chapters 1–3), nucleic acids (Chapter 4), and membranes (Chapter 5). The next three chapters are more specialized and cover topics such as use of fluorescence in immunological tests (Chapter 6), total internal reflection (Chapter 7), and studies of microparticles (Chapter 8). The overall level of presentation is aimed at the scientist with a clear interest in fluorescence work and with some understanding of the techniques and the principles (provided in part in previous volumes). In general this volume will serve extremely well as a reference for workers in the field or for use with selected topics in advanced graduate courses in chemistry or biochemistry. The chapters are written by top specialists in their fields, but the style and central purposes differ enough that each chapter will be mentioned separately.

Chapter 1 provides a very comprehensive review of the use of fluorescence and phosphorescence of tyrosine in studies of proteins. The chapter builds logically and clearly and draws from most of the literature (222 references) to describe experiments on a large range of proteins ranging from calcium binding proteins to neuropeptides. The chapter is a wealth of information and is reasonably current. Chapter 2 is focused on the description of fluorescence to study dynamic properties of proteins using intrinsic probes such as tyrosine and tryptophan as well as probes introduced into the protein. The emphasis is on the connection between motional models and observations using a variety of dynamic fluorescence techniques. The theoretical basis is presented with examples from a number of applications. Chapter 3 is dedicated to the more specialized use of tryptophan phosphorscence to study proteins structure and dynamics. The chapter provides a particularly good description of phosphorescence quenching and its use in selected applications. Neither of Chapters 2 and 3 is as comprehensive in coverage of the literature as Chapter 1.

Chapter 4 provides an extensive coverage of the use of fluorescence in studies of nucleic acids. The chapter has a strongly theoretical section in which the particularly useful aspects of fluorescence approaches for studying rotational dynamics are emphasized. This is followed by a broad coverage of experimental examples. The end briefly introduces other dynamic studies of nucleic acids. Chapter 5 presents a broad coverage of the numerous uses of fluorescence in studies of membranes. The chapter manages to highlight the current status of the fields even though there are many fluorescence techniques employed. The discussion of the need for lifetime distribution analysis in membrane applications is very good, and the discussion of time-resolved anisotropy measurements is reasonably modern and complete. This chapter contains the least current set of references.

Chapter 6 is the shortest and most descriptive of the chapters and provides a brief overview of some of the considerations important to using fluorescence in immunologically based diagnostic tests. Chapter 7 discusses in great detail the exciting technique of total internal reflection fluorescence spectroscopy. It is quite technically based and would, perhaps, have been better suited for Volume 1 of the series. Nevertheless, the theoretical description is thorough and complete and includes the newer use of metal coated surfaces. The applications extend from quantitative measurements of binding to surfaces to qualitative descriptions of adherent cells on surfaces. The references are current and complete. Chapter 8 introduces a special application of fluorescence to very small particle systems (tens of microns) in which the fluorescence spectra can be used to study properties of the particle morphology. The effect is based on a coupling between fluorescence emission and the scattering field from the particle. The particular effects of energy transfer in very small systems are also discussed. A few specific experimental examples are presented to validate this relatively new use of fluorescence spectroscopy.

Overall, this is a very useful volume in the series, and it completes the series well. The material presented in the different chapters provide a wide variety of examples of biochemical applications of fluorescence spectroscopy. My only disappointment is the absence of a review of the use of fluorescence energy transfer techniques in mapping distances in proteins, nucleic acids, and macromolecular assemblies. The individual chapters range from comprehensive descriptions of applications to detailed theoretical analyses of selected principles and applications to specific presentations of new techniques and phenomena. It is not a volume easily read by all, but anyone with an interest in applications of fluorescence techniques in biology will find a wealth of information.

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