

# Book Reviews

**Organic Reactions, Vol. 54.** Leo A. Paquette, Editor (The Ohio State University). John Wiley & Sons, Inc. Publishers, New York, NY. 1999. x + 442 pp. 15 × 22.5 cm. \$89.95. ISBN 0-471-58959-4.

Volume 54 of *Organic Reactions* follows the valuable tradition of previous volumes in this series by bringing together two new discussions of important organic processes under the skillful senior authorship of Roberto Rossi and Robert Moriarity, respectively.

In the first of these chapters, Rossi and his coauthors, Adriana Pierini and Ana Santiago, present an exhaustive compilation of examples of Aromatic Substitution by the  $S_{RN}1$  Reaction. This type of reaction is characterized by a mechanism in which single electron transfer to the aromatic substrate initiates a chain process, which ultimately leads to nucleophilic displacement of substituents from nonactivated aromatic and certain hindered aliphatic substrates. Such reactions have expanded the synthetic scope of aromatic nucleophilic substitution dramatically over the past several decades, and Rossi and his co-workers have made numerous valuable contributions to this field of research. In the first chapter, the authors have presented over 2000 examples of specific  $S_{RN}1$  reactions involving various carboaromatic, heteroaromatic, and alkyl substrates reacting with 16 classes of nucleophiles, ranging from carbanions through phenoxides to organometallic reagents. A dozen detailed experimental procedures are included to illustrate the various methods for initiating the  $S_{RN}1$  reaction, which is accomplished most often and conveniently by near-UV irradiation, but which can also be done by means of alkali metals or electrochemically. This chapter now becomes the definitive source of information for anyone interested in learning about or using  $S_{RN}1$  chemistry.

The second chapter in this volume, entitled Oxidation of Carbonyl Compounds with Organohypervalent Iodine Reagents, has been lucidly written by Robert Moriarity and Om Prokash. Using examples taken from over 200 references and illustrated in more than 40 well-organized tables, the authors begin with a brief review of common hypervalent iodine reagents. This is followed by a discussion of mechanisms by which these reagents lead to various products derived from initial  $\alpha$ -oxidation of carbonyl compounds. Then, specific examples of  $\alpha$ -functionalization of carbonyl compounds under basic, acidic, and neutral conditions are described. Reactions of silyl enol ethers and ketene silyl acetals with hypervalent iodine reagents are then presented, followed by a discussion of functionalization and dimerization of  $\beta$ -dicarbonyl compounds. An interesting section on synthetic applications of hypervalent iodine-promoted 1,2-aryl migrations further demonstrates the versatility of these safe, effective, and relatively benign reagents. Nearly 50 examples of specific experimental procedures are included in the chapter.

Practitioners looking to effect oxidative  $\alpha$ -functionalization of carbonyl compounds or conversion of enolizable aryl

ketones to 2-arylalkanoates would be well served by a close examination of this chapter prior to choosing more toxic and less selective traditional oxidizing agents.

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**Stereoselective Biocatalysis.** Edited by Ramesh N. Patel (Bristol-Myers Squibb Pharmaceutical Research Institute, New Brunswick, NJ). Marcel Dekker, Inc., New York. 2000. xii + 932 pp. 17.5 × 25 cm. \$250.00. ISBN 0-8247-8282-8.

*Stereoselective Biocatalysis* is an attempt by the editor to cover the full spectrum of the emerging research area known as biocatalysis. He almost succeeds in this effort. The list of authors of the 30 chapters reads like a "who's who" of biocatalysis. While published in the United States, few authors from the United States are represented in the book. The book can be divided into chapters that concentrate on the catalysis (enzymes or whole cells) and those that emphasize the substrate or chemical compounds being made. Almost the entire field of enzyme reaction types useful to chemists employing biocatalysis is described in the book. These include epoxidases, hydroxylations, aldolases, and amino acid dehydrogenases. There is some repetition in that two chapters each are present on decarboxylases, whole cell reductases, and nitrile lyases. The compounds covered include anticholesterol drugs, steroids, terpenes, and pharmaceutical and other industrial intermediates. Additional chapters discuss the use of enzymes as biosensors, in chemical protection/deprotection, and in supercritical carbon dioxide. What is missing are chapters on enzymes in organic solvents (however, some examples are given throughout the book), CLECs (cross-linked enzyme crystals are only briefly mentioned), and directed evolution (the future of biocatalysis?). Despite the shortcomings, the book will serve as a good reference source for specialists working in the field and, with supplementation, could be employed in University courses on the subject. Pure synthetic organic chemists might pick up this book, but will be unfamiliar with the growing terminology that is developing around this field.

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**Tetrahedron Organic Chemistry Series Volume 19: High-Resolution NMR Techniques in Organic Chemistry.** By Timothy D. W. Claridge (Oxford University). Elsevier Science, Amsterdam, The Netherlands. 1999. xiv + 382 pp. 21 × 29.5 cm. \$49.50. ISBN 0-08-042798-7.

Claridge states that he wrote this book from the perspective of an academic NMR laboratory manager in a research setting. In my opinion the author is right on target with this book, which belongs on the NMR console and not on the office bookshelf collecting dust. The book is an excellent reference source and guide for the most common NMR experiments used by organic chemists, and it is also an excellent textbook for organic graduate and postdoctoral students. A major strength of this book in my opinion is that it is written at the appropriate level in terms of NMR theory for organic chemists. Thus a minimum of mathematics is used to explain NMR experiments, and vectors are used clearly and concisely to explain selected NMR experiments. The experiments are discussed from a practical and an application standpoint, which is of great value to an organic chemist. In addition to students, this book is also of great value to the mature organic chemist who wants to remain current with NMR applications to organic chemistry.

The text is divided into nine chapters. A table at the beginning of each chapter outlines the major experiments and applications to be discussed, and references are given at the end of each chapter. The references are not exhaustive, but are sufficient to direct the reader to the pertinent literature on a particular subject.

Chapter one provides an overview of the historical and instrumental development of NMR and describes pulse sequence nomenclature and other general information. The most common NMR experiments used by organic chemists are listed in a table that indicates the information obtained from each experiment. This information helps the reader develop an understanding of how to use these experiments to obtain structural information on organic molecules.

Chapter two provides an excellent nonmathematical explanation of the theory of NMR. Vector diagrams are employed to explain how NMR experiments work; the author makes the interesting comparison to a carousel to explain the rotating frame of reference. This comparison illustrates why I feel that this is an excellent teaching text for an advanced undergraduate or graduate NMR course.  $T_1$  and  $T_2$  relaxation mechanisms are discussed from a practical perspective describing various experimental techniques from "quick and dirty" to very accurate methods used to measure both types of relaxation. The author includes a discussion of processes other than molecular motion that affect relaxation, including chemical shift anisotropy, spin-rotation, scalar coupling to quadrupolar nuclei, and quadrupolar relaxation. These topics are not generally discussed in a text of this type, but they are topics of which organic chemists should be aware.

Chapter three presents a concise discussion of the practical aspects of data collection and processing. In this chapter each component of the spectrometer is explained in sufficient detail to allow the reader to understand its operation. A wide variety of factors that affect data collection are discussed, including the effect of floor vibration on the observed NMR peaks. This discussion is interesting and very instructive. The author also presents an excellent discussion on the relatively new techniques of gradient shimming and calibration. To my knowledge this is one of the few books that include such a discussion. Other useful discussions include acquisition/digitization, pulse excitation, detection, Nyquist condition, dynamic range, shimming, pulse calibration, and spectrometer performance checks. Overall this is an excellent chapter for anyone involved in the day-to-day collection of NMR data.

Chapters four to eight describe various 1D and 2D NMR methods. One-dimensional topics discussed include the following: optimizing sensitivity, quantitative measurement, decoupling, and spectral editing, with particular emphasis on the INEPT and DEPT experiments. The concept of 2D NMR is presented in chapter five. The COSY experiment is discussed using vector diagram to develop and illustrate the concepts of 2D NMR. The discussions of coherence transfer and coherence transfer pathways and the application of gradient pulses to select coherence transfer pathways are particularly timely. Homonuclear and heteronuclear shift correlation experiments are presented in separate chapters. The basic and most commonly employed NMR experiments, such as the homonuclear experiments COSY and TOCSY, and the heteronuclear experiments HMQC, HSQC, HMBC, and HETCOR, which are used to correlate  $^1\text{H}$ -X spins, are discussed from a practical and an application perspective.  $J$ -resolved experiments are presented in chapter seven, and the NOE and NOESY experiments are discussed in chapter eight. The final chapter is entitled Experimental Methods and discusses the experimental details of selected popular pulse sequences, including selective excitation and gradient experiments.

Overall this is a very good text, both well written and easy to understand. It provides a great deal of information that will be useful on a daily basis. I highly recommend the text for all practicing organic chemists and organic graduate students.

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