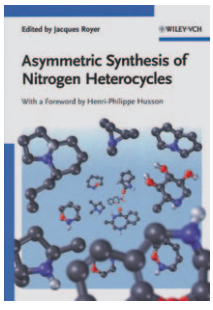

Asymmetric Synthesis of Nitrogen Heterocycles
Edited by Jacques Royer. Wiley-VCH, Weinheim 2009. 409 pp., hardcover € 139.00.—ISBN 978-3527320363

Asymmetric Synthesis of Nitrogen Heterocycles

This book summarizes the principal methods for preparing chiral nitrogen heterocycles. Since many pharmacologically active molecules contain one or more nitrogen heterocycles, this topic is of great importance to many synthetic organic chemists.

Indeed, nitrogen heterocycles comprise one of the largest families of organic compounds. Even though aromatic heterocycles are excluded from the book (for obvious reasons), the amount of literature on chiral nitrogen heterocycles is still too large to allow an exhaustive overview. Although I have found that in some topics several significant references are missing, I recognize that the authors have chosen the examples on the basis of their personal criteria, most probably without any bias. Since the book is focused on recent advances, most of the cited works are from the period 2000 to 2007. However, there are many references from before 2000 as well as some from 2008. Nonetheless, the editor did not clearly define a literature period for the entire book; it varies from chapter to chapter. The book is well edited, although it lacks a common format for schemes in the individual chapters. Of the few mistakes that are present, most are located in the figures and schemes, as usually occurs with this type of text.

The book is organized in two parts: the first deals with nitrogen heterocycles having only one nitrogen atom and the second with heterocycles having more than one heteroatom. Part I is structured according to the size of the ring. The first chapter, written by G. Cardillo, L. Gentilucci, and A. Tomelli, deals with the synthesis of three- and four-membered rings. Although most biologically active compounds with a nitrogen-containing three-membered ring are polycyclic, the chapter is centered on the synthesis of simple monocyclic aziridines and azetidines in chiral form. It also describes some procedures for chemical and enzymatic resolution of enantiomers. Chapter 2, written by P. Q. Huang, is devoted to five-membered rings. Whilst primarily dedicated to pyrrolidines, pyrrolidinones, and pyrrolines, it also features a few examples of fused bicyclic systems with a bridgehead nitrogen, which are provided at the end the chapter. Chapter 3, written by N. Toyooka, covers recent literature on six-membered rings and includes many examples of bicyclic compounds. The fourth and final chapter of Part I, written by Y. Troin and M. E. Sinibaldi, deals with larger heterocycles. It describes the main synthetic approaches to enantiomerically pure azepines and azocines, together with some stereospecific—and even racemic—methods.

Part II also comprises four chapters (Chapters 5–8) and is again ordered according to the size of the ring. Chapter 5, by S. Lanners and G. Hanquet, is a review of three- and four-membered rings. Explanations of the asymmetric synthesis of well-known oxaziridines are complemented by examples of syntheses of less-common heterocycles such as diaziridines, diazirines, diazetidines, oxazetidines, and thiazetidines. Chapter 6, by C. Kadouri-Puchot and C. Agami, deals with five-membered rings, which constitute the largest family of heterocycles with more than one heteroatom. In view of the huge quantity of literature in this area, the authors have focused on recent developments, but have also included the most significant results from the past 15 years. Chapter 7, by P. Mátius and P. Tápolcsanyi, provides an overview of six-membered rings, spanning the literature from 1957 to 2007. The authors have covered chiral pyridazines, pyrimidines, piperazines, oxadiazines, and morpholines, but did not include any examples of polycyclic compounds containing these rings. The fourth and final chapter of Part II and of the book, by J. Royer, discusses asymmetric syntheses of diazepines, oxazepines, and thiazepines.

In summary, the book is clearly written and very well structured. It should prove useful to any chemist interested in a brief overview of the main procedures for the asymmetric synthesis of simple nitrogen heterocycles. It should also be useful as a reference text for graduate students and for researchers in academia or industry.

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Elements of Synthesis Planning

Ever since Corey developed the concept of retrosynthetic analysis, textbooks of varying quality that try to explain the process of designing the ideal synthesis of any target molecule have been appearing. *Elements of Synthesis Planning*, by R. W. Hoffmann, is another attempt to rationalize the synthesis of structurally complicated and demanding natural products in a research laboratory and to instruct the reader about how to develop effective synthetic schemes and routes.

The present book by R. W. Hoffmann, although presented as an improved version of the earlier

edition, is a more or less direct translation of the German version published in 2006 (*Elemente der Syntheseplanung*, Elsevier Spektrum der Wissenschaft), with additional problem sections at the end of each chapter. In his book, Hoffmann describes different strategies for achieving the goal of preparing the desired compound. One chapter is devoted to the formation of bonds between functional groups, and explains in detail the use of polar synthons and of umpolung reactions to successfully install carbon–carbon bonds between functional groups in cases with various spatial relationships. The following chapter deals with bond formation by branching of a skeleton structure, with special emphasis on the importance of symmetry in the synthesis of such systems. Next the author discusses the incorporation of readily available building blocks, a strategy that is especially important for generating or introducing chirality. The following sections are devoted to the construction of cyclic structures and the use of protecting groups in the course of a synthesis, and to the generation of stereogenic centers. The last group of chapters is concerned with the ranking of synthetic methods by comparing different approaches toward the same target molecule, and with the application and development of computer-aided synthesis planning. In the final chapter of the book, Hoffmann describes and compares syntheses of some selected natural products, namely strychnine, colchicine, dysidiolide, asteriscanolide, and lepadiformine. Each individual chapter ends with a problem section, and solutions are given at the end of the book. All in all, this text, in a clever and comprehensible way, adapts and condenses many elements from related earlier books such as Warren's *Organic Synthesis:The Disconnection Approach*, *The Logic of Chemical Synthesis* by Corey and Cheng, *Classics in Total Synthesis* by Nicolaou and Sorensen and by Nicolaou and Snyder, Ho's *Tactics of Organic Synthesis*, and others.

Thus, in *Elements of Synthesis Planning* Hoffmann aims to show that natural products of varying complexity can be successfully prepared by using strict and formal guidelines. This approach is of great advantage as a routine strategy for finding a route to a desired target molecule. On the other hand, however, it implies that the elegance, creativity, and artistic components of total synthesis can be reduced to mere handcraft, leaving little room for the advancement and development of one's own methodology. Readers looking for more inspiration in this direction might find it in Hudlicky's *The Way of Synthesis*.

Throughout *Elements of Synthesis Planning*, the reaction schemes do not include an indication of chemical yields. When one is considering strategy and comparing different approaches toward the same target, this piece of information could be quite useful to evaluate efficiency or to be made aware of the necessity for longer reaction sequences in cases of low-yielding multistep processes. The layout of the formula schemes is not consistent, and although that does not detract from the scientific content, the aesthetics and ease of reading are diminished. The last chapter of the book describes and compares syntheses of some selected natural products. This section would have benefited from more detailed discussions of the syntheses, and a clearer emphasis on key steps and synthetic strategies.

The author does not clearly specify the readership for which *Elements of Synthesis Planning* is intended; however, it is clear that some advanced knowledge in the field of organic chemistry is required to follow and appreciate the details of the syntheses. Therefore, the textbook can be recommended to graduate students or postgraduate researchers in the field. The work also appears to be suitable as a basis for lecture notes or as a study guide, especially when students try to solve the problems. In a nutshell, as *Elements of Synthesis Planning* is not pricey, it can be welcomed as an alternative and supplement to similar textbooks on this subject.

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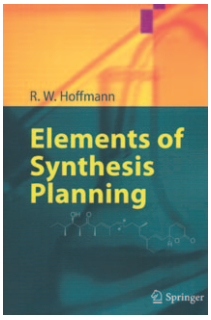

Elements of Synthesis Planning
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