

Foreword

In a 1990 *Angewandte* article entitled “Organic Synthesis – Where now?” I made the statements [1]: “The primary center of attention for all synthetic methods will continue to shift towards catalytic and enantioselective variants; indeed, it will not be long before such modifications will be available with every standard reaction for converting achiral educts into chiral products” and “The discovery of truly new reactions is likely to be limited to the realm of transition-metal chemistry, which will almost certainly provide us with additional *miracle reagents* in the years to come”. It was not very risky to make such predictions, because these developments were already going on in 1990, when the discovery of the Sharpless epoxidation celebrated its 10th anniversary, when the enantioselective hydrogenations with diphosphane–Pd complexes were well established (Kagan, Knowles, Noyori), when highly active and versatile metathesis catalysts for organic synthesis were about to be developed by Schrock and Grubbs, and when chiral Lewis acids, such as those derived from BINOL, TADDOL, diaminocyclohexane or semi-corrins were already “on the market”.

An almost explosive increase of worldwide activities in the field of stereoselective reactions (“asymmetric synthesis”), especially of catalytic enantioselective transformations, has, however, set in only within the last ten years. A look at any issue of any journal in which organic chemistry results are published is striking evidence for the fact that the center of attention has indeed become enantioselective catalysis by transition-metal complexes (organometallic catalysis), by organic acids or bases/nucleophiles (“organocatalysis”), and by enzymes (biocatalysis). These are exactly the topics of this book with the demanding title “Asymmetric Synthesis – The Essentials”, edited by Christmann and Bräse.

The book is unique, mainly for the following two reasons.

1. It is based on a novel concept, containing more than 50 essay-type contributions, of ca. five pages each, covering essentially all current research in the area of stereoselective synthesis. After the title of the essay a general background is given, followed by a description of the type of reaction with illustrative examples, a conclusion with perspectives, a *curriculum vitae* of the main author, and a list of leading references.

2. The editors must be congratulated for having been able to persuade an illustrious group of essentially all the major players in the field of stereoselective

synthesis from around the world to act as authors, and to submit collectively their contributions. Surprisingly, there is hardly any overlap between the various essays. It looks to me as if this endeavor must have involved periods of truly Sisyphean efforts by the editors?

The book is a flashlight picture of the state of the art in the field of preparation of enantioenriched compounds. The emphasis is on catalytic processes leading to one of two enantiomers preferentially, directly from achiral precursors. There are some contributions, in which the use of a stoichiometric amount of a chiral additive is described (cf. sparteine in Hoppe's work). Diastereoselective transformations for the preparation of enantiopure products (stoichiometrically employed chiral reagents, and the auxiliary approach) are the subject of only a few contributions (cf. Meyers, Evans, Enders, Hoffmann, Kunz, Davis, de Meijere). Chapters by giants in the field of total synthesis of complex natural products (cf. Danishefsky, Nicolaou, Paterson) remind us that, depending upon the degree of linearity, only a few enantioselective steps are involved in such multistep syntheses, while the major task consists of series of functional-group-selective (including protection/deprotection), regioselective and diastereoselective transformations.

There could hardly be more variety of topics, not only in view of the types of reactions dealt with. There are totally practical sections describing just what can be done, and there are more mechanistic essays (cf. non-linear effects by Kagan or autocatalysis by Soai). The techniques covered or mentioned range from immobilization of reagents and catalysts, entire syntheses carried out on solid phase, combinatorial methods, photochemical processes, automated, high-throughput screening of enantiomer ratios, and reactions carried out in water.

With so many authors involved, it is not astonishing that the chemical language, and especially the "language of stereochemistry", in this book is not uniform. There are few contributions, in which "stereochemistry" is used instead of "configuration", in which *re/si* is used instead of *Re/Si* as topicity descriptor [2], or in which 100% yield or *ee* [3] is claimed (every analytical method has a limit of detection!) [4]. This will, however not at all detract from the enormous merits deserved by the editors and authors for having achieved this work, nor will it diminish the great value of the book as an up-to-date overview of the field of stereoselective reactions in Organic Chemistry. Both, experienced researchers and novices will profit by learning from this collection of concise essays about the state of the art and future prospects of the many exciting developments in the center of today's synthetic organic methodology.

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1. D. Seebach, *Angew. Chem.* **1990**, *102*, 1363; *Angew. Chem. Int. Ed.* **1990**, *29*, 1320.
2. V. Prelog, G. Helmchen, *Angew. Chem.* **1982**, *94*, 614; *Angew. Chem. Int. Ed.* **1982**, *21*, 567; D. Seebach, V. Prelog, *Angew. Chem.* **1982**, *94*, 696; *Angew. Chem. Int. Ed.* **1982**, *21*, 654.
3. I belong to the advocates for the abolishment of the outdated term %ee, see: R. E. Gawley, *J. Org. Chem.* **2006**, *71*, 2411.
4. See (a) the glossary in: E. L. Eliel, S. H. Wilen, *Stereochemistry of Organic Compounds*, Wiley, New York, **1994**, pp. 1191–1210; (b) G. Helmchen, The Glossary of Problematic Terms, in Houben-Weyl, *Methods of Organic Chemistry, Stereoselective Synthesis*, Workbench Edition, Vol. E 21a, Part A 1., General Aspects, Nomenclature and Vocabulary of Organic Stereochemistry, G. Helmchen, R. W. Hoffmann, J. Mulzer et al. (Eds.), G. Thieme Verlag 1996; (c) G. Quinkert, E. Egert, C. Griesinger, *Aspects of Organic Chemistry*, Ch. 10, Wiley-VCH and Verlag Helv. Chim. Acta, 1996.