

Book Reviews

Stereoselective Synthesis. By R. S. Atkinson, Wiley: New York, 1995, 529 pp, paperback. £ 29.95. ISBN 0-471-95419-5.

This monography is broad in scope, highly didactic, and gives a new classification of stereoselective syntheses. The book is written in a clear style; it is informative and may well become one of the classics in stereochemistry, both to senior undergraduates and to graduate students who have to cope with the making of 3-D molecules. Perspective views of molecular stereostructure and of three-dimensional reaction mechanisms, are of utmost importance. By and large these diagrams are clearly sketched, thanks to the use of some modern software programs. In some instances though the scale reduction process - by the printer - leads to blurred back-bonds. Take for example page 101 (Scheme 36 and Scheme 37) are excellent three-dimensional representations, whereas on page 100 (Scheme 34) some of the bonds pointing to the rear side are blurred.

After having defined the usual stereochemical vocabulary, the author describes a new classification of stereochemical reactions which may be of some use to the scientific community, when it comes to a systematic analysis of such three-dimensional chemical processes. *Type 0* reactions are defined as those molecular transformations in which no new chiral centres are created; for example when an enantiopure compound undergoes a chemical transformation without any modification taking place at the asymmetric centre(s). *Type 0* reactions are of particular interest when it comes to the preparation of so-called "second-rank" enantiopure starting materials from the (few) available compounds of the chiral pool.

Two chapters are devoted to *Type I* reactions, namely to those molecular transformations which proceed with either inversion or with retention of configuration at a single chiral centre, with a particular emphasis on Mitsunobu reactions and nucleophilic attack of allylpalladium complexes. *Type I* reactions comprise also simple chirality transfer processes, i.e. those in which a single chiral centre is transferred with concomitant migration of one or more double bonds (one being configured). S_N2' reactions, [2,3] and [3,3] sigmatropic rearrangements are discussed along these lines, including the Ireland-Claisen and the oxy-Cope modifications.

In the next three chapters the author is dealing with *Type II* reactions i.e. with those which involve the diastereoselective formation of a product containing at least two chiral centres from the reaction of one or more prochiral double bonds contained in one or more achiral starting materials using achiral reagents. These reactions include many (usually concerted and FMO-symmetry-controlled) cycloadditions, electrocyclic reactions and sigmatropic rearrangements; also two-step additions to double bonds in which two chiral centres are created. By and large the above cited reaction types are inherently diastereoselective, whereas photoinduced $[2\pi+2\pi]$ cycloadditions are only occasionally diastereoselective. Diastereoselectivity of *Type II* aldol reactions is explained in one of the chapters, in most cases in terms of chairconformed closed transition states the examples cited being well chosen. It is worth mentioning that these [3,3]-sigmatropic-like mechanisms are represented with well drawn perspective views.

In the second half of this book Atkinson addresses *Type III* addition reactions to prochiral double bonds, i.e. asymmetric synthesis - in no less than 8 chapters - a topic of foremost importance indeed. Three *Type III* sub-categories are considered by the author: i) those in which the parent chiral centre(s) and the prochiral double bond undergoing addition are contained within the same molecule; in this case the resulting diastereoselectivity is often described as substrate-controlled and is referred to as *Type III_{s.c.}*; ii) those in which the existing chiral centre(s) in the reagent and the prochiral double bond undergoing addition are in different molecules; the resulting diastereoselectivity is described as reagent-controlled and is referred to as *Type III_{r.c.}*; iii) those in which the substrate contains one or more chiral centres and a prochiral double bond undergoing addition and the reagent also contains one or more chiral centres; these involve double asymmetric induction and are referred to as *Type III_{s.c./r.c.}*. Reactions which involve *Type III* reactions other than addition to prochiral double bonds are usually enzyme catalysed. Thanks to this novel classification of stereoselective reactions, the author was able to discuss a large array of asymmetric syntheses, without omitting to define special molecular effects like A-1,3 and A-1,2 strain. Within his ordering nomenclature he draws the attention of the reader to the importance of stereoelectronic effects, of conformation control, of chelate control

(for example in 1,3-asymmetric induced addition to carbonyl groups), of intramolecular delivery and diastereoface selection from covalently bound reagents, of preliminary complexation in some *Type III_{r,c}* asymmetric syntheses, etc... One chapter is devoted to catalytic enantioselective reactions (*Type III_{cat.enant.}*) and deals, not surprisingly, with Sharpless-Katsuki epoxidations, with enantioselective reduction of ketones thanks to Corey's chiral oxaborolidine robot and BH₃, with enantioselective hydrogenation of ketones using Noyori's catalysts and gives many more examples which belong to the classics of modern time asymmetric technology. This monography gives a large coverage of modern stereoselective syntheses, with a particular emphasis on both stoichiometric and catalytic asymmetric syntheses. Three-dimensional reaction mechanisms are discussed in a didactic way; by and large, they are represented with well drawn diagrams. Atkinson's book should be strongly recommended to graduate students and to post-doctoral fellows who cope with stereostructures and with organic synthesis in three dimension.

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Dictionary of Organic Compounds on CD-ROM. Edited by J. I. G. Cadogen, S. V. Ley, G. Pattenden, R. A. Raphael, C. W. Rees. Chapman & Hall: London, 1996, Version 4:1, £ 3,500. ISSN 0967-6686.

Dictionary of Organic Compounds has come a long way since its first published edition in 1934. It has proved to be a very useful and popular tool for many scientists. Due to the ever-expanding numbers of organic compounds described in the literature, such a tool on CD-ROM is an essential part of the information services available to modern science.

Dictionary of Organic Compounds on CD-ROM contains all compounds and information included in the Dictionary of Organic Compounds, now in its sixth edition (with supplements), Dictionary of Organophosphorus Compounds and some other publications. As with previous editions of Dictionary of Organic Compounds, the sixth edition is very

thorough (for example, for taxol, 42 references are cited including the 1995 Nicolaou synthesis) and Dictionary of Organic Compounds on CD-ROM contains information on over 190,000 organic compounds. Dictionary of Organic Compounds on CD-ROM is very easy to use, allowing you to access, via the plethora of functions available to you, a vast array of information on organic compounds. There are many ways to find information, including structure/substructure search (the drawing application is very simple to manipulate with many variables to customize your compound search) and indexes of compound name, physical properties (e.g. mp/bp), key literature citations, CAS Registry Numbers, etc. Few details or tools are overlooked and user-friendly devices such as speech bubbles allow even an inexperienced user to explore possibilities within each search mode. Two instruction manuals are included; a user manual and a quick reference guide. The user manual details sample guided searches for new users which describes how to search step-by-step search queries. They are easy to follow and highlight many of the program's capabilities. The more experienced user, however, is also very much catered for, with respect towards being able to customize keyboard shortcuts for repetitious complex search routines and eliminate unnecessary frills to accelerate operating time. The attention to detail can be highlighted by the incorporation of a fully functional periodic table in the structure search mode, where full physical data of an element can be accessed. The CD-ROM is updated, and a new version sent to replace the old one, every six months, without incurring extra cost other than the initial outlay. Dictionary of Organic Compounds on CD-ROM contains information on many of the more common natural products. However, its companion, the Dictionary of Natural Products on CD-ROM contains a more comprehensive coverage of *all* natural products. As for criticism, I would prefer to be able to scroll up and down the text list as well as be able to use the index stem in the text search mode, but such a minor point in no way reflects upon such an outstanding and invaluable information tool. A must for Organic chemists.

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