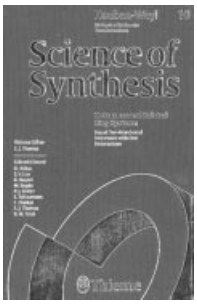
Ringing the Changes

Science of Synthesis, Houben-Weyl Methods of Molecular Transformations. Vol. 10. Fused Five-Membered Hetarenes with one Heteroatom. Edited by *E. Jim Thomas*. Georg Thieme Verlag, Stuttgart 2000. 916 pp., hardcover € 1599.00).—ISBN 3-13-112241-2

During the 92 years of its existence Houben–Weyl has become a revered monumental institution of German organic chemistry. The vast wealth of information collected together in these volumes is truly impressive. It is gathered not only from the literature but usually also from the practical experience of the authors. Occasionally that has given the volumes an aftertaste of I. G. Farbenindustrie, with an overemphasis on industrially oriented methods. In contrast, some aspects, such as modern stereochemistry, tended to be somewhat neglected for a long time. It was not until 1995, with the publication of the supplementary volumes E21a–f on stereoselective synthesis, that stereochemistry was given the attention that it deserved. The philosophy that the experimental organic chemist should need no other book (i.e., Houben–Weyl replaces the library, so that one does not need to leave the workbench!) has been the editors' ambitious guiding principle throughout. However, with regard to user-friendliness things were different: it was never exactly easy to find a specific item of information, partly because a consistent structure was never established. In accordance with the work's original subtitle "Methoden der Organischen Chemie", the arrangement of subject matter began with general methods (oxidation, reduction, photochemistry, etc.), but suddenly between these, for no clear reason, there appeared "Carbocyclic Three-Ring Compounds, Isocyclic Four-Ring Compounds". Then in a motley succession, without any recognizable sequence, came the compound classes (e.g., isatins, ketenes, peroxides, sulfur compounds, in that order). The volume "Hydrocarbons III" raised its monolithic shape, and is still waiting expectantly for its brothers I and II. Things become even more erratic with the supplementary volumes, where suddenly we find unstable intermediates such as carbenoids and carbanions treated as compound classes. It was always a serious shortcoming that large and important parts of the overall work lagged far behind the current state of knowledge in their content; for example, the most recent treatment of aldehydes was in 1983, and of ketones as long ago as 1977. The attempt to bring the series up to date by issuing a bewildering array of supplementary volumes achieved only patchy improvements. It made the out-of-date volumes even more noticeable, and the price for the complete work rose to an astronomical figure. For many years the fact that it was in the German language considerably hindered its international distribution, and potential English-speaking users also frequently complained about the lack of subject and author indexes. The latter shortcoming was remedied from November 2000 onwards. The result of that herculean task was the publication of about 20 (!) index volumes, so heavy that using them is a sort of fitness training. In this latest phase Houben–Weyl seems more than ever like an overgrown organism that is being crushed under its own weight.



Thus, it was time for a fresh start. The handsomely produced *Guidebook* that appeared in 2000 states "Thieme Publishers have seen the need to relaunch the Houben Weyl series in a new very accessible and focused format called Science of Synthesis". The exclusive use of English is in itself an indication that something new is now happening, and that the dust of the past and the taint of I. G. Farben are to be shaken off. A top-class international editorial team has been put to work, and will aim at a worldwide market. Is this a case of putting old wine in new bottles, or are we witnessing a historic new beginning? The series title *Science of Synthesis* tells us nothing, and does not strike one as a happy choice ("SOS"!). Would not "Handbook of Preparative Organic Methods" have been more appropriate? The *Guidebook* also indicates how the relentless flood of information is to be handled better in the future: the first (highest) level of subdivision is called "category" (presumably to be understood as compound class in the broadest sense, as Category 1 is organometallics and Category 2 is hetarins). But then confusion reappears, since Category 3 is not a compound class in the true sense, but the result of certain types of bond formation (thus, for example, compounds with four or three carbon–heteroatom bonds (C–X compounds), with four carbon–heteroatom bonds (e.g., CO_2), and with three carbon–heteroatom bonds (nitriles, etc.)). This type of classification has been tried before, not very successfully, in the well-intentioned Pergamon Press opus *Comprehensive Functional Group Transformations*, and now we see it being revived unnecessarily here.

The publishers' program is very ambitious. *Science of Synthesis* will consist of

This section contains book reviews and a list of new books received by the editor. Book reviews are written by invitation from the editor. Suggestions for books to be reviewed and for book reviewers are welcome. Publishers should send brochures or (better) books to the Redaktion Angewandte Chemie, Postfach 101161, 69451 Weinheim, Germany. The editor reserves the right of selecting which books will be reviewed. Uninvited books not chosen for reviews will not be returned.

48 volumes altogether, which are to be published by 2007. Nine volumes will appear in the period 2000 – 2001. Those that already exist are Volume 9 (*Fully Unsaturated Small Ring Heterocycles and Monocyclic Five-Membered Hetarenes with One Heteroatom*) and the present Volume 10 (*Fused Five-Membered Hetarenes with One Heteroatom*). Volume 10 uses the familiar hierarchical Houben – Weyl system of arranging the contents. The highest level of subdivision is the compound class; for example, 10.1 covers benzofurans, and 10.13 covers indoles. The next level is defined by the method of synthesis. Thus we have 10.13.1, indoles synthesized by ring closure, followed by 10.13.2, indoles synthesized by ring transformations; 10.13.3 … by aromatization; 10.13.4 … by substitution of existing substituents; 10. 13.5 … by substituent modification. The next levels comprise the individual methods and their variants, extending down to a ninth level. For example, 10.13.1.1.1.1.1.1 is the Fischer method for synthesizing indoles, and 10.13.1.1.1.1.1.1.1 is variant number 1 of that (Granberg's tryptamine synthesis).

As a test of how quickly the desired information can be found, I chose to search for a method to synthesize 4-bromoindole, regioselectively if possible. The compound is not listed in the index, so I had no alternative but to scan through the text to find it. Of the four main routes 10.13.1 to 10.13.4, I chose 10.13.1 because more possibilities were given there than elsewhere. Fischer indole syntheses and their variants were rejected because of insufficient regioselectivity, so the only possibility was more leafing through pages and reading. Just as I was about to give up exhausted, quite by chance I came across the desired structural formula on page 424, under "Leimgruber – Batcho Synthesis" (with a 1986 literature reference). If I had spent the same amount of time with the PC using *Beilstein Crossfire* or *Scifinder*, it would certainly have yielded many recent literature references, with also much more information concerning derivatives. Therefore, if *Science of Synthesis* is to offer rapid access to information about synthetic routes, the publishers need to choose a completely different system for arranging the material based on specific substitution patterns (e.g., for indoles, 3-monosubstitution, 2,4-disubstitution, etc.) as the highest level of subdivision, listing under these the best methods of synthesis. In the present form the process of searching is far from straightforward. Nevertheless, the work is a superb, and in many respects exhaustive, compilation of synthetic methods for specific heterocyclic compound classes. The laboratory procedures that were such a highly valued and praised feature of the old Houben – Weyl have been retained, so that one gains an immediate impression of the amount of work involved in each suggested method and its practicability.

So what is new here compared with the old Houben – Weyl, and what has been improved? Certainly the subject and author indexes are an innovation and an improvement, even though the former is not as useful as it might be. The work remains unrivaled in the high quality of the contents and the standard of production.

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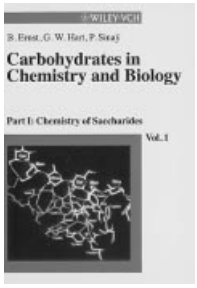
Carbohydrates in Chemistry and Biology. Vol. 1 – 4. By *Beat Ernst, Gerald W. Hart* and *Pierre Sinaÿ*. Wiley-VCH, Weinheim 2000. 2340 pp., 949 figs., 111 tabs., hardcover € 849.00.—ISBN 3-527-29511-9

Volumes 1 and 2 cover the chemical synthesis of glycosides and glycomimetics, the enzymatic synthesis of glycosides, and the investigation of carbohydrate-receptor interactions by biophysical techniques. By recruiting leading scientists in the field, the editors succeed in covering the latest developments in the fields of carbohydrate synthesis and the area of investigations of carbohydrate-receptor interactions by biophysical methods. For instance, the contribution of Schmidt and Jung about trichloroacetimidates will be a valuable tool not only for the specialist but also for every synthetic chemist who wishes to enter the field of carbohydrate synthesis. Also, the first volume contains contributions that have a high educational value and are suitable for students entering the field. For example, the chapter written by Mallet and Sinaÿ entitled: "Classics and Total Synthesis of Oligosaccharides and Glycoconjugates" gives a rather compact overview and a genuine understanding of important strategies that have been employed in the past decades to synthesize biologically active oligosaccharides and glycoconjugates. The second volume addresses in depth the enzymatic synthesis of glycosides. Basically, all important strategies for making saccharides by using glycosyltransferases are covered. The second volume concludes with an extended contribution covering the most important biophysical techniques to investigate carbohydrates and their interaction with protein receptors. The main tools to analyze carbohydrate structures, NMR, MALDI-TOF, and surface plasmon resonance (Biacore) are discussed by several authors, all experts in their fields. The corresponding chapters contain valuable references to further specialize on a distinct topic. To summarize, these two volumes are a valuable addition to each laboratory's book shelf.



Volumes 3 covers the current knowledge of glycosyltransferases and glycosidases of mammalian cells, plants, yeasts, and microbes as well as the biosynthesis of precursors and nucleotide-sugars and represents a valuable handbook for both chemists and biologists in the glycoscience area. The editors have invited numerous outstanding scientists to provide a comprehensive overview of recent advances in glycoscience. The collection of articles in volume 4 reviews the functional significance of free saccharides and protein- or lipid-linked saccharides in cell-cell interaction in development and disease and covers in depth the current state of knowledge of oligosacharide interaction with lectins and other carbohydrate binding receptors.

Volumes 3 and 4 of "Carbohydrates in Chemistry and Biology " address a broad readership who requires solid background and therefore these volumes are not suited for teaching glycoscience to readers outside the field. For nonexperts it is difficult to use the index, and

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