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Book review

Best synthetic methods: carbohydrates, Edited by Helen M. I. Osborn (University of Reading), Series Editor Laurence M. Harwood (University of Reading), Academic Press, An Imprint of Elsevier Science Ltd: Amsterdam–Boston–London–New York–Oxford–Paris–San Diego–San Francisco–Sydney–Tokyo, 2003. ISBN 0-12-312085-3; 430 pp.; EUR 145; US$ 145.

Recent appreciation of the importance of the involvement of carbohydrates in a variety of vital biological processes has resulted in an explosive growth of the fields of glycobiology and glycochemistry. As a result, the very specialized and fairly narrow area of carbohydrate chemistry has expanded into a multidisciplinary area of research called glycoscience. Glycoscience includes all aspects of isolation, synthesis, structural studies, biological investigations, and therapeutic applications of sugar molecules. This has been reflected in recent publication trends. While in the 1970s or 1980s, a single monograph could describe major achievements in the area, nowadays, a series of volumes is required to cover major aspects of this subject. Two recent book series spring to mind in this regard: *Carbohydrates in Chemistry and Biology*; Ernst, B., Hart, G. W., Sinaÿ, P., Eds.; Wiley–VCH: Weinheim, New York, 2000 and *Glycoscience: Chemistry and Chemical Biology*; Fraser-Reid, B., Tatsuta, K., Thiem, J., Eds.; Springer: Berlin–Heidelberg–New York, 2001.

This volume, edited by Osborn, is a part of the series, Best Synthetic Methods, edited by Laurence M. Harwood. Therefore, the scope of this work appears to be clear: to summarize recent advances and the most reliable and common procedures for the convergent synthesis of carbohydrates. Almost all chapters contain thorough experimental procedures, detailed descriptions of equipment, and lists of hazardous materials used. Since carbohydrate chemistry is a very broad field, the title of this book, 'Carbohydrates', might be somewhat misleading as this book is all about glycosylation. If one needs to synthesize a disaccharide, this book will guide them through the procedures required for the synthesis of the glycosyl donor and glycosyl acceptor, as well as provide a number of options for their coupling. The experimental procedures and the related information are as thorough as those required for the undergraduate organic laboratory. However, those looking for a monograph that would give a more conventional source of protocols for monosaccharides, or thorough background information on comparative reactivity, reagent choice, the anomeric effect, nomenclature, conformations, etc. will be disappointed.

The book consists of 12 chapters, which can be divided into four major sections. The first section of the book, Chapters 1 and 2, discusses the importance and general aspects of the glycosylation reaction. Also, methods used for selective protecting-group manipulations with the emphasis on the preparation of glycosyl acceptors are discussed here. In the second section, Chapters 3–5, the synthesis and activation (glycosidation) of various glycosyl donors is described. Both traditional glycosyl donors, such as halides, acetates, thioglycosides, trichloroacetimidates, and less common derivatives, such as pentenyl and vinyl glycosides, glycals, selenides, and sulfoxides are covered here. The third section, Chapters 6 and 7, deals with modern strategies for convergent oligosaccharide synthesis. Such pioneering concepts as the armed–disarmed approach and the orthogonal glycosylation strategy are described here. No experimental procedures are included in these two chapters, and perhaps are unnecessary since a survey of glycosylation methods appears earlier in the book. Indeed, reactivity tuning and convergent multistep syntheses are still far from being generally applicable. These strategies have to be elaborated individually for each particular synthetic target. The fourth part of the book, Chapters 8–12, addresses special cases of glycosylation reactions. Among these, the methods for construction of the elusive β-mannosidic linkage—one of the most well-preserved mysteries of synthetic carbohydrate chemistry—synthesis of α-sialosides, N- and O-linked glycosyl amino acids and glycopeptides, C-glycosides, and enzymatic methods with the use of glycosidases and glycosyltransferases are described.

The book certainly belongs in every laboratory dealing with oligosaccharide synthesis. While the critical reader might also long for information on redox processes, inversion of configuration, and chain elongation,

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undoubtedly, this monograph is a very useful source of practical methods used for the preparation of carbohydrate building blocks and construction of the glycosidic bond. I expect that the book edited by Osborn will become an excellent and timely addition to the bookshelf that already features a comprehensive collection of *Methods in Carbohydrate Chemistry*, edited by Whistler and Wolfrom/BeMiller of the 1960s and 1970s, and *Preparative Carbohydrate Chemistry*, edited by Hanessian (1997). Virtually every researcher, ranging from a senior postdoctoral fellow to a very inexperienced undergraduate student just starting to learn this exciting area of organic chemistry, will find a wealth of useful and readily accessible material. The book is highly recommended.

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