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BOOK REVIEW

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Review of Carbohydrate Chemistry and Biochemistry

Carbohydrate Chemistry and Biochemistry. By Michael Sinnott (University of Huddersfield). RSC Publishing: Cambridge, U.K. 2007. xviii + 748 pp. $199.00. ISBN 978-0-85404-256-2.

Research in the field of carbohydrate chemistry and biochemistry has experienced a remarkable surge in recent years. Almost daily revelations add to the myriad roles that cell surface and intracellular carbohydrates play in critical pathways in both normal and diseased states. This book is a comprehensive treatise intended to serve as an advanced undergraduate or graduate text for the uninitiated. There are many positive aspects of this book and a few shortcomings, but if one can overlook the latter, it should merit a place on the bookshelf of most glycoscientists.

The book is divided into only seven chapters; thus, some do run on a bit, but the coverage of the subject matter is quite thorough. Topics include basic structure and nomenclature of both monosaccharides (Chapter 1) and polysaccharides (Chapter 4), conformational analysis (Chapter 2), anomeric chemistry (Chapter 3), enzymatic glycosyl transfer (Chapter 5), non-anomeric sugar chemistry (Chapter 6), and radical reactions of carbohydrates (Chapter 7). In Chapter 1, the groundwork is set by descriptions of open-chain carbohydrate forms, followed by a comprehensive treatment of mutarotation. It is curious that this latter topic is covered in such detail, as can be said for other subtopics throughout the book. Although the chapter title is about "...Open Chain Forms of Carbohydrates", there is also a discussion of cyclitols that concludes the chapter. Next is conformational analysis, where the author does a good job of addressing the gauche and anomeric effects and describing different puckering forms of pyranoses and furanoses. Chapter 3 covers nucleophilic substitution at the anomeric center, focusing on hydrolysis, solvolysis, and glycoside synthesis reactions.

The remaining 600+ pages comprise the four remaining chapters. In Chapter 4, a comprehensive treatment of oligosaccharide structure is tackled, with many polysaccharide conformations described in detail. The author spends several pages describing the techniques involved in analyzing structure (NMR, X-ray, microscopy, MS), which is admirable, but perhaps a bit misplaced in this volume. In Chapter 5, the author does a brilliant job on enzyme glycosyl transfer, with most modes of transferases and glycosyl hydrolases covered in some detail. Next is a somewhat inconsistent chapter on "Heterolytic Chemistry Other than Nucleophilic Attack at the Anomeric or Carbonyl Center", where rearrangements, including classical chemistry such as the Amadori and Maillard reactions, are covered. There is so much to cover under this subject heading that the chapter seems to ramble between various reactions of carbohydrates, both chemical and enzymatic in nature (it is odd that the running title on alternate chapter pages is "Non-Anomeric Two Electron Chemistry", nothing like the actual chapter title). The book concludes with one-electron chemistry of carbohydrates, where a good deal of the chapter deals with enzymatic reactions on carbohydrates that are initiated by one-electron transfers. Some typical radical reactions such as the Barton−McCombie deoxygenation and radical reactions at the anomeric center are also introduced, but many synthetically useful reactions are neglected.

The book seems a bit uneven, as alluded to above; it could have been divided into several more chapters that focused on specific aspects of the last four headings to add better organization. Some figures and chemical structures are erroneous; so, a bit more proofing also would have been helpful. The author spends excessive text on techniques, such as why Fourier transform is important in NMR, and details on wavelengths and diffraction theory for X-ray crystallography, details that could have been left to a few key references. This would have allowed more discussion on protein−carbohydrate interactions and their importance in biology, a topic that was deliberately omitted due to the difficulty of measuring these weak interactions (stated in the Preface)—all the more reason to discuss them! A minor, but nonetheless rather disturbing feature is that the book is tinged with the author's personal feelings on topics such as Intelligent Design and Microsoft; these have no place in a textbook.

Despite these negatives, the overall view of the text is favorable, since it covers so many varied topics, some perhaps unfamiliar to even the most seasoned glycoscientist. As a physical organic text, it would be a welcome reference for those seeking to learn about carbohydrate science, as well as for those practicing it. If one can look past the perceived shortcomings, this book can be very useful to a large group of researchers.

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