

Preface

Carbohydrates are one of the three most important components of living cells (the other two being amino acids and lipids). In order to understand their biochemical behavior one must understand steric and electronic factors that control their reactivity and chemistry. Two properties of carbohydrates that are most important for their chemical behavior are their shape (conformation) and stereoelectronic interactions that are unique and characteristic for each carbohydrate structure.

So chapters on anomeric effect, a very important electronic effect first discovered in studies of carbohydrates and later found to be of general importance in many other organic molecules, glycosidic bond hydrolysis, isomerization of free carbohydrates in aqueous solution, relative reactivity of hydroxyl groups in a carbohydrate molecule, nucleophilic displacement with or without change of the configuration at the reacting carbon atom, addition of nucleophiles to glycopyranosiduloses, etc., are all to a various extent related to stereoelectronic effects that exist in carbohydrate structures.

Cyclic acetals and ketals and anhydrosugars are both very important intermediates in synthetic carbohydrate chemistry, first being used for protection of hydroxyl groups that are not supposed to take part in further chemical transformation of the intermediate and second being used as synthetic intermediates in carbohydrate chemistry because they can serve as starting materials for the synthesis of many different carbohydrate derivatives, for example, the amino sugars, the branched chain sugars, oligosaccharides. The amino sugars, being important components of many biomolecules such as glycosaminoglycans, heparin, chondroitin as well as many natural products, such as sugar-based antibiotics, macrolide antibiotics, are discussed in a separate chapter.

The last three chapters of the book deal with topics not usually found in carbohydrate chemistry texts like this one, although according to the author's opinion they are very important and they are unjustly neglected. These are carbohydrate-based antibiotics, synthesis of polychiral natural products from carbohydrates, and chemistry of higher-carbon carbohydrates.

Much attention has been paid to the mechanisms of various carbohydrate reactions as well as to the role of stereoelectronic effects that they play in the reactivity of carbohydrates and the stereochemical outcome of various carbohydrate reactions.

In the end, I wish to express my deep gratitude to Professor Pierre Deslongchamps for taking time to read the entire book and provide me with invaluable comments and critique. I would also like to thank my wife, Irina Miljković, for her patience and understanding throughout my scientific life.

Carbohydrates

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