Preface

This book is intended as a text for students, not as a monograph for researchers. It is written for an audience of advanced undergraduates and graduate students who want a deeper understanding of the chemical reactions that take place in living organisms. We assume that readers have a background in organic chemistry at the level of the typical two-semester college course, and we attempt to provide an accurate treatment of major biochemical pathways from the perspective of mechanistic organic chemistry. Although enzymes are crucial to biological reactions, our focus always remains on the reactivity patterns of the substrate molecules and on the organic, arrow-pushing details of the individual reactions.

With the emphasis in biochemical research now focused primarily at the molecular level, with enzyme crystal structures now obtained routinely, and with enzyme–substrate interactions now visualized easily using readily available computer programs, today's students have a unique opportunity to understand the chemical logic of living systems. Our goal is to provide that understanding by showing how the reactions that take place in living organisms follow the same rules of chemical reactivity and occur by the same chemical mechanisms as reactions that take place in the laboratory. Biochemical transformations are not mysterious; there are logical and understandable reasons why they take place as they do. Biochemical reactions usually occur with more specificity and control than analogous laboratory reactions, but the principles behind all reactions are the same.

We begin this book with a brief review chapter on the fundamental organic reaction mechanisms commonly found in biochemical pathways. Following this brush up on reaction mechanisms is a general introduction to the main classes of biomolecules. Then comes the heart of the book: full chapters devoted to the major metabolic pathways of the main classes of biomolecules—lipids, carbohydrates, proteins, nucleotides, and secondary metabolites. In the course of these chapters, we cover the chemistry of the common coenzymes, see examples of the common sorts of biological transformations, and ultimately begin to develop an understanding of the patterns found throughout bioorganic chemistry. We conclude with a summary of the reaction patterns and mechanisms frequently used in nature to effect chemical transformations,

followed by a brief chapter summarizing some general themes of enzymatic catalysis. All mechanisms have been updated in this second edition, and several hundred references to recent literature are given for those students who want more detail.

Good luck in your studies. We have enjoyed writing this book, and we hope that after reading it you come to a deeper appreciation and understanding of the beautiful and intriguing chemistry that takes place in living organisms.

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