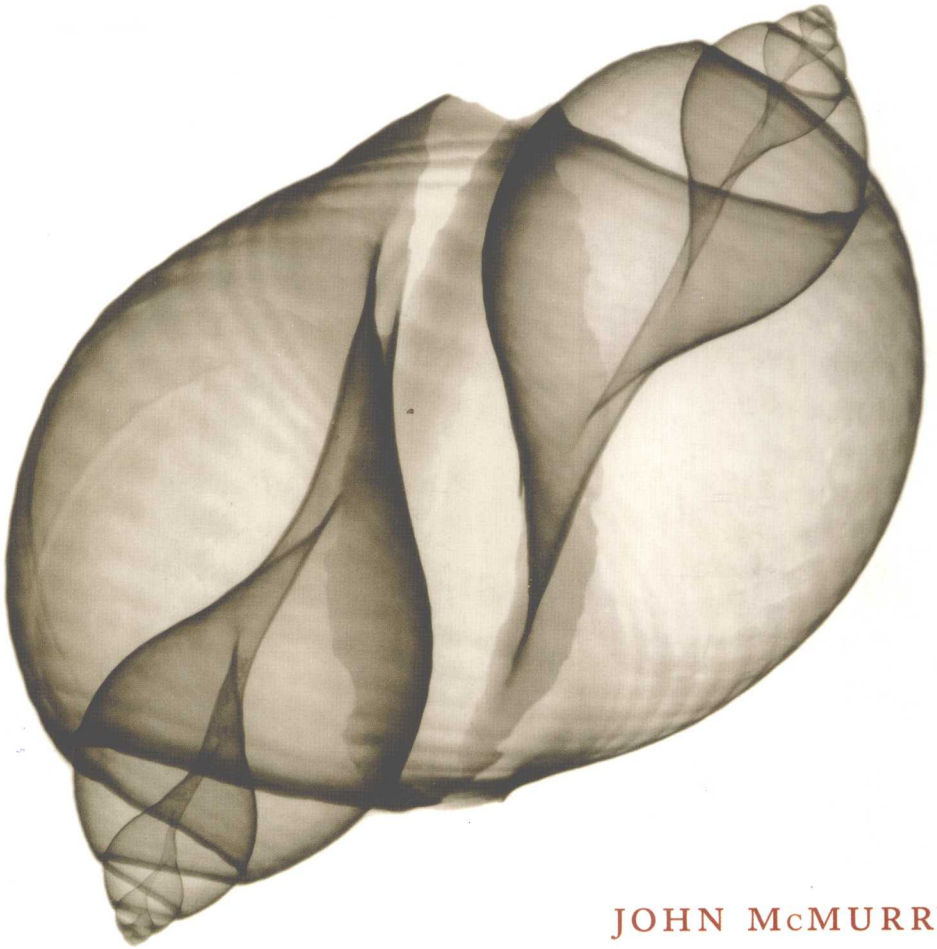
INTERNATIONAL STUDENT EDITION

Organic Chemistry

A BIOLOGICAL APPROACH



JOHN McMURRY

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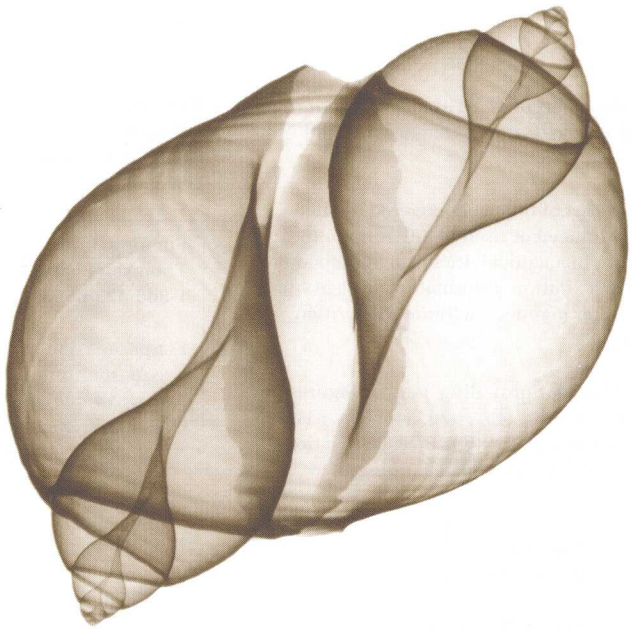

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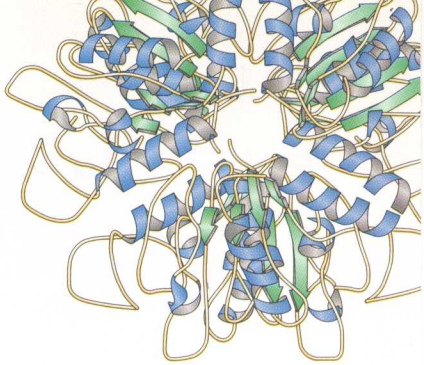
Preface



Introduction

I've taught organic chemistry many times over many years, and it has often struck me what a disconnect there is between the interests and expectations of me, the teacher, and the interests and expectations of those being taught, my students. I love the logic and beauty of organic chemistry, and I want to pass that feeling on to others. My students, however, seem to worry primarily about getting into medical school. Yes, of course that's a simplification, but there is truth in it. All of us who teach organic chemistry know that a large majority of students in our courses—perhaps 80% or more, and including many chemistry majors—are interested primarily in the life sciences.

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But if we are teaching future biologists, biochemists, physicians, and others in the life sciences, why do we continue to teach the way we do? Why do we spend so much time discussing the details of reactions that are of interest to research chemists but have no connection to the biological sciences? Wouldn't the limited amount of time we have be better spent paying more attention to the organic chemistry of living organisms and less to the organic chemistry of the research laboratory? I believe so, and I have written this book, *Organic Chemistry: A Biological Approach,* to encourage others who might also be thinking that the time has come to try something new.

Organization

Make no mistake, this is still a textbook on Organic Chemistry, but the guiding principle in deciding what to include and what to leave out has been to focus on those organic reactions that have a direct counterpart in biological chemistry. When looking through the text, three distinct groups of chapters are apparent. The first group (Chapters 1–5, 9, 11, and 12) covers the traditional foundations of organic chemistry that are essential in building the background necessary for further understanding of the science. The second group (Chapters 6–8, 10, and 13–18) provides coverage of common laboratory reactions that have biological counterparts (of which there are many more than you might think). As each laboratory reaction is discussed, a biological example is also shown. The inclusion of these biological reactions makes the material much more relevant for students, who might, for example, be more

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interested in reading about trans fatty acids when they're learning about catalytic hydrogenation than when they're learning about lipids. The third group of chapters (19–24) is unique to this text. These chapters deal exclusively with the main classes of biomolecules—amino acids and proteins, carbohydrates, lipids, and nucleic acids—and show how deeply organic chemistry and biochemistry are intertwined. Following an introduction to each class, the major metabolic pathways for that class are discussed from the perspective of mechanistic organic chemistry. See, for example, Sections 20.2 to 20.5 on amino acid metabolism.

Content Choices

"Writing *Organic Chemistry: A Biological Approach* has been a wonderful learning experience for me. I hope that both you and your students will enjoy and benefit from this text, and I would be very interested in hearing your questions and opinions."
John McMurry

Many organic chemists might be surprised to find that such topics as carbene chemistry, acetylide alkylation, allylic bromination, and Diels–Alder reactions are not included in this text. The decision not to cover these topics was not taken lightly, but the space saved by leaving out some nonbiological reactions has been put to good use. Practically all reactions covered are immediately illustrated with biological examples, and approximately 25% of the book is devoted entirely to biomolecules and the organic chemistry of their biotransformations. Furthermore, the deletion of some nonbiological reactions has resulted in a shorter text that many professors will have time to cover in its entirety.

There is more than enough organic chemistry in this text. My hope is that the students we teach, including those who worry about medical school, will come to agree that there is also logic and beauty here.

Features

Reaction Mechanisms

"The innovative vertical presentation of reaction mechanisms that has been so well received in my other texts is retained in *Organic Chemistry: A Biological Approach.*"
John McMurry

The innovative vertical presentation of reaction mechanisms that has been so well received in my other texts is retained in *Organic Chemistry: A Biological Approach*. Mechanisms in this format have the reaction steps printed vertically while the changes taking place in each step are explained next to the reaction arrow. Students can see what is occurring at each step in a reaction without having to jump back and forth between structures and text.

Visualization

"I want students to see that the mechanisms of biological reactions are the same as those of laboratory organic reactions."
John McMurry

I want students to see that the mechanisms of biological reactions are the same as those of laboratory organic reactions. Toward this end, and to let students more easily visualize the changes occurring in large biomolecules, this book introduces an innovative method for focusing on the reactive parts in large molecules by ghosting the nonreacting parts. In addition, consistent color, with clearly labeled numbered steps, is used in mechanisms throughout the text to show the progress of the reactions more clearly.

More Features

- The reaction from students and colleagues to my previous texts has been very gratifying, and I have made every effort to keep the writing in this text as lucid and succinct as possible.

- Why do we have to learn this? I've been asked this question so many times by students that I thought that it would be appropriate to begin each chapter with the answer. *Why This Chapter?* is a short paragraph at the end of the introduction to every chapter that tells students why the material about to be covered is important and explains how the organic chemistry of each chapter relates to biochemistry.
- Worked Examples are titled to give students a frame of reference. Each Worked Example includes a Strategy and a worked-out Solution and is followed by Problems for students to try on their own.
- *Lagniappe* (a Creole word meaning "something extra") boxes at the end of each chapter are provided to relate real-world concepts to students' lives.
- The Visualizing Chemistry Problems that conclude each chapter offer students an opportunity to see chemistry in a different way by visualizing molecules rather than by simply interpreting structural formulas.
- Thorough media integration with Organic ChemistryNow™ and Organic OWL is provided to help students practice and test their knowledge of the concepts. The Organic ChemistryNow online assessment program is enhanced with biochemical coverage especially for biology and premed students. Icons throughout the book direct students to the Organic ChemistryNow website. An access code is required to enter Organic ChemistryNow. Visit **http://www.thomsonedu.com** to register.
- A number of the figures are animated in Organic ChemistryNow. These figures are designated as **Active** in the figure legends.
- Summaries and Key Word lists help students by outlining the key concepts of the chapter.
- Summaries of Reactions bring together the key reactions from the chapter in one complete list.
- An overview entitled "A Preview of Carbonyl Chemistry" follows Chapter 13 and highlights the idea that studying organic chemistry requires both summarizing and looking ahead.
- Current IUPAC nomenclature rules, as updated in 1993, are used to name compounds in this text.

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ORGANIC Chemistry Now™ To further student understanding, the text features sensible media integration through the **Organic ChemistryNow** website, a powerful online learning companion that helps students determine their unique

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The Organic Chemistry of Biological Pathways By John McMurry and Tadhg Begley. Intended for advanced undergraduates and graduate students in all areas of chemistry and biochemistry, *The Organic Chemistry of Biological Pathways* provides an accurate treatment of the major biochemical pathways from the perspective of mechanistic organic chemistry. Roberts and Company Publishers, ISBN: 0-9747077-1-6

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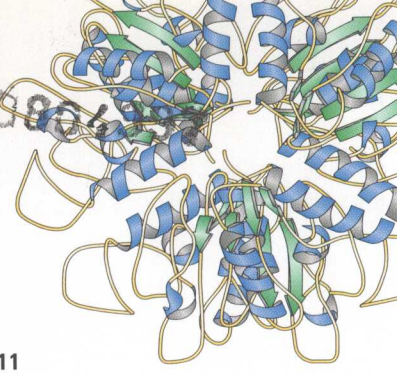
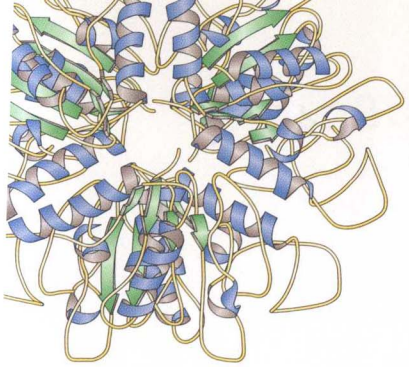
Brief Contents



*Chapter 25 is available as an Adobe Acrobat PDF file at http://www.thomsonedu.com

Key to Sequence of Topics (chapter numbers are color coded as follows):

- **Traditional foundations of organic chemistry**
- **Organic reactions and their biological counterparts**
- **The organic chemistry of biological molecules and pathways**



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