

Preface

Special demands are placed on texts designed for courses which include students who are not majoring in biology. For many, this will be their only encounter with the life sciences. Thus, the text, first and foremost, must capture and hold the interest of the student. Second, the text must adequately treat both the scope and the depth of modern biology. And third, the information must be presented in a context in which it will illuminate the students' lives by relating directly to the world they experience.

This text has grown out of our own experiences in teaching general biology, both at the majors and non-majors level. Our teaching has led us to keep these three basic principles in mind in writing this book. In our own classes we have seen textbooks fail, no matter how accurate and complete, because the students have not enjoyed reading them. We have tried throughout this book to offer stimulating examples and lively illustrations, simple yet complete explanations, and fundamental principles. We have neither written down to the student nor indulged in flights of fancy. We avoid superfluous terminology, which so often gives students the impression that biology consists of a list of terms to be memorized. Nevertheless, since an instructor cannot discuss important biological concepts unless the students have a working knowledge of the appropriate terms, these are defined *and used* throughout the text. And to give the students an intellectual framework for their expanding knowledge, we integrate the concepts of biology with everyday experiences, especially through essays and end-of-chapter reflections.

Features

Themes. We feel very strongly that student understanding is enhanced by having individual facts organized into logical, coherent themes whenever possible. A common flaw in many texts we have used is their tendency to describe numerous topics as if they were unrelated to one another, so that the separate chapters, and even sections within a single chapter, consist of a series of detached vignettes. We have made a determined effort to see that each of our chapters flows from unifying principles through factual

detail to a final conclusion. Equally important, we draw upon the individual text topics again and again, showing how each contributes to our understanding of biology as a whole.

Our text has been written especially with three themes in mind. One thread woven throughout the text is the theme of *adaptation to the environment*. Most topics, especially physiology, make the most sense when the student learns how the structures of an organism help it to thrive in its normal environment. This is the goal of Chapter 18, "Unifying Concepts in Physiology," and the reflections found at the end of most chapters. Introductory students, especially, want answers to that inevitable question, "So what?" The second organizing concept, *evolution*, is closely related to the first. Organisms are adapted to their environment because that environment places selective pressures upon them that help them to shape their evolutionary development. Third, we stress the *unity of biology* at all levels from molecules to ecosystems. Individual topics are placed in broad biological contexts that enhance their relevance and tie them to other subjects. For example, we do not allow the principles of molecular genetics to remain isolated from the rest of biology; instead we explicitly show how they help to explain the principles of inheritance discovered by Mendel and Morgan (Chapter 10).

Organization. One difficulty that must be faced early on in teaching biology, and even more so in writing a textbook, is that there is no correct sequence. Virtually every topic in biology benefits by having everything else precede it. Further, in an introductory course not all topics can be covered equally well, and different instructors will wish to emphasize different areas. We have taught non-majors courses using both the traditional sequence (start small and work up) and an ecology/evolution-first sequence, and are very sensitive to the difficulties presented to the student when lecture and text do not follow the same order. Although this text is organized in the traditional sequence, many instructors teach their courses in a different order. (One alternative sequence, with ecology and evolution as the initial topics, is given in the Instruc-

tor's Manual.) Therefore, we endeavored to make the units as versatile as possible. Not all topics are completely interchangeable, but we have included several features with flexibility of sequencing in mind.

The *introductory chapter* does more than merely break the student in gently. We have laid a foundation for the study of biology by presenting some of the essential assumptions that underlie all scientific endeavor, by discussing the scientific method, and, most importantly, by providing a brief overview of the diversity of life and introducing some unifying concepts in biology, including evolution. Instructors may thus, while assigning the chapters in the first part of the book, employ concrete examples from the living world without fearing that their students will not understand. Evolution must be, of course, the foundation for any modern biology course, and we have presented a short explanation of the basics of evolutionary theory in this first chapter. This very brief discussion will not suffice for a course, however, and complete discussions of all topics are given later, in the appropriate sections of the text. The student is not expected to refer back to this chapter to fill in material missing from later ones.

Biology contains many *recurrent themes*. For example, plant adaptations for life on land are an essential part of plant physiology, of the invasion of the land during evolution, of plant diversity, and of ecology. We have not hesitated to repeat important concepts in several places in the book, not in tiresome detail, but with enough thoroughness to make them understandable separately in each presentation. This judicious repetition, which extends to the occasional duplication of figures, has a twofold purpose. First, it makes the text more adaptable to varied sequences of instruction. Second, repetition is a form of emphasis, strengthening the student's understanding.

Supplementary Learning Aids. We have leavened our chapters with essays—glimpses into the fascinating and sometimes bizarre world of biology—which we hope the student will enjoy reading. Although most biology texts contain end-of-text glossaries, they are often too brief and selective to be of real use as a student study aid. Our glossary is very inclusive. The definitions are also quite complete, often including two or three levels of definition, for example defining “gene” both in classical and in molecular genetic terms. Each chapter concludes with a concise, numbered summary of the major points covered, as well as questions for student review. Suggested readings allow the motivated student to delve more deeply into selected topics.

The Learning Package. In addition to the textbook, a Student Study Guide is available. This workbook contains chapter outlines, sample examination questions in a variety of formats, and enjoyable reviews in the form of crossword puzzles.

For the instructor there is an Instructor's Manual, with chapter outlines, examination questions, suggested additional student readings for reports and projects, and source of audio-visual materials. Instructors who adopt the textbook may also request from the publisher a set of overhead transparencies, selected textual illustrations in color. In addition to the examination questions in the instructor's resource booklet, there is a Test Bank of multiple-choice questions; the Test Bank has been computerized for those instructors wishing this option.

Acknowledgments

“One picture is worth a thousand words,” and nowhere is that more true than in a biology text. The best writing cannot convey by itself the structure of the human kidney, the astonishingly accurate mimicry of a twig-mimic moth, nor the appearance of an ecosystem that a student has never seen. In this regard we have been fortunate. We have had the delight of working with Carol Dufficy, who drew the complex structures in the text. Her artwork is technically excellent, and her imagination and enthusiasm know no bounds. Carl May, John Cunningham, Bill Ervin, Ron Shimek, and Toby Zausner cheerfully helped us find many of the attractive photographs used throughout the text.

No text is the sole work of its authors. We have benefited from the advice and knowledge of our colleagues, first at the University of Missouri in Columbia, where we began writing this book, and now at the University of Colorado in Denver. The authors of hundreds of original research articles and scores of advanced texts have also played a role in developing this book. So have hundreds of our students, who have not hesitated to tell us when they failed to follow us. Despite any author's best efforts, some inaccuracies are inevitable. Though dozens of reviewers assisted us to achieve both accuracy and clarity, they cannot be expected to have caught every flaw, and any errors that remain are, of course, our responsibility. At times we decided not to follow a reviewer's suggestion, and for this we ask his or her indulgence.

Space does not permit our thanking our reviewers individually for their assistance in correcting our efforts, but we would like to mention each briefly. Particular thanks are due to Douglas Fratianne of Ohio State University,

Richard C. Tolman of Brigham Young University, and David Cotter of Georgia College, who each read the complete manuscript. Dr. Tolman has prepared the Instructor's Manual, and Dr. Cotter has prepared both the Student Study Guide and the Test Bank. Other reviewers of the text at various stages in its preparation were:

C. O. Patterson	<i>Texas A and M University</i>
Alexander Henderson	<i>Millersville University</i>
Steele R. Lunt	<i>University of Nebraska—Omaha</i>
Alan Schoenherr	<i>Fullerton College</i>
Laura Mays Hoopes	<i>Occidental College</i>
David J. Cotter	<i>Georgia College</i>
Eldon Sutton	<i>University of Texas, Austin</i>
Gerald Farr	<i>Southwest Texas State University</i>
Wayne Elmore	<i>Marshall University</i>
Jerry Wermuth	<i>Purdue University—Calumet</i>
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Vernon Avilia	<i>San Diego State University</i>

Bob Coburn
William Lowen
Douglas Fratianno
Richard Tolman
Arnold Karpoff
Albert Ruesink

Middlesex Community College
Suffolk Community College
Ohio State University
Brigham Young University
University of Louisville
Indiana University

Finally, we would like to thank the staff of Macmillan Publishing Company, who had faith in us from the start, supported us in the writing of this book, and saw the importance of the illustration program. Thanks to John Griffin for getting us into this in the first place, and to Gregory Payne, Kate Aker, and Gerald Lombardi for shepherding, guiding, and prodding us along the way. Edward Neve, our production supervisor, saw that the innumerable pieces of art, photographs, and galleys somehow combined correctly to form the finished product in the reader's hands. We owe them all a great debt for their efforts and encouragement over the last three years.

A good textbook, ultimately, is one that professors and students enjoy. We ask that students and teachers write to us, telling us what we have done well and could improve next time. We hope students will come to appreciate how important a knowledge of biology is in understanding health and medicine, advances in genetics, environmental issues, and the effects of nuclear war, to mention just a few things. We hope that our book will enhance our students' appreciation and enjoyment of their lives.

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