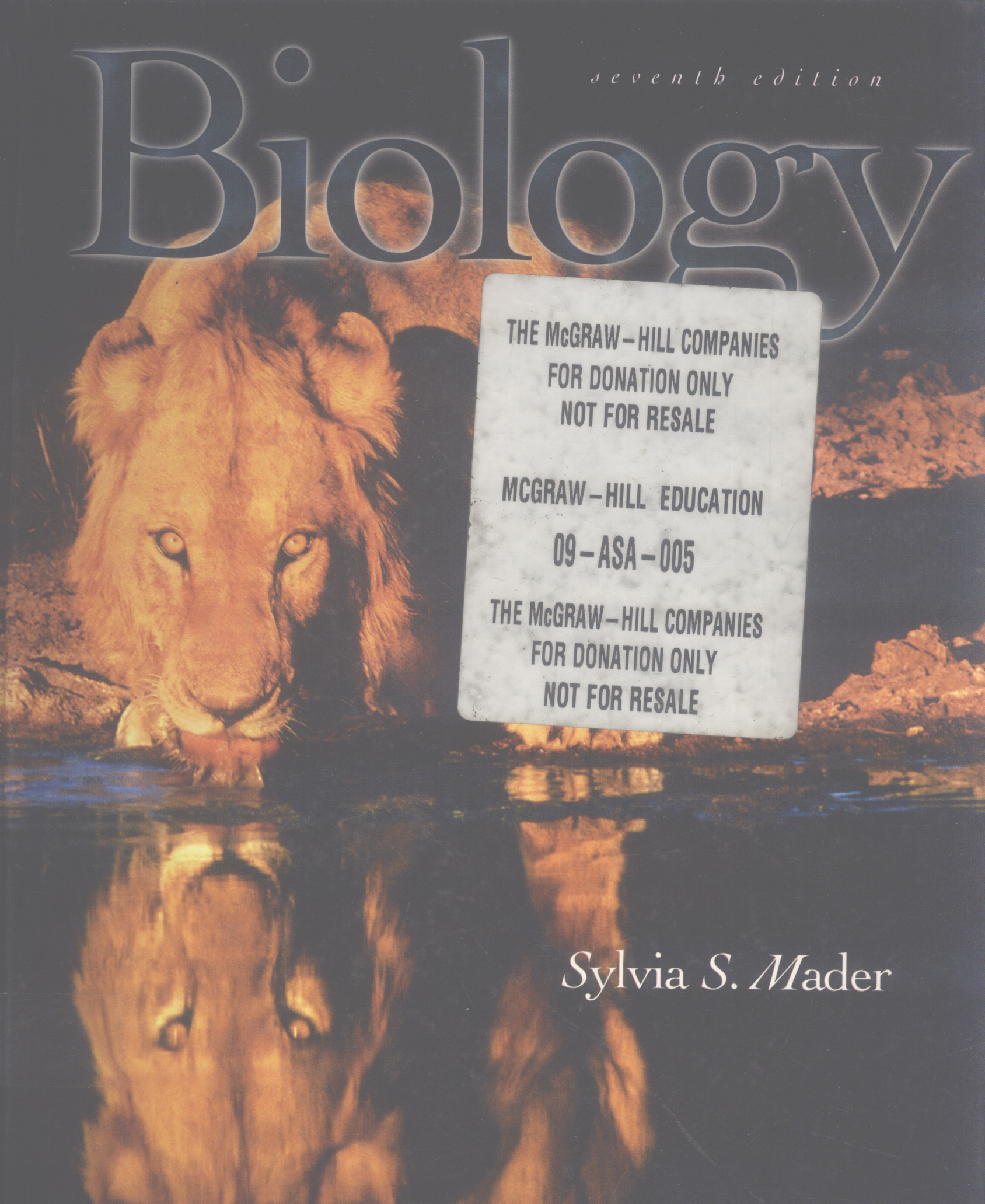
seventh edition

Biology



Sylvia S. Mader

seventh edition

Biology

Sylvia S. Mader

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Preface

When I write *Biology* I always feel that I am speaking directly to you, the reader. This occurs, no doubt, because I taught biology before I began to write about it. During those years, I began to develop techniques for making science-shy students successful in their study of biology. The first edition of *Biology* had a learning system that has continued to improve through feedback from both students and instructors. The end result is the seventh edition you hold in your hands. The major topics in *Biology* are now numbered. This allows instructors to assign just certain portions of the chapter and permits study in terms of the concepts listed in the chapter outline. With the advent of the computer it became possible for me to page the text so that each illustration is on the same or facing page as the reference.

Most illustrations in this edition are new or revised to improve their student appeal and educational design. Each type of molecule (fat, protein, nucleic acids) is colored the same, not just in the chemistry chapters but throughout the book. Each type organelle is colored the same in the cell chapter and also in all chapters. The addition of icons relates the part to the whole and the addition of micrographs relates art to an actual structure. Icons occur in the cell, ecology, diversity, and systems chapters. A cell icon shows the usual location of organelles. A cellular respiration icon depicts the connections between various pathways. Phylogenetic tree icons remind students of the evolutionary relationship among groups of organisms.

The emphasis on the scientific process has been strengthened in this edition of *Biology*. The first chapter has an improved description of the scientific process using a more appealing experiment from literature. The end matter of each chapter now contains *Thinking Scientifically* questions and these give students an opportunity to participate in the scientific process and learn to think critically. The *Science Focus* readings are more varied this edition. Some of these are written by contemporary biologists who tell how they go about doing their research and how these findings can be applied to human beings.

A *Bioethical Issue* section has been added to the end of most chapters. These issues pertain to a wide range of topics that require thoughtful consideration by society at this time. The issues end with appropriate questions to help students center their thoughts and arrive at an opinion. The myriad of topics considered include genetic disease testing, human cloning, AIDS vaccine trials, animal rights, responsibility for one's health, and fetal research.

New Chapters and Sections

Biology is an introductory text that covers the concepts and principles of biology from the structure and function of the cell to the organization of the biosphere. It draws upon the entire world of living things to bring out an evolutionary theme that is introduced from the start. The concept of evolution is necessary to understanding the unity and diversity of life and serves as a background for the study of ecological principles and modern ecological problems.

Every chapter of *Biology* has been revised and skillfully updated so that this edition has not grown in page length. These chapters are new:

Chapter 9, Cellular Reproduction and the Cell Cycle, has been reorganized and now ends with a discussion of the relationship between the cell cycle and cancer.
Chapter 27, Conservation Biology, is a new chapter which discusses the current biodiversity crisis including why we should care, the root causes, and how to preserve species and prevent extinctions.
Chapter 30, The Protists, was thoroughly updated to better reflect modern concepts regarding protist diversity.
Chapter 37, Nutrition and Transport in Plants, now begins with a section that includes a discussion of soil formation and its nutritional functions. In this chapter, new figures support an improved discussion of xylem and phloem transport.
Chapter 46, Neurons and Nervous Systems, has been reorganized and rewritten for better flow. The more thorough discussion of the central nervous system includes a new section on learning and memory.
Chapter 49, Hormones and Endocrine Systems, better emphasizes the role of hormones in homeostasis and the effects of imbalance on the human phenotype.

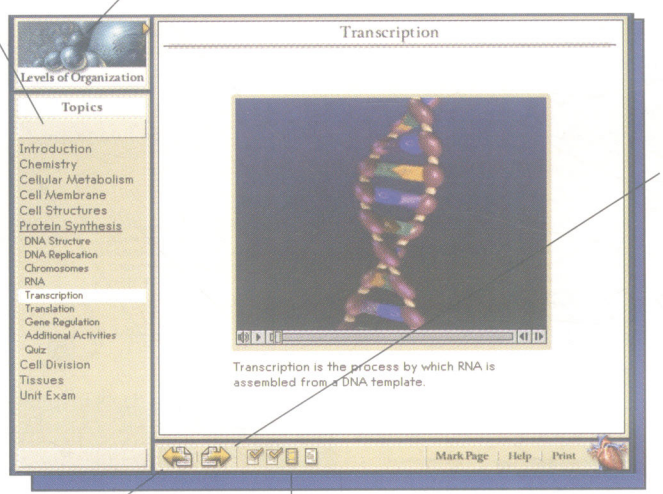
A more complete list of updates for the seventh edition is available on the *Biology* website.

Essential Study Partner CD-ROM

A free study partner that engages, investigates, and reinforces what you are learning from your textbook. You'll find the **Essential Study Partner** for *Biology* to be a complete, interactive student study tool packed with hundreds of animations and learning activities. From quizzes to interactive diagrams, you'll find that there has never been a better study partner to ensure the mastery of core concepts. Best of all, it's **FREE** with your new textbook purchase.

The topic menu contains an interactive list of the available topics. Clicking on any of the listings within this menu will open your selection and will show the specific concepts presented within this topic. Clicking any of the concepts will move you to your selection. You can use the UP and DOWN arrow keys to move through the topics.

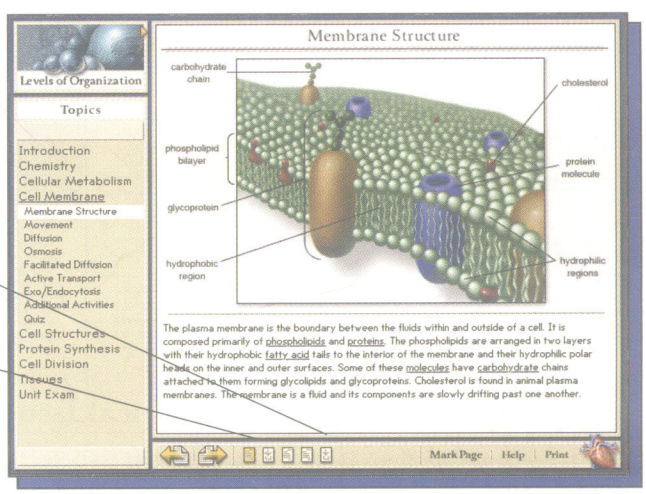
The unit pop-up menu is accessible at any time within the program. Clicking on the current unit will bring up a menu of other units available in the program.



To the right of the arrows is a row of icons that represent the number of screens in a concept. There are three different icons, each representing different functions that a screen in that section will serve. The screen that is currently displayed will highlight yellow and visited ones will be checked.

The film icon represents an animation screen.

Along the bottom of the screen you will find various navigational aids. At the left are arrows that allow you to page forward and backward through text screens or interactive exercise screens. You can also use the LEFT and RIGHT arrows on your keyboard to perform the same function.



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The page icon represents a page of informational text.

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www.mhhe.com/biosci/genbio/maderbiology7

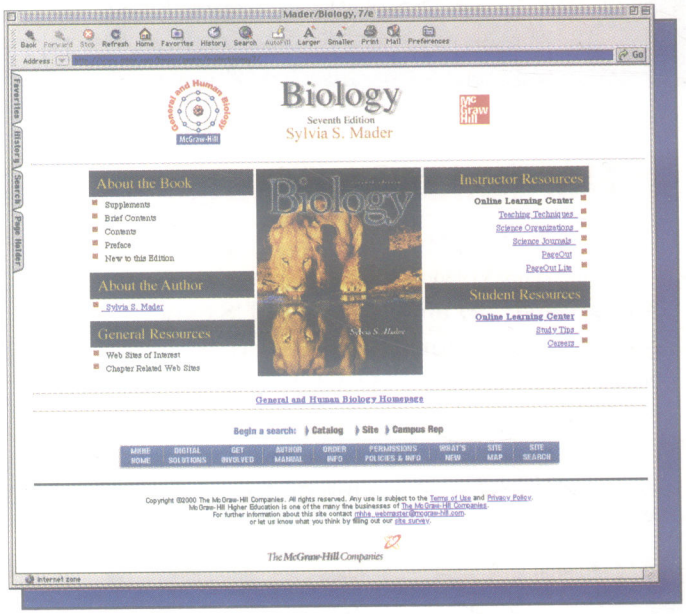
This text-specific website allows students and instructors from all over the world to communicate. Instructors can create a more interactive course with the integration of this site, and students will find tools that help them improve their grades and learn that biology can be fun.

Student Resources

Study questions
Quizzing with immediate feedback
Links to chapter-related websites
Case studies
Interactive art labeling exercises
Critical thinking exercises

Instructor Resources

Instructor's Manual
Activities that can be assigned as coursework
Links to related websites to expand on particular topics
Classroom activities
Lecture outlines
Case studies



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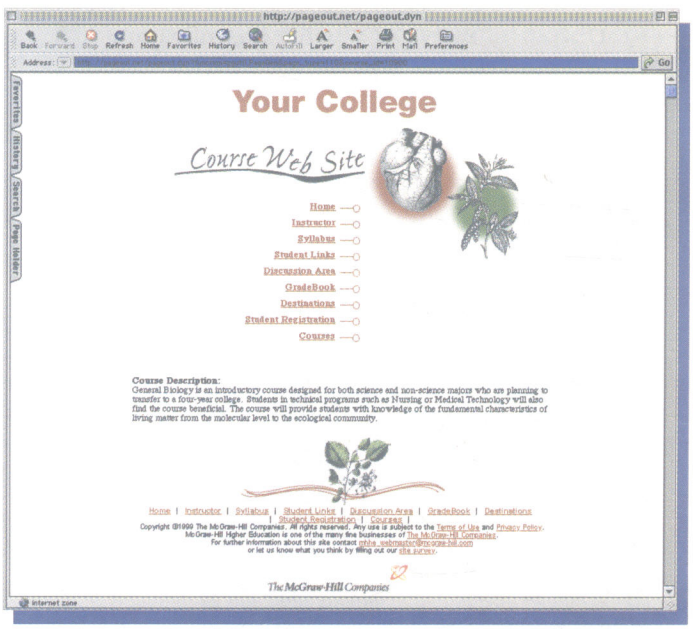

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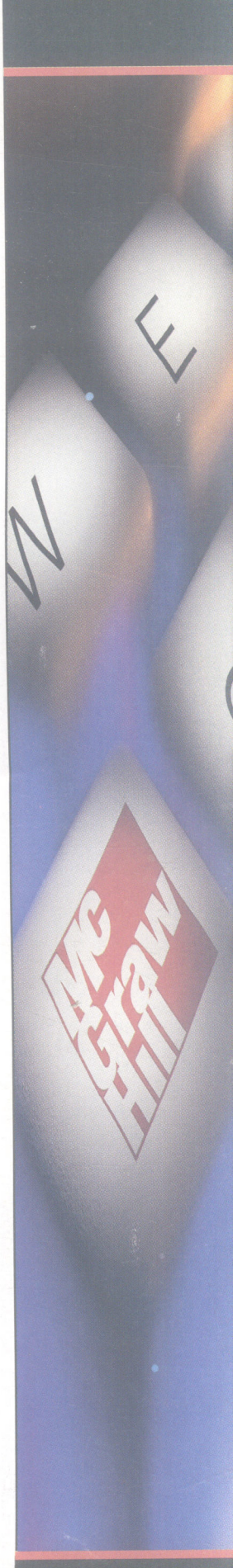

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New Technology

Essential Study Partner CD-ROM

This interactive student study tool is packed with over 100 animations and more than 200 learning activities. From quizzes to interactive diagrams, your students will find that there has never been a more exciting way to study biology. A self-quizzing feature allows students to test their knowledge of a topic before moving on to a new module. Additional unit exams give students the opportunity to review an entire subject area. The quizzes and unit exams hyperlink students back to tutorial sections so they can easily review coverage for a more complete understanding. The text-specific *Essential Study Partner CD-ROM* supports and enhances the material presented in ***Biology*** and is correlated with the text.

Biology Online Learning Center

McGraw-Hill text-specific websites allow students and instructors from all over the world to communicate. By visiting this site, students can access additional study aids—including quizzes—explore links to other relevant biology sites, and catch up on current information. Log on today!

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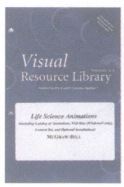
PageOut™

Put together your own customized website with the use of PageOut, a program designed specifically for instructors wanting to put course information on the web. No experience in web publishing is necessary, just choose from a collection of templates to create your class website.

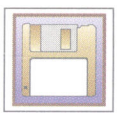
Visual Resource Library CD-ROM

This helpful CD-ROM contains approximately 1,500 images and select animations that can be easily imported into PowerPoint to create multimedia presentations. Or, you may use the already prepared PowerPoint presentations.



Life Science Animations CD-ROM

This two CD-ROM set contains more than 125 animations of important biological concepts and processes.

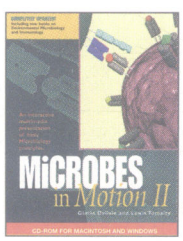


Classroom Testing Software (MicroTest)

This helpful testing software—available in either Macintosh or Windows format—provides well-written and researched book-specific questions featured in the Test Item File.

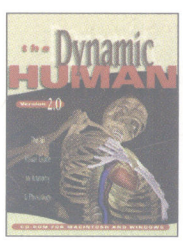
Life Science Animations Videotape Series

Animations of key biological processes are available on seven videotapes. The animations bring visual movement to biological processes that are difficult to understand on the text page.



Microbes in Motion CD-ROM, Version 2.0

This interactive CD-ROM allows students to actively explore microbial structure and function. Great for self-study, preparation for class or exams, or for classroom presentations.



The Dynamic Human CD-ROM, Version 2.0

This guide to anatomy and physiology interactively illustrates the complex relationships between anatomical structures and their functions in the human body. Realistic, three-dimensional visuals are the premier feature of this exciting learning tool.

Dynamic Human Videodisc

Enhance your classroom presentations with movement, sound, and motion of internal organs, cells, and systems. More than 80 premier 3-D animations covering all body systems from the outstanding *Dynamic Human CD-ROM* are included.

Other Available Supplements

Instructor's Manual

The *Instructor's Manual* is designed to assist instructors as they plan and prepare for classes using ***Biology.*** The *Instructor's Manual* contains both an extended lecture outline and lecture enrichment ideas, which together review in detail the contents of the text chapter. The technology section lists videos and computer software items that are available from outside sources and also those that are available from McGraw-Hill.

Student Study Guide

To ensure close coordination with the text, the author Dr. Sylvia S. Mader has written the *Student Study Guide* that accompanies the text. Each text chapter has a corresponding study guide chapter that includes a listing of objectives, study questions, and a chapter test. Answers to the study questions and the chapter tests are provided to give students immediate feedback.

The concepts in the study guide are the same as those in the text, and the study questions in the study guide are sequenced according to these concepts. Instructors who make their choice of concepts known to the students can thereby direct student learning in an efficient manner. Instructors and students who make use of the *Student Study Guide* should find that student performance increases dramatically.

Laboratory Manual

Dr. Mader has also written the ***Laboratory Manual*** to accompany ***Biology.*** With few exceptions, each chapter in the text has an accompanying laboratory exercise in the manual (some chapters have more than one accompanying exercise). In this way, instructors are better able to emphasize particular portions of the curriculum, if they wish. The 35 laboratory sessions in the manual are designed to further help students appreciate the scientific method and to learn the fundamental concepts of biology and the specific content of each chapter. All exercises have been tested for student interest, preparation time, and feasibility. This lab manual can be customized to fit your lab course, contact your McGraw-Hill representative for details.

Transparencies

This set of transparency acetates to accompany the text, has been expanded to *650* full-color acetates.

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Biology has always been a team effort and it is fitting to acknowledge all those who worked so diligently on this edition. My publisher Michael Lange was always there to offer advice and my editor Patrick Reidy stepped in when needed to encourage us all. The clear, steady directives of my developmental editor, Anne Melde, were very much appreciated. She also contributed heavily to the success of the multimedia that accompanies the text.

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In my office, Evelyn Jo Hebert has consistently provided steadfast and proficient support through several editions of the text. Everyone on the book team remained cheerful and helpful while going beyond the call of duty. My thanks to them all.

The Reviewers

Many instructors have contributed not only to this edition of *Biology* but also to previous editions. I am extremely thankful to each one, for they have all worked diligently to remain true to our calling and provide a product that will be the most useful to our students.

In particular, it is appropriate to acknowledge the help of the following individuals for the seventh edition:

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