

Preface

Global warming, bioengineered crops, stem cell research, mad cow disease, biodiversity—our students are and will continue to be inundated with scientific information and misinformation throughout their lives. Faced with the rapidly expanding field of biology, how does one decide which concepts and facts to convey? Which types of biological knowledge will best help students to make informed choices relating to their own lives, now and in the future? Which will best prepare students for their upper-level courses? Recognizing that there are no uniquely correct answers, we have revised the eighth edition of *Biology: Life on Earth* to give our users more choices.

In talking to educators engaged in the exciting but challenging mission of introducing students to biology, a single consensus emerged: “We need to help our students become scientifically literate.” Scientific literacy endows a student with the mental tools to cope with expanding knowledge. It requires a foundation of factual knowledge that provides a cognitive framework into which new information can be integrated. But scientific literacy also includes the ability to grasp and evaluate new information from the news and popular press. A scientifically literate individual recognizes the interrelatedness of concepts and the need to integrate information from many areas.

BIOLOGY: LIFE ON EARTH EFFECTIVELY MANAGES A WEALTH OF SCIENTIFIC INFORMATION

Our eighth edition of *Biology: Life on Earth* is not only a revised and improved textbook, but a complete package of learning aids for students and teaching aids for instructors. Our major goals are

- To help instructors present biological information in a way that will foster scientific literacy among students
- To help students acquire information according to their own learning styles
- To help students relate this information to their own lives so as to understand its importance and relevance

BIOLOGY: LIFE ON EARTH

... Is Organized Clearly and Uniformly

Throughout each chapter, students will find aids that help them navigate through the information.

- Each chapter opens with “At a Glance,” presenting the chapter’s major sections and essays. Instructors can easily assign—and students can easily locate—key topics within the chapter.
- Major sections are introduced with general questions, while minor subheadings are summary statements re-

flecting their more specific content. An important pedagogical goal of this organization is its emphasis on biology as a hierarchy of interrelated concepts, rather than merely a compendium of isolated, independent subjects.

- The “Summary of Key Concepts” pulls together important concepts using major subheadings and their numbering system to allow instructors and students to review the chapter efficiently.
- Thought questions are found at the end of each Case Study, incorporated into selected figure captions, and in “Applying the Concepts” sections. These features all stimulate students to think about science rather than merely memorizing facts.

... Contains Revitalized Illustrations

Benefiting from the advice of reviewers and careful scrutiny by the authors, we have once again improved the illustration program. For the eighth edition, we have

- **Added and replaced many photographs** to help capture student interest. Our new, more flexible text layout allows us to add “thumbnail” photos illustrating some plants and animals previously described only in words.
- **Continued our emphasis on color consistency** Consistent colors illustrate specific atoms, structures, and processes.
- **Added more key process figures** As well as redrawing many diagrams for greater interest and clarity, we have added new figures that visually illustrate and pull together complex processes such as photosynthesis and cellular respiration.
- **Enhanced label clarity** We have placed additional boxed text within figures to ensure clearer explanations.
- **Continued our use of thought questions in selected figure captions** Answers to these questions are available for the first time in the back of the book.

... Has Been Updated and Reorganized

We incorporate scientific discoveries that students might read about in the news, placing them within a scientific context to help foster scientific literacy. Although each chapter has been carefully revised, here are some highlights of the eighth edition:

- **Unit One: The Life of a Cell** New case studies introduce the student to bioengineered skin and the puzzling prions responsible for mad cow disease. In response to reviewers’ suggestions, we have reversed the order of presentation in Chapters 4 and 5. Cell structure is now covered before membrane structure, allowing us to describe the details of membrane specializations in the context of cell structures already introduced. In Chapter 5,

"Cell Membrane Structure and Function," our coverage of diffusion, osmosis, and tonicity is enhanced, and we have added a Scientific Inquiry essay on the discovery and structure of aquaporins.

- **Unit Two: Inheritance** In Chapter 9, "DNA: The Molecule of Heredity," we have expanded our discussion of the discovery that DNA is the molecule of heredity with a Scientific Inquiry essay describing the Hershey-Chase experiment as an application of the scientific method. Additional coverage of prokaryotic gene organization, transcription, and translation highlights important similarities and differences between prokaryotes and eukaryotes in Chapter 10, "Gene Expression and Regulation." In Chapter 11, "The Continuity of Life," a new section describes the importance and timing of mitosis and meiosis in eukaryotic life cycles. Also in Chapter 11, the Case Study on skin cancer brings a real-world perspective to a new section on the control of cell division, and a Health Watch essay describes the genetic basis of cancer. We have updated Chapter 13, "Biotechnology," with new essays on biotech applications. As in past editions, the chapter continues its dual focus on technologies and applications, emphasizing both practical and ethical controversies over the medical and agricultural uses of biotechnology.
- **Unit Three: Evolution and Diversity of Life** In response to reviewer requests, we now devote two chapters to enhanced coverage of bacteria, archaea, and viruses as well as the diverse eukaryotic protists. Unit Three includes expanded discussions of several key topics in systematics and evolutionary genetics, and new figures to illustrate these sometimes challenging concepts. The chapters covering the diversity of life include expanded discussion of numerous taxa, within both vertebrate and invertebrate groups. Throughout the unit, we have added or revised topics to reflect new discoveries in evolutionary biology.
- **Unit 4: Behavior and Ecology** In this unit, we have enlivened Chapter 25, "Animal Behavior," with new photographs and examples. Chapter 26, "Population Growth and Regulation," now covers life tables, logistic growth, and demographics. Chapter 28, "How Do Ecosystems Work?" contains updated environmental coverage with sections on clean air and water, and a new Earth Watch essay, "Poles in Peril." Chapter 29, "Earth's Diverse Ecosystems," now describes two new aquatic habitats: freshwater streams and rivers, and marine benthic communities. A highlight of the eighth edition is a new chapter on the emerging field of conservation biology. In Chapter 30, "Conserving Life on Earth," we describe the services provided by ecosystems and attempts to estimate their value to humanity. We explain how human activities can reduce biodiversity, and we discuss how conservation efforts and sustainable use can preserve and restore functional ecosystems.

- **Unit Five: Animal Anatomy and Physiology** This unit begins with revised coverage of homeostasis and the more regulation. Students will find added and updated coverage on current topics including anorexia and obesity, bird flu, the neurochemistry of love, high-tech reproduction, new contraceptives, sexually transmitted diseases, stem cells, and fetal alcohol syndrome. We have retained our human emphasis while providing additional comparative coverage, adding topics such as countercurrent gas exchange in fishes, Malpighian tubules in insects, and sections on invertebrate hormones and defenses against disease.
- **Unit Six: Plant Anatomy and Physiology** This unit boasts many figure revisions and new photos to better illustrate plant anatomy and physiological processes, as well as their fascinating environmental adaptations. We have also expanded coverage of the agricultural uses of plant hormones.

Engages and Motivates Students

Scientific literacy cannot be imposed on students; they must actively participate in acquiring both the necessary information and skills. Thus, it is crucial for students to recognize that biology is about their personal lives as well as the life all around them. To help engage and motivate students, this new edition continues to offer these features:

- **Links to Life** Our short, informally written Links to Life relate to subjects that are both familiar to the student and relevant to the chapter.
- **Case Studies** In the eighth edition, we have retained and updated our more popular case studies while introducing several new ones. Case studies are based on recent news items, situations in which students might find themselves, or particularly fascinating biological topics. At the end of each chapter, the Case Study Revisited feature allows students to explore the topic further in light of what they have learned. Students also will find an in-depth investigation of each Case Study available on the companion Web site.
- **Bioethics** Many topics explored in the text have ethical implications for human life. These include genetic engineering and cloning, the use of animals in research, and human impact on other species. They are now identified with a bioethics icon that alerts students and instructors to the possibility for further discussion and investigation.
- **Essays** We retain our full suite of essays in this edition. Earth Watch essays explore pressing environmental issues, while Health Watch essays cover medical topics. Closer Look essays allow instructors to explore selected topics in greater detail; Scientific Inquiry essays explain how scientific knowledge is acquired. Evolutionary Connections essays end selected chapters by placing topics in an evolutionary context.

Provides Media and Print Supplements That Support Your Teaching Approach and Focus Student Study Time

- **Instructor Resource Center on CD/DVD (0-13-195773-2)** This multiple-disc instructor tool was built to support your teaching approach and invigorate your lectures. No other textbook for this course offers as many options and as much innovation and quality in instructor support. Resources include the entire art program of the book (in labeled, unlabeled, and editable-label formats) offered as fully optimized JPEGs and in various PowerPoint® files including Chapter Lecture presentations as well as hundreds of 2-D and 3-D animations and simulations preloaded into PowerPoint® presentations. See the back endpapers for more information on the instructor materials supporting this book.
- **CRS “Clicker” Questions (0-13-233497-6)** For the first time, a set of 900+ unique and original CRS questions—not questions taken from the test bank. Many questions include art, and all offer Instructor Notes that often describe insights relating to the use of the questions in classes where this textbook was assigned and Clickers were used.
- **Test Item File (printed 0-13-195768-6; TestGen® 0-13-233500-X)** The most respected collection of test questions in this market has been revised and thoroughly updated.
- **Instructor Resource Guide (0-13-195767-8)** A collection of printed instructor tools including class-tested lecture activities is offered both as Word files on the IRC on CD/DVD and in this printed version.
- **Companion Web site with Grade Tracker (www.prenhall.com/audesirk/)** This student Web site is a 24/7 focused study tool to help in mastering course concepts. Key features include the Online Study Guide to organize study, Chapter Quizzes to help students determine how well they know information, and 103 Web Tutorials that use

animation and activities to help explain the most challenging concepts in each chapter. See the front endpapers for more information on the student media.

- **Study Guide (0-13-195769-4)** A traditional printed study guide with helpful materials including practice quizzes and activities.

ACKNOWLEDGMENTS

Biology: Life on Earth is truly a team effort. Our Development Editor Anne Scanlan-Rohrer sought ways to make the text more clear, consistent, and student friendly. Art Director John Christiana developed and executed a fresh design for this new edition, and Art Editor Rhonda Aversa deftly coordinated the art program. The many new and improved illustrations were artfully rendered by Artworks with the help of Jay McElroy. Photo Researcher Yvonne Gerin tirelessly tracked down excellent photos. Christianne Thillen tackled the job of copyediting with meticulous attention to detail. Tim Flem, our Production Editor, brought the art, photos, and manuscript together into a seamless whole, accepting last-minute changes with remarkable good nature. Media Editor Patrick Shriner and Assistant Editor Crissy Dudonis coordinated production of all the media and study aids that contribute so much to the total package that is *Biology: Life on Earth*. Our marketing manager, Mandy Jellerichs, helped create a marketing strategy that will effectively communicate our message to our audience. Editors Teresa Chung and Jeff Howard directed the project with energy and imagination. We thank Teresa for her unfailing faith in the project and for assembling a fantastic team to implement it. We add a special thanks to Jeff for shepherding this enormous endeavor to completion with good-natured patience and skill.

TERRY AND GERRY AUDESIRK

BRUCE E. BYERS

EIGHTH EDITION REVIEWERS

George C. Argyros, *Northeastern University*
 Peter S. Baletsa, *Northwestern University*
 John Barone, *Columbus State University*
 Michael C. Bell, *Richland College*
 Melissa Blamires, *Salt Lake Community College*
 Robert Boyd, *Auburn University*
 Michael Boyle, *Seattle Central Community College*
 Matthew R. Burnham, *Jones County Junior College*
 Nicole A. Cintas, *Northern Virginia Community College*
 Jay L. Comeaux, *Louisiana State University*
 Sharon A. Coolican, *Cayuga Community College*
 Mitchell B. Cruzan, *Portland State University*
 Lewis Deaton, *University of Louisiana—Lafayette*
 Dennis Forsythe, *The Citadel*
 Teresa L. Fulcher, *Pellissippi State Technical Community College*

Martha Groom, *University of Washington*
 Richard Hanke, *Rose State College*
 Kelly Hogan, *University of North Carolina—Chapel Hill*
 Dale R. Horeth, *Tidewater Community College*
 Joel Humphrey, *Cayuga Community College*
 James Johnson, *Central Washington University*
 Joe Keen, *Patrick Henry Community College*
 Aaron Krochmal, *University of Houston—Downtown*
 Stephen Lebsack, *Linn-Benton Community College*
 David E. Lemke, *Texas State University*
 Jason L. Locklin, *Temple College*
 Cindy Malone, *California State University—Northridge*
 Mark Manteuffel, *St. Louis Community College*
 Steven Mezik, *Herkimer County Community College*
 Christine Minor, *Clemson University*