

Preface

THE CASE FOR SCIENTIFIC LITERACY

Climate change, biofuels versus food and forests, bioengineering, stem cells in medicine, potential flu pandemics, the plight of polar bears and pandas, human population growth and sustainability: these are just some of the very real, urgent, and interrelated concerns facing our increasingly connected human societies. The Internet places a wealth of information—and a flood of misinformation—at our fingertips. Never have scientifically literate students been more important to humanity's future. As educators, we feel humbled before this massive challenge. As authors, we feel hopeful that the Twelfth Edition of *Biology: Life on Earth* will help lead introductory biology students along paths to understanding.

Scientific literacy requires a foundation of factual knowledge that provides a solid and accurate cognitive framework into which new information can be integrated. But more importantly, it endows people with the mental tools to separate the wealth of data from the morass of misinformation. Scientifically literate citizens are better able to evaluate facts and make informed choices in their personal lives and in the political arena.

This Twelfth Edition of *Biology: Life on Earth* continues our tradition of:

- Helping instructors present biological information in a way that will foster scientific literacy among their students.
- Helping to inspire students with a sense of wonder about the natural world, fostering an attitude of inquiry and a keen appreciation for knowledge gained through science.
- Helping students to recognize the importance of what they are learning to their future roles in our rapidly changing world.

BIOLOGY: LIFE ON EARTH, TWELFTH EDITION

... Is Organized Clearly and Uniformly

Navigational aids help students explore each chapter. An important goal of this organization is to present biology as a hierarchy of closely interrelated concepts rather than as a compendium of independent topics.

- Major sections are introduced as broad questions that stimulate students to think about the material to follow; subheadings are statements that summarize their specific content.
- Each major section concludes with "Check Your Learning" questions that remind students of the key concepts and content in the preceding passage.

- "Case Study Continued" segments end with probing questions to help students anticipate what they will learn next.
- A "Summary of Key Concepts" section ends each chapter, providing a concise, efficient review of the chapter's major topics.

... Engages and Motivates Students

Scientific literacy cannot be imposed on students—they must actively participate in acquiring the necessary information and skills. To be inspired to accomplish this, they must first recognize that biology is about their own lives. For example, we help students acquire a basic understanding and appreciation of how their own bodies function by including information about diet and weight, cancer, and lower back pain.

We fervently hope that students who use this text will come to see their world through keener eyes. For example, they will perceive forests, fields, and ponds as vibrant and interconnected ecosystems brimming with diverse life-forms rather than as mundane features of their everyday surroundings. If we have done our job, students will also gain the interest, insight, and information they need to look at how humanity has intervened in the natural world. If they ask the question, "Is this activity sustainable?" and then use their new knowledge and critical thinking skills to seek some answers, we can be optimistic about the future.

In support of these goals, the Twelfth Edition has updated features that make *Biology* more engaging and accessible.

- **Case Studies** Each chapter opens with an attention-grabbing "Case Study" that highlights topics of emerging relevance in today's world. Case Studies, including "Unstable Atoms Unleashed" (Chapter 2), "New Parts for Human Bodies" (Chapter 4), and "Unwelcome Dinner Guests" (Chapter 20), are based on news events, personal interest stories, or particularly fascinating biological topics. "Case Study Continued" segments weave the topic throughout the chapter, and "Case Study Revisited" completes the chapter, exploring the topic further in light of the chapter's lessons.
- **Boxed Essays** Three categories of essays enliven the text. "Earth Watch" essays explore pressing environmental issues; "Health Watch" essays cover important or intriguing medical topics; and "Doing Science" essays explain how scientific knowledge is acquired. In addition, "In Greater Depth" essays that provide more detailed information on some topics are available on Mastering Biology.
- **"Have You Ever Wondered" Questions** These popular features demystify common and intriguing questions, showing biology in the real world.

- **End-of-Chapter Questions** The questions that conclude each chapter allow students to review the material in different formats—multiple choice, fill-in-the-blank, short-answer, and essay—that help them to study and assess what they have learned. Answers to the multiple choice, fill-in-the-blank, and short-answer questions are included in the back of the book. Hints for the essay questions are included on Mastering Biology.
- **Key Terms and a Complete Glossary** Boldfaced key terms are defined clearly within the text as they are introduced. These terms are also available on Mastering Biology as flashcards, providing students with an opportunity to quiz themselves on important definitions. The glossary, carefully written by the authors, provides complete definitions for all key terms, as well as for other important biological terms.

... Encourages Critical Thinking

Throughout the text, we aim to help students develop and improve their ability to think critically about scientific information and concepts. Aspects of the text that foster critical thinking include:

- **Two Question Types in Essays and Figure Captions** In each chapter, students encounter a number of questions designed to encourage them to think critically about the content. “Think Critically” questions focus on solving problems, thinking about scientific data, or evaluating a hypothesis. “Consider This” questions invite students to form an opinion or pose an argument for or against an issue, based on valid scientific information. Answers to “Think Critically” questions are included in the back of the book; hints for “Consider This” questions are included on Mastering Biology.
- **In-depth Questions for Classroom Discussion** A number of new “Think Deeper” questions, available in the Instructor Resource area, follow up and extend “Think Critically” questions by asking additional, related questions that require more extensive thought and analysis.
- **Chapter-Ending Thought Questions** The end-of-chapter material for each chapter concludes with “Applying the Concepts” questions that challenge students to apply knowledge gained in the chapter to novel problems.
- **“Doing Science” Essays** These essays illustrate the process of science in a methodical way, emphasizing the process of what scientists do. Essays describe the details of experiments, highlighting exciting technology and data. They are structured to emphasize the process of inquiry, with sections titled “What Question Was Asked?”, “How Was Evidence Gathered?”, and “What Was Learned?” All “Doing Science” essays conclude with a “Think Critically” or “Consider This” question,

encouraging students to analyze data or engage with the topics presented in the essay.

- **Data in “Earth Watch” Essays** Students will find examples of real scientific data in the form of graphs and tables. The essays are accompanied by “Think Critically” questions that challenge students to interpret the data, fostering increased understanding of how science is communicated.

... Is a Comprehensive Learning Package

The Twelfth Edition of *Biology: Life on Earth* is a complete learning package, providing updated and innovative teaching aids for instructors and learning aids for students.

ACKNOWLEDGMENTS

Biology: Life on Earth enters its Twelfth Edition guided by the excellent team at Pearson. Beth Wilbur, Director of Portfolio Management, continues to oversee the enterprise with warmth, competence, and first-rate leadership. Courseware Portfolio Manager Cady Owens, Content Development Director Ginnie Simone Jutson, and Content Producer Anastasia Slesareva coordinated this complex and multifaceted endeavor. Ginnie and Cady did a wonderful job of working with us to develop a revision plan to further extend the text’s appeal and reach. We also appreciate Cady’s extensive travel to share her enthusiasm for the text and its extensive ancillary resources with educators across the country. Mary Tindle, Content Producer at SPi Global, did a marvelous job of keeping everything on track and on schedule. Senior Development Editor Jennifer Angel carefully reviewed every word and figure in the manuscript, making sure the prose was clear, the images informative, and the organization logical. In addition, Jennifer worked diligently and with ingenuity to ensure that page layouts were attractive and effective. We very much appreciate her attention to detail and thoughtful suggestions. Our outstanding copyeditor, Lucy Mullins, improved the text and art and caught errors that we had overlooked. The book boasts a large number of excellent new photos, tracked down with skill and persistence by Kristin Piljay. Matthew Perry made sure we had proper permission to use the photos we chose.

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We are extremely fortunate to be working with the Pearson team. This Twelfth Edition of *Biology: Life on Earth* reflects their exceptional abilities and dedication.

Finally, we appreciate the 400+ faculty members from around the country who have checked and rechecked the text for accuracy and clarity over the past several years. Reviewers specific to the past two editions are listed below.

With gratitude,

**TERRY AUDESIRK, GERRY AUDESIRK,
AND BRUCE BYERS**

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