

Preface

Because we have a young daughter, we often hear the question "Why?" It's an exciting question, because it provides us with an opportunity to share some of what we know, or to learn more by looking up the answer to our daughter's question. The question "why?" begins a person's exploration of his or her world. For those fortunate enough to continue asking such questions, the exploration and the delight of learning become life-long and continuously enriching experiences. As teachers and scientists, we are continuously learning about life on Earth. In writing this textbook, we have had the good fortune both to learn more and to share our interest in biology with an extended classroom of thousands of students.

A course in introductory biology may be a student's first real exposure to the fascinating complexity of life. As teachers, we recognize how easily a student may become mired in the overwhelming number of new facts and terms, while losing sight of the underlying principles of biology and their relevance to daily life. *Biology: Life on Earth* has been carefully written and revised to integrate the necessary biological facts into a broader conceptual framework that stresses unifying themes and the ways in which an understanding of biology can enrich and enlighten day-to-day living. Why study biology? Maybe we're biased, but what can be more fascinating than learning about life on Earth?

Biology: Life on Earth

Focuses on Concepts

The subheadings within each major chapter section have been cast as sentences so that they introduce key concepts in each section of text. Our "At a Glance" section opens each chapter with an outline that brings these statements together, presenting an overview of the chapter and its most important ideas. Figure titles tell the student at a glance what idea the figure illustrates, before the details are described in the caption. Concepts are further stressed in highlighted in-text summaries and in end-of-chapter summaries.

Makes Biology Relevant

There is a danger that students will stop asking the question "why?" if the equally important question "so what?" isn't answered. In fact, there is no science that can tell us more about ourselves and our world than can biology. Knowledge of biology illuminates everyday life: how our bodies work, why our house plants bend toward the window, why a growling dog raises the fur along its back. A knowledge of biology is also crucial to understanding modern concerns and controversies such as population growth, the spread of diseases such as AIDS, the destruction of tropical rain forests, and the promise and perils of genetic engineering. In this text, we make a conscious effort to relate concepts in biology to everyday experiences and to important issues facing society. These applications are interwoven into the text, introduced in end-of-chapter essay questions, and highlighted in boxed essays such as:



Earth Watch — a series of environmental essays addressing issues such as biodiversity, ozone depletion, and population growth.



Health Watch — a series of essays investigating topics such as how ulcers form, how kidney dialysis works, and how bone fractures heal.

Communicates the Scientific Process

One cannot understand biology without knowing how science works. Biology is not just a compendium of facts and ideas; it is the outgrowth of a dynamic process of inquiry and human endeavor. In many places throughout the text, accompanying descriptions of biological facts and concepts, are descriptions of how those findings were achieved. The scientific process is further highlighted in Scientific Inquiry essays:



Scientific Inquiry — students will learn, for example, how fossils are dated, how the structure of DNA was discovered, and how scientists have learned that a newborn baby prefers her own mother's voice.

Stresses Unifying Themes

Two themes are interwoven throughout the text: evolution and adaptation to the environment. As Theodosius Dobzhansky so aptly put it, "Nothing in biology makes sense, except in the light of evolution." *Life on Earth* has been forged in the crucible of evolution, and any modern biology text must reflect that fact. Many of the chapter introductions have an evolutionary theme, and many chapters end with a feature new to this edition:



Evolutionary Connections — lively discussions that link chapter concepts into the broader perspective of evolution.

Adaptation to the environment flows naturally from the concept of evolution; the environment exerts selective pressure on organisms that helps shape their evolution. Nevertheless, not all structures are optimal solutions to environmental challenges. Many apparently unlikely biological designs are due to genetic drift, chance catastrophes, and the fact that the raw material for evolution consists of random mutations affecting previously existing structures. In the words of Sydney Brenner, "Anything produced by evolution is likely to be a bit of a mess," and we have tried to show that, too.

Our own concern for the environment also threads its way throughout this text. Whenever appropriate, we have tried to present students with the biological rationale for making sound environmental decisions.

Stimulates Exploration

For every "why?" that is answered, many more questions are raised. The knowledge and understanding of science that students gain from this text will allow them to continue to seek answers throughout their lives. Why does a flower have a particular arrangement of stigma and anthers? Watch what happens when a bee explores it! Thought-provoking questions end each chapter, along with interesting and informative references, where topics can be explored in more detail. A free supplement for students, *The New York Times Themes of the Times* brings together a collection of recent, topical, biological articles from the pages of *The New York Times*. The ABC News/Prentice Hall

Video Library for instructors features brief clips from programs like *20/20*, *World News Tonight*, and *Nightline*. Finally, the text challenges the student to enter the information age with its own home page on the World Wide Web. *Life on the Internet: Biology - A Student's Guide* is available as a supplement to help students navigate through the web to access the regularly updated resources on the *Biology: Life on Earth* home page:



Net Watch — an icon at the end of each chapter highlights the specific address for each chapter's resources.

Is Flexible in Organization

There is no "correct" sequence of topics in biology; nearly every subject would be more understandable if all the other subjects preceded it! Our response to this dilemma has been to make the units as flexible as possible, using selective repetition of important points. For example, learning how plants became adapted to life on dry land is important in understanding their evolution, their diversity, and their physiology, so we have repeated key concepts separately in each discussion. Our first chapter sets the stage for coverage of topics in different orders by reviewing the diversity of life and the principles of evolution. Extensive cross-referencing throughout the text allows the student to find new related material or review previously covered areas.

By providing relatively complete coverage of all the major topics in biology, this text accommodates courses that provide a broad overview as well as those that delve into selected areas of biology. We recognize that some topics are harder than others for introductory students to grasp. When the details of more difficult topics are integrated into the text, students may lose sight of underlying concepts in the welter of detail. So we have written the text to provide a more general overview of complex subjects, providing the details in the boxed sections entitled *A Closer Look*:



A Closer Look — These boxes focus on the more challenging details of topics such as chemiosmosis, the immune response, and urine formation in the nephron.

New in This Edition:

Our text has a new look and important new features which reflect the philosophy guiding the revision:

- ❖ Conceptual, full-sentence chapter subheadings highlight key concepts in each section. Figure titles now present the concept underlying each figure.

- ❖ The inheritance unit has been reorganized, allowing the classical experiments of genetics to be interpreted in the light of modern understanding of DNA and gene function.

- ❖ New essays have been added—some contributed by outside experts—covering topics such as DNA fingerprinting and the discovery of the gene for Huntington's disease.

- ❖ New end-of-chapter features include multiple choice questions, revised essay questions, and new questions that specifically relate chapter topics to issues in modern society and everyday life.

- ❖ The most creative, progressive supplements package available; including laser disc, CD-ROM, and Internet technology. Also a regularly updated *New York Times* supplement for students, and an ABC videos series. For a complete listing see page xi.

Acknowledgments

Biology: Life on Earth is truly a team effort, and we wish to acknowledge and thank our teammates.

The dauntingly complex task of putting together a book of this magnitude has been handled with unflagging dedication and zeal by the skilled development team at Prentice Hall. Ray Mullaney, Editor in Chief of Engineering, Science, and Mathematics development, and Nicole Gray, Assistant Development Editor, made sure the text was clear, consistent, and student-friendly. Ray continued to oversee the production of the text, contributing substantially to its design, photographic selection, and accuracy. Debra Wechsler, Senior Production Editor, patiently dealt with the minutiae of assuring accuracy in the art program and the translation from typed draft to final printed page. Tobi Zausner and Kathy Ringrose skillfully and doggedly tracked down excellent photos. Margo Quinto tackled the job of copyediting with meticulous care. Stephanie Hiebert did an excellent job in reading through the final typeset pages to help ensure accuracy in both text and art. We also wish to thank Heather Scott, our talented Art Director, for creatively guiding the text and cover design; Patrice Van Acker who coordinated the art program; John Jordan and his incredibly talented formatting team — Karen Noferi, Richard Foster, and David Tay. Mary Hornby has overseen the production of our print supplements, test bank, and transparencies. Linda Schreiber did a

fantastic job of coordinating the multimedia program, especially our exciting new laser disc and CD-ROM.

Colleagues at other institutions have helped us enormously. Many, listed in the following pages, have stimulated us to rethink our presentation with careful, thoughtful reviews. Essays were contributed by Joseph Chinnici, Mark Shotwell, and Gisele Muller-Parker. A wonderful supplements package was engineered by Joseph Chinnici, Kristin Uthus, Rhoda Perozzi, Gayle Sauer, Linda Butler, Andrew Stull, Steven Brunasso, Mike McKinley, and Blanche Haning. We thank Bill Stark, Richard Mortensen, Gerald Summers, Rhoda Perozzi, Florence Juillerat, Jerri Lindsey, Scott Freeman, and Dan Doak for contributing thought-provoking end-of-chapter questions.

Marketing is being handled with talent and enthusiasm by Kelly McDonald, our Executive Marketing Manager. We also would like to thank Paul F. Corey, Editor in Chief of Science, for his insight and support through the past two editions. Finally, but most importantly, our editor, Sheri Snaveley, has nurtured this project through thick and thin, smoothing rough spots and boosting our morale with her good humor, optimism, and energy.

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