

Preface

Inspired by the enthusiastic responses of the many users of the fifth edition, we authors have worked closely together to create a new, sixth edition that reflects current progress in biology and the evolving needs of today's courses and students. For this edition, the author team is fortunate to include Jean Dickey of Clemson University. Jean brings a wealth of experience teaching introductory biology, superb communication skills, and special expertise in ecology. She is also the author of the popular lab manual *Laboratory Investigations for Biology*, which has accompanied our book since its first edition.

The aim of *Biology: Concepts & Connections* has always been to engage students from a wide variety of majors in the wonders of the living world. Most of these students will not become biologists themselves, but their lives will be touched by biology every day. Today, understanding the concepts of biology and their connections to our lives is more important than ever. Whether we're concerned with our own health or the health of our planet, a familiarity with biology is essential. This basic knowledge and an appreciation for how science works have become elements of good citizenship in an era when informed evaluations of health issues, environmental problems, and applications of new technology are critical.

The "connections" to which the title of this book refers include many such practical applications of biology—and go beyond them. Biology has important connections with the other natural sciences and with the humanities and social sciences as well. And the study of life has no coherence without an understanding of the connections between the different areas of biology and an appreciation of the grand unifying theme of evolution. From its first edition, the hallmarks of this book have included an emphasis on connections within biology and between biology and other fields. In this sixth edition, we have increased the emphasis on connections to our everyday world while also doing more to help students connect the concepts of biology to evolution.

We could not have hoped to meet our ambitious goals for this book without extensive discussions with teaching colleagues around the world and feedback from many of the hundreds of instructors and hundreds of thousands of students who have used our earlier editions. We have been gratified by their enthusiasm for the book and have paid close attention to their thoughtful suggestions for improvement. For this edition, we set out to create a book that would be more effective than ever as a learning tool and would also integrate smoothly with the rich program of supporting materials at *mybiology*.

How can we help students learn—and enjoy—biology? How can we help instructors teach biology? Our responses to these questions are reflected in the teaching strategies we bring to the book. Below we describe our main strategies as they are embodied in *Biology: Concepts & Connections*, Sixth Edition.

Focus Students on the Main Ideas of Biology

Biology is a vast subject that gets bigger every year, but an introductory biology course is still only one or two terms long. In that brief time, we explore all of life, from molecules to ecosystems, while also trying to share the excitement of research breakthroughs. For beginning students confronting this avalanche of information, it can seem as important to memorize all the scientific terms and facts as it is to master and apply the major ideas. This situation changes, however, when students acquire a framework of key biological concepts into which they can fit the many new things they learn. It is this framework of concepts that will serve them long after they have forgotten specific facts and terms.

Concept Modules *Biology: Concepts & Connections* was the first introductory biology textbook to use concept modules to help students recognize and focus on the main ideas of each chapter. The heading of each module is not simply a topic title but a carefully crafted statement of a biological concept. Each concept heading serves as a focal point for a module, and the module's text and illustrations converge on that concept with explanation and, often, evidence. For example, "Sensory receptors convert stimulus energy to action potentials" announces a key concept in Chapter 29 (Module 29.2). The text and illustrations introduce the general principles of sensory reception and transduction, using the human sense of taste as an example. In this and other modules, we integrate the words and pictures to an unprecedented degree: The text walks the student through the illustrations, just as an instructor would do in class. In teaching a sequential process, such as the functioning of the taste-bud receptor cells (Figure 29.2), we number the steps in the text to correspond to numbered steps in the figure. The synergy between a module's verbal and graphic components transforms the concept heading into an idea with meaning to the student, serving both visual and nonvisual learners.

Integrated Media Relevant modules feature references to the BioFlix™ 3-D animations with tutorials, MP3 Tutors, Web Activities, and Web Process of Science Investigations available at *mybiology*. You can read about these valuable learning tools on page xx.

Checkpoint Questions The checkpoint question at the end of each module encourages students to test themselves as they proceed through a chapter. Some questions simply ask the student to restate the main concept or a corollary; others test understanding of the supporting evidence or ask the student to connect the concept to another concept in the book; still others require the student to carry out a calculation using information in the module. Feedback is provided on the spot: The answer is printed upside down beneath the question.

Help Students Connect the Concepts

How do we help students see the connections between concepts? First, we group the modules under prominent main headings, printed on orange bars, which form an overarching framework for the chapter. Students first see these main headings and their subordinate concepts and connections in the outline at the beginning of the chapter. Within the chapter, we often make use of overviews and reviews, and explanatory transitions at the beginnings or ends of modules help the modules flow as a continuous story. The chapter summary at the end of the chapter is organized using the main chapter headings. This Reviewing the Concepts section includes helpful visuals. Following the summary, a section called Connecting the Concepts helps students tie the chapter's concepts together for themselves. This section includes concept maps for students to complete and other graphic activities.

Relate Biological Concepts to Everyday Life

Connection Modules Students are more motivated to study biology when they can connect it to their own lives and interests—for example, to health issues, economic problems, environmental quality, ethical controversies, and social responsibility. In this edition, gold Connection tabs mark the numerous application modules that go beyond the core biological concepts. You can preview the Connection module headings on the front endpapers of the book.

Chapter-Opening Essays Most of the illustrated essays that introduce the chapters discuss topics that relate to readers' lives and interests. For example, Chapter 3, "The Molecules of Cells," opens with an essay on lactose intolerance. And a new essay for Chapter 26, "Hormones and the Endocrine System," discusses endocrine disruption caused by pollutants in the environment. Other introductory essays continue our earlier tradition of featuring a nonhuman organism and describing how it is adapted to its environment. One example is our new essay for Chapter 1, which focuses on African leopards, our cover organism. Our hope is that essays like this one will nurture students' appreciation for biological diversity.

Applying the Concepts Many of the questions in Applying the Concepts, found at the end of every chapter, encourage students to use the concepts they have learned in thinking about various social and environmental issues.

Adapt This Book to Fit Your Course

Though a biology textbook's table of contents must be linear, biology itself is more like a web of related concepts without a single starting point or prescribed path. Courses can navigate this network starting with molecules, with ecology, or somewhere in between, and most courses omit some topics. *Biology: Concepts & Connections* is uniquely suited to serve this variety of courses. The seven units of the book are largely self-contained, and in a number of the units, chapters can be assigned in a different order without much loss of coherence.

Moreover, the modular format of the chapters makes it easy to omit or to relocate modules within a syllabus.

Relate Biological Concepts to Evolution

The history of life on Earth goes back more than 3.5 billion years, and this past is the key to the present diversity of organisms. As the unifying theme of this textbook, evolution elevates biology from a collection of facts to a coherent study of changing life on a changing planet. In *Biology: Concepts & Connections*, students study the structure, function, and behavior of organisms in an evolutionary context. And throughout the book, students learn to view the unity and diversity of life—the similarities and differences among organisms—as the dual consequences of descent with modification. Our reorganized and enhanced coverage of evolution in Unit Three of this edition strengthens this unifying theme.

In addition, this edition has a new feature called Evolution Connections. In every chapter, one or more modules, identified by rust-colored tabs, highlight the relevance of evolution to some aspect of the chapter content. Examples include Module 12.21 on what genome sequences reveal about evolution and Module 20.2 on how the body forms of aquatic animals reflect natural selection.

Help Students Learn the Process of Science

A biology course should familiarize students with the scientific process—in particular, with the posing and testing of hypotheses. With a solid introduction to the process of science in Chapter 1, students will be equipped to appreciate the many examples throughout the book of how scientific concepts emerge from observations and experimental evidence. The book also puts human faces on science with Talking About Science modules, marked with teal tabs.

Many of the questions in Applying the Concepts, at the end of each chapter, give students personal practice with science as a process. At **mybiology**, students can access a wealth of interactive activities, including Process of Science Investigations, YouDecide, and GraphIt! In fact, this book will work best for students who participate actively in learning about biological concepts and their applications.

■ ■ ■

Introductory biology is the only science course that many students will take during their college years. Long after today's students have forgotten most of the specific content of their biology course, they will be left with general impressions and attitudes about science and scientists. We hope that this new edition of *Biology: Concepts & Connections* helps make those impressions positive and supports instructors' goals for sharing the fun of biology. To help us produce an even better text in the next edition, please send your comments and suggestions to us in care of our editor, Chalon Bridges, at Pearson Benjamin Cummings, 1301 Sansome Street, San Francisco, CA 94111. You can also send e-mail to chalon.bridges@pearson.com.

Jane Reece, Martha Taylor, Eric Simon, and Jean Dickey