

Preface

To the Student

Is it acceptable to clone humans? When does human life begin? What should be done about our warming planet? Who owns living organisms? What are our responsibilities toward endangered species? Having taught this course for nearly 40 combined years, we understand that no amount of knowledge alone will provide satisfactory answers to these questions. Addressing them requires the development of a scientific literacy that surpasses the rote memorization of facts. To make decisions that are individually, socially, and ecologically responsible, you must not only understand some fundamental principles of biology but also be able to use this knowledge as a tool to help you analyze ethical and moral issues involving biology. This is the aim of this textbook.

To help you understand biology and apply your knowledge to an ever-expanding suite of issues, we have structured each chapter of *Biology: Science for Life* around a compelling story in which biology plays an integral role. Through the story you not only will learn the relevant biological principles but also will see how science can be used to help answer complex questions. As you learn to apply the strategies modeled by the text, you will also be developing your critical thinking skills.

Even though you may not be planning to be a practicing biologist, well-developed critical thinking skills will enable you to make better decisions about issues that affect your own life and form well-reasoned, fact-based opinions about personal, social, and ecological issues.

To the Instructor

You are probably all too aware that teaching non-majors students is very different from teaching biology majors. You know that most of these students will never take another formal science course; therefore, your course may be the last chance for these students to appreciate how biology is woven throughout the fabric of their lives and to develop a deep understanding of the process of science. You recognize the importance of engaging non-majors because you know that these students will one day be voting on issues of scientific importance, holding positions of power in the community, serving on juries, and making health care decisions for themselves and their families. This text is designed to help you reach your goals.

By now, most non-majors biology instructors are aware that this book differs from other books in that we use a compelling storyline woven throughout the entire chapter to garner student interest. Once we draw students in, we keep them engaged by returning to the storyline again and again until the end of the chapter, when students should be able to form their own data-driven opinions about each topic. Storylines are skillfully crafted to allow the same depth and breadth of coverage as any non-majors biology text.

Our experience has taught us that students will not remember as many facts as we hope they will, but they can and do remember how to apply the scientific method to novel questions involving biology, and they can retain a strong appreciation for how science differs from other methods of understanding the world. To ensure our students leave our course with the ability to critically evaluate information they may come across, this text focuses heavily on process of science, providing opportunities for students to practice applying the scientific method and analyze data at every opportunity.

New to the Fifth Edition

The positive feedback obtained in previous editions assured us that presenting science alongside a story works for students and instructors alike. In the fifth edition, we have added two new features and several reorganized chapters. We also updated storylines and continued to improve popular features from previous editions as well as our supplements.

New Features: Working with Data and Sounds Right, But Is It?

In this edition, we have added new **Working with Data** questions to select figures within each chapter. Students are asked questions that guide them in how to carefully and critically analyze and interpret data in graphical, tabular, or written form. Each chapter contains at least one of these critical data analysis questions. In Chapter 6, for example, students are asked to evaluate a graph showing the cancer risks associated with smoking.

A new end-of-chapter feature, **Sounds Right, But Is It?**, addresses common misconceptions we know that our own students often have. In Chapter 4, for example, the misconception deals with whether use of laxatives can cause permanent weight loss. To help students identify

and discard such misconceptions, the description of the misconception is followed by guided inquiry questions, which lead students through a careful analysis of the reliability of the misconception, using the biological concepts from the chapter covered.

Updated Physiology Coverage and New Chapter

Content in physiology chapters has been significantly reorganized to address concerns from instructors that too much material was covered in too few chapters; what was once covered in two chapters is now spread over three. **Chapter 17** now focuses only on tissues and organs, while the new **Chapter 18** uses a discussion of the biology of the digestive and urinary systems as a way to help students understand the biological and safety consequences of binge drinking.

Revised Unit One Coverage

Because we have found that our students need more practice analyzing pseudoscientific information they come across, we are using **Chapter 2** of the book to build on **Chapter 1's** introduction to the scientific method. There, students will use their newly acquired skills to learn about life and evolution in analyzing whether zombies as they are portrayed in popular culture are “alive” and whether humans are evolutionarily progressing to become higher beings. They will learn basic biochemistry while determining whether the Bermuda Triangle is a site of massive ship and plane disappearances, whether ingesting sugar causes hyperactivity, and whether tryptophan in turkey does make people tired.

Updated Storylines

Our chapter on cellular respiration and body weight (**Chapter 4**) incorporates new meta-data showing that being underweight is less healthy than being overweight and the health consequences of being overweight start at higher weights than once thought. Our chapter on global warming and photosynthesis (**Chapter 5**) is updated to reflect the continued global changes resulting from this process. The cell division chapter (**Chapter 6**) helps students understand the biology of differently acquired cancers using the examples of the very public battles fought by celebrities like Angelina Jolie. The protein synthesis chapter (**Chapter 9**) has been updated to reflect current developments in pet and human cloning as well as so-called genetic pharming practices.

Our review of biological diversity (**Chapter 13**) now examines the question of humanity's supposed superiority over other species. The skeletal, endocrine, and muscular system coverage (**Chapter 21**) revolves around the

2014 inclusion of women's ski jumping as an Olympic sport for the first time, and the chapter on the nervous system has been revised to focus on the phenomenon of students sharing non-prescribed ADD meds with each other (**Chapter 23**).

Improved Pedagogy

With the previous editions, we focused on improving flexibility for instructors via **A Closer Look** chapter subsections; these are now streamlined and better identified within the text. Our popular **Roots to Remember** feature that helps students build their scientific vocabulary is now integrated into the chapter itself; students can find definitions for these terms as they occur. Features that help students assess their understanding within the chapter—**Stop and Stretch** and **Visualize This** questions—have been expanded and updated in nearly every chapter. Many **Savvy Reader** essays, found in every chapter and meant to develop students as better consumers of popular media, have been updated as well.

Supplements and Media

For the fifth edition, we've undertaken a significant revision and updating of the complete supplements package. Judi Roux EdD, a talented college instructor with years of classroom experience in non-majors biology and colleague of Colleen Belk at the University of Minnesota, Duluth, has undertaken authoring these innovative new items. We think you will find that the supplements she developed are brimming with ideas for how to reach this particular population of students. In addition to a completely revamped Instructor's Manual (for use in traditional lectures as well as flipped classrooms) and a test bank, we also provide slides, animation, and videos to enrich instruction efforts. Available online, the *Biology: Science for Life with Physiology* resources are easy to navigate and support a variety of learning and teaching styles. Judi Roux authored not only the Instructor Guide, MasteringBiology Quiz and Test Items, but the PowerPoint lectures as well.

New features in MasteringBiology include interactive concept maps and Working with Data exercises for each chapter. And our **Learning Outcomes** continue to provide support to students and instructors by organizing the chapter summary and tagging questions and activities within MasteringBiology and other ancillary material.

We believe you will find that the design and format of this text and its supplements will help you meet the challenge of helping students both succeed in your course and develop science skills—for life.

We look forward to learning about your experience with *Biology: Science for Life with Physiology, Fifth Edition*.