

Preface

This is a wonderful time to teach and learn biology. Opportunities to marvel at the natural world and the life within it abound. It's difficult to peruse a news website without finding stories that touch on biology and its intersection with society. In addition, the world of pop culture is rich with books, movies, TV shows, comic strips, and video games that feature biological wonders and challenge us to think about important biological concepts and their implications. Although some people say that they don't like biology (or, more often, science in general), nearly everyone will admit to an inborn biophilia. After all, most of us keep pets, tend a garden, enjoy zoos and aquariums, or appreciate time spent outdoors. Furthermore, nearly everyone realizes that the subject of biology has a significant impact on his or her own life through its connections to medicine, biotechnology, agriculture, environmental issues, forensics, and myriad other areas. But despite the inborn affinity that nearly everyone has for biology, it can be a struggle for nonscientists to delve into the subject. Our primary goal in writing *Campbell Essential Biology with Physiology* is to help instructors motivate and educate the next generation of citizens by tapping into the inherent curiosity about life that we all share.

Goals of the Book

Although our world is rich with “teachable moments” and learning opportunities, the explosion of knowledge threatens to bury a curious person under an avalanche of information. “So much biology, so little time” is the universal lament of nonmajors biology instructors. Neil Campbell conceived of *Campbell Essential Biology with Physiology* as a tool to help instructors and students focus on the most important areas of biology within a single semester. To that end, the book is organized into six core areas: cells, genes, evolution, ecology, animals, and plants. His vision, which we carry on and extend in this edition, has enabled us to keep *Campbell Essential Biology with Physiology* manageable in size without being superficial in developing the concepts that are most fundamental to understanding life. We take the “less is more” mantra in education today to mean fewer topics and more focused explanations, not content that is more diluted.

In countless conversations with instructors and students, we have noticed some important trends in how biology is taught. In particular, many instructors voice a desire to achieve three goals in their introductory biology courses for nonscience majors: (1) to engage students by relating the core content to their lives and the greater society; (2) to clarify the process of science by showing how it is applied in the real world; and (3) to demonstrate how evolution serves as biology's unifying theme. To help achieve these goals, every chapter of this book includes three important features. First, a chapter-opening section called Biology and Society highlights a connection between the chapter's core content and students' lives. Second, a section called The Process of Science describes how the scientific process has illuminated the topic at hand, using a classic

or modern experiment as an example. Third, a chapter-closing Evolution Connection section relates the chapter to biology's unifying theme of evolution. To maintain a cohesive narrative for each topic, the content of each chapter is tied together with a unifying chapter thread, a relevant high-interest topic that is woven throughout the three chapter essays and throughout the entire chapter. In this way, the unifying chapter thread ties together the three pedagogical goals of the course using a topic that is compelling and relevant to students.

New to This Edition

We hope that this latest edition of *Campbell Essential Biology with Physiology* goes even further to help students relate the material to their lives, understand the process of science, and appreciate how evolution is the unifying theme of biology. To this end, we've added significant new features and content to this edition:

- **New high-interest topics** Every chapter in *Campbell Essential Biology with Physiology* has its own unifying chapter thread—a high-interest topic that helps to demonstrate the relevance of the chapter content. The chapter thread is incorporated into the three main essays of each chapter (Biology and Society, The Process of Science, and Evolution Connection) as well as throughout the chapter text. In this edition, we significantly updated many of these topics and essays. For example, Chapter 2 (Essential Chemistry for Biology) includes a new chapter-opening essay on the causes and impacts of droughts. Chapter 7 (Photosynthesis: Using Light to Make Food, a potentially difficult-to-relate-to topic for many nonscience majors) has the new unifying chapter thread “Green Energy” and includes a new chapter-opening essay on biofuels. Chapter 23 (Circulation and Respiration) has the new unifying chapter thread “Athletic Endurance,” along with three new essays in the chapter that emphasize the role of training on athletic performance, a topic of great interest to many college students.
- **Updated content** As with every edition, we introduce timely, high-interest topics into the chapter content. For example, Chapter 6 (Cellular Respiration: Obtaining Energy from Food) mentions ethanol biofuels; Chapter 15 (The Evolution of Microbial Life) discusses the recent success that Craig Venter's team has had in “rebooting” one bacterial species with the lab-synthesized genome of another; Chapter 18 (An Introduction to Ecology and the Biosphere) notes the Deepwater Horizon oil spill; and Chapter 29 (The Working Plant) discusses the use of sunflowers to detoxify soil around the Fukushima nuclear disaster site.
- **Intriguing questions** Most people have questions about the subject of biology that are both relevant and highly illuminating. New to this edition, we have tapped into this innate curiosity by including a series of intriguing questions in large-type font within every chapter. Each chapter has from three to seven of these attention-grabbing

questions, always placed alongside the text that answers them. We hope that as students read the chapter, they will be drawn in by such questions and motivated to read the surrounding content to discover the answers. For example, Chapter 3 (The Molecules of Life) asks, "Why does chocolate melt in your mouth but not in the package?" as a hook to discuss the different properties of saturated and unsaturated fats. In Chapter 11 (How Genes Are Controlled), the question "Can cloning reverse extinction?" relates the process of nuclear transplantation to a discussion of ethical questions that surround it. Chapter 13 (How Populations Evolve), poses the question "If your parents spend a lot of money on orthodontia for you, will your children inherit nice, straight teeth?" to make students consider the heritability of phenotypic traits. Chapter 18 (An Introduction to Ecology and the Biosphere) asks, "Are vampire devices consuming electricity while you sleep?" to draw students' attention to actions they can take to reduce their carbon footprints. We expect these questions to pique students' curiosity and deepen their engagement with the content.

- MasteringBiology™ updates** Many instructors wish to encourage and assess student learning outside the classroom. To this end, we have created a new version of MasteringBiology that features more than 100 new interactive activities: Building Vocabulary exercises that ask students to place key terms within sentences and paragraphs, Learning Through Art activities that help students learn through labeling of important illustrations, Interpreting Graphs and YouDecide exercises that challenge students to assess quantitative information in ways that promote critical thinking, and Connecting the Concepts activities that help students see the relationship between different content areas. To make it easier for instructors to incorporate MasteringBiology into their courses, we have included a prebuilt course (SimonBiology: Bio-1010) that includes multiple assignments for each chapter. Each assignment is a mix of multimedia, interactive, and multiple-choice questions, which take between 20 and 40 minutes to complete. For each chapter, at least one assignment is written as prelecture preparation, and at least one more is intended as an applications-oriented summative assessment. Instructors can copy the entire course (and then simply change due dates to very quickly deploy the course) or pick and choose individual assignments. In addition, there are several new ways of assessing student achievement in key

content areas in MasteringBiology, including an Evolution Quiz that enables the instructor to track assumptions and measure learning gains and remedial exercises that can help students who struggle with the chemistry or math.

- Teaching the issues** Many instructors, including the authors, like to use current events to demonstrate the relevance of core content to students' lives. For this edition of *Campbell Essential Biology with Physiology*, we have created a series of instructor PowerPoint presentations that focus on important issues such as cancer, HIV, and global climate change. Each PowerPoint presentation topic has an associated MasteringBiology homework assignment that can be used to demonstrate learning gains, check comprehension, and root out misconceptions.
- Instructor Exchange** We know that instructors often struggle to find new ways to engage and excite nonmajors students, but many lack opportunities for interaction with like-minded colleagues. To tap into the tremendous wealth of talent that exists among biology instructors, we have created an Instructor Exchange blog and website (available through the Instructor Resources area within MasteringBiology) as a means of discussing and distributing proven strategies from the classroom. We invite instructors to view the site, search for activities that can help their students, and contribute their own ideas.
- Demonstrating learning outcomes** Instructors are often asked to demonstrate fulfillment of the learning outcomes that have been established for their course. The latest version of MasteringBiology greatly simplifies this process by keying individual questions and activities to one or more prewritten chapter-specific learning outcomes. In addition, instructors can add their own learning outcomes and associate them with specific tasks. Instructors can use the learning outcomes feature to generate a report that shows how student participation in MasteringBiology has fulfilled the goals established by these learning outcomes, allowing each instructor to assess student completion of the designated outcomes with greater ease.

Attitudes about science and scientists are often shaped by a single required science course—*this* course. We hope to tap into the innate appreciation of nature we all share and nurture this affection into a genuine love of biology. In this spirit, we hope that this textbook and its supplements will encourage all readers to make biological perspectives a part of their personal worldviews. Please let us know how we are doing and how we can improve the next edition of *Campbell Essential Biology with Physiology*.

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