Preface

As active scientists working in a wide variety of both basic and applied biology, we are fortunate to be part of a field that is not only fascinating but also changes rapidly. It is apparent not just in the time span since we started our careers—we see it every day when we open a newspaper or a scientific journal. As educators of both introductory and advanced-level students, we desire to convey our excitement about biology's dynamic nature.

This new edition of *Life* looks, and is, quite different from its predecessors. In planning the Eighth Edition, we focused on three fundamental goals. The first was to maintain and enhance what has worked well in the past—an emphasis on not just what we know but how we came to know it; the incorporation of exciting new discoveries; an art program distinguished by its beauty and clarity; plus a unifying theme. As should be the case in any biology textbook, that theme is evolution by natural selection, a 150-year-old idea that more than ever ties together the living world. We have been greatly helped in this endeavor by the addition of a new author, David Hillis. His knowledge and insights have been invaluable in developing our chapters on evolution, phylogeny, and diversity, and they permeate the rest of the book as well.

Our second goal has been to make *Life* more pedagogically accessible. From the bold new design to the inclusion of numerous learning aids throughout each chapter (see New Pedagogical Features), we have worked to make our writing consistently easy to follow as well as engaging.

Third, between editions we asked seven distinguished ecologists—all of whom teach introductory biology—to provide detailed critiques of the Ecology unit. As a result of their extensive suggestions, Part Nine, Ecology, has a fresh organization (see The Nine Parts). And one of the seven, May Berenbaum, has agreed to join the *Life* author team for the Ninth Edition. The other six stalwarts are thanked in the "Reviewers of the Eighth Edition" section.

Enduring Features

As stated above, we are committed to a blending of a presentation of the core ideas of biology with an emphasis on introducing our readers to the process of scientific inquiry. Having pioneered the idea of depicting seminal experiments in specially designed figures, we continue to develop this here, with 96 EXPERIMENT figures (28 percent more than in the Seventh Edition). Each follows the structure: Hypothesis, Method, Result, and Conclusion. Many now include "Further Research," which asks students to conceive an experiment that explores a related question.

A related feature is the RESEARCH METHOD figures, depicting many laboratory and field methods used to do this research. All the Experiment and Research Method figures are listed in the endpapers at the back of the book.

Another much-praised feature—which we pioneered ten years ago in *Life*'s Fifth Edition—is the BALLOON CAPTIONS used in our figures. We know that many students are visual learners. The balloon captions bring explanations of intricate, complex processes directly into the illustration, allowing the reader to integrate the information without repeatedly going back and forth between the figure and its legend.

Life is the only introductory biology book for science majors that begins each chapter with a story. These OPENING STORIES, most of which are new to this edition, are meant to intrigue students while helping them see how the chapter's biological subject relates to the world around them.

New Pedagogical Features

There are several new elements in the Eighth Edition chapters. Each has been designed as a study tool to aid the student in mastering the material. In the opening page spread, IN THIS CHAPTER previews the chapter's content, and the CHAPTER OUTLINE gives the major section headings, all numbered and all framed as questions to emphasize the inquiry basis of science.

Each main section of a chapter now ends with a RECAP. This key element briefly summarizes the important concepts in the section, then provides two or three questions to stimulate immediate review. Each question includes reference to pertinent text or a figure or both.

The CHAPTER SUMMARY boldfaces key terms introduced and defined in the chapter. We have kept the highlighted references to key figures and to the Web tutorials and activities that support a topic in the chapter.

Another new element, BIOBITS, is not strictly a learning aid, but offers intriguing (occasionally amusing) supplemental information. BioBits, like the opening stories, are intended to help students appreciate the interface between biology and other aspects of life.

Redesigned WEB ICONS alert the reader to the tutorials and activities on *Life*'s companion website (www.thelifewire.com). Each of these study and review resources, many of which are new for the Eighth Edition, has been created specifically for *Life*. A full list, by chapter, is found in the front endpapers of the book.

The Nine Parts

We have reorganized the book into nine parts. Part One sets the stage for the entire book, with the opening chapter on biology as an exciting science, starting with a student project, and how evolution unites the living world. This is followed by chapters on the basic chemical building blocks that underlie life. We have tried to tie this material together by relating it to theories on the origin of

life, with new discoveries of water in our solar system as an impetus.

In Part Two, Cells and Energy, we present an integrated view of the structure and biochemical functions of cells. The discussions of biochemistry are often challenging for students; thus we have reworked both the text and illustrations for greater clarity. These discussions are presented in the context of the latest discoveries on the origin of life and evolution of cells.

Part Three, Heredity and the Genome, begins with continuity at the cellular level, and then outlines the principles of genetics and the identification of DNA as the genetic material. New examples, such as the genetics of coat color in dogs, enliven these chapters. This is followed by chapters on gene expression and on the prokaryotic and eukaryotic genomes. Many new discoveries have been made in this new field of genomics, ranging from tracking down the bird flu virus to the genomes of wild cats, such as the cheetah.

Part Four, Molecular Biology: The Genome in Action, reinforces the basic principles of classical and molecular genetics by applying them to such diverse topics as cell signaling, biotechnology, and medicine. We use many new experiments and examples from applied biology to illustrate these concepts. These include the latest information on the human genome and the emerging field of systems biology. The chapter on natural defenses now includes a discussion of allergy.

Part Five, The Patterns and Processes of Evolution, has been updated in several important ways. We have emphasized the importance of evolutionary biology as a basis for comparing and understanding all aspects of biology, and have described numerous practical applications of evolutionary biology that will be familiar and relevant to the everyday lives of most students.

Recent experimental studies of evolution are described and explained, to help students understand that evolution is an ongoing, observable process. The chapters on phylogenetics and molecular evolution have been completely rewritten to reflect recent advances in those fields. Other changes reflect our growing knowledge of the history of life on Earth and the mechanisms of evolution that have given rise to all of biodiversity.

Part Six, The Evolution of Diversity, reflects the latest views on phylogeny. It continues to emphasize groups united by evolutionary history over classically defined taxa. This emphasis is now supported by an appendix on the Tree of Life that clearly maps out and describes all groups discussed in the text, so that students can quickly look up unfamiliar names and see how they fit into the larger context of life. We now discuss aspects of phylogeny that are still under study or debate (among major groups of eukaryotes, plants, and animals, for instance).

In Part Seven, Flowering Plants: Form and Function, we report on several exciting new discoveries. These include the receptors for auxin, gibberellins, and brassinosteroids as well as great progress on the florigen problem. We have updated our treatment of signal transduction pathways and of circadian rhythms in plants. The already strong treatment of environmental challenges to plants has been augmented by new Experiment figures on plant defenses against herbivores, one confirming that nicotine does help tobacco plants resist certain insects.

Part Eight, Animals: Form and Function, is about how animals work. Although we give major attention to human physiology, we embed it in a background of comparative animal physiology. Our focus is systems physiology but we also introduce the underlying cellular and molecular mechanisms. For example, our explanations of nervous system phenomena—whether they be action potentials, sensation, learning, or sleep—are discussed in terms of the properties of ion channels. The actions of hormones are explained in terms of the molecular mechanisms. Maximum athletic performance is explained in terms of the underlying cellular energy systems. Throughout Part Eight we try to help the student make the connections across all levels of biology, from molecular to behavioral, and to see the relevance of physiology to issues of health and disease. Of central importance in each chapter is mechanisms of control and regulation.

Part Nine, Ecology, begins with a new chapter that describes the scope of ecological research and discusses recent advances in our understanding of the broad patterns in the distribution of life on Earth. The next chapter, also new, combines Behavior and Behavioral Ecology. It shows how the decisions that organisms make during their lives influence both their survival and reproductive success, and also the dynamics of populations and the structure of ecological communities. The chapter on Population Ecology has new material that explains how ecologists are able to mark and follow individual organisms in the wild to determine their survival and reproductive success. Following a chapter on Community Ecology, another new chapter, Ecosystems and Global Ecology, shows how ecologists are expanding the scope of their studies to encompass the functioning of the global ecosystem. This discussion leads naturally to the final chapter in the book, Conservation Biology, which describes how ecologists and conservation biologists work to reduce the rate at which species are becoming extinct as a result of human activities.

Full Books, Paperbacks, or Loose-Leaf

We again provide *Life* both as the full book and as a cluster of paperbacks. Thus, instructors who want to use less than the whole book, or who want their students to have more portable units, can choose from these split volumes:

Volume I, The Cell and Heredity, includes: Part One, The Science and Building Blocks of Life (Chapters 1–3); Part Two, Cells and Energy (Chapters 4–8); Part Three, Heredity and the Genome (Chapters 9–14); and Part Four, Molecular Biology: The Genome in Action (Chapters 15–20).

Volume II, Evolution, Diversity, and Ecology, includes: Chapter 1, Studying Life; Part Five, The Patterns and Processes of Evolution (Chapters 21–25); Part Six, The Evolution of Diversity (Chapters 26–33); and Part Nine, Ecology (Chapters 52–57).

Volume III, Plants and Animals, includes: Chapter 1, Studying Life; Part Seven, Flowering Plants: Form and Function (Chapters 34–39); and Part Eight, Animals: Form and Function (Chapters 40–51).

Note that each volume also includes the book's front matter, Appendixes, Glossary, and Index.

Life is also available in a loose-leaf version. This shrink-wrapped, unbound, 3-hole punched version is designed to fit into a 3-ring binder. Students take only what they need to class and can easily integrate any instructor handouts or other resources.

Media and Supplements for the Eighth Edition

The media and supplements for *Life*, Eighth Edition have been assembled with two main goals in mind: (1) to provide students with a collection of tools that helps them effectively master the vast amount of new information that is being presented to them in the introductory biology course; and (2) to provide instructors with the richest possible collection of resources to aid in teaching the course—preparing, presenting the lecture, providing course materials online, and assessing student comprehension.

All of the *Life* media and supplemental resources have been developed specifically for this textbook. This gives the student the greatest degree of consistency when studying across different media. For example, the animated tutorials and activities found on the Companion Website were built using textbook art, so that the manner in which structures are illustrated, the colors used to identify objects, and the terms and abbreviations used are all consistent.

The rich collection of visual resources in the Instructor's Media Library provides instructors with a wide range of options for enhancing lectures, course websites, and assignments. Highlights include: layered art PowerPoint® presentations that break down complex figures into detailed, step-by-step presentations; a collection of approximately 200 video segments that can help capture the attention and imagination of students; and the new set of PowerPoint® slides of textbook art with editable labels and leaders that allow easy customization of the figures.

For a detailed description of all the media and supplements available to accompany the Eighth Edition, please turn to "Life's Media and Supplements package" on page xiii.

Many People to Thank

One of the wisest pieces of advice ever given to a textbook author is to "be passionate about your subject, but don't put your ego on the page." Considering all the people who looked over our shoulders throughout the process of creating this book, this advice could not be more apt. We are indebted to many people, who gave invaluable help to make this book what it is. First and foremost are our colleagues, biologists from over 100 institutions. Some were users of the previous edition, who suggested many improvements. Others reviewed our chapter drafts in detail, including advice on how to improve the illustrations. Still others acted as accuracy reviewers when the book was almost completed. Our publishers created an advisory group of introductory course coordinators. They advised us on a variety of issues, ranging from book content and design to elements of the print and media supplements. All of these biologists are listed in the Reviewer credits.

We needed a fresh editorial eye for this edition, and we were fortunate to work with Carol Pritchard-Martinez as development editor. With a level head that comes from years of experience, she was a major presence as we wrote and revised. Elizabeth Morales, our artist, was on her second edition with us. This time, she extensively revised almost all of the prior art and translated our crude sketches into beautiful new art. We hope you agree that our art program remains superbly clear and elegant. Once again, we were lucky to have Norma Roche as the copy editor. Her firm hand and encyclopedic recall of our book's many chapters made our prose sharper and more accurate. For this edition, Norma was joined by the capable and affable Maggie Brown. Susan McGlew coordinated the hundreds of reviews that we described above. David McIntyre was a truly proactive photo editor. Not only did he find over 500 new photographs, including many new ones of his own, that enrich the book's content and visual statement, but he set up, performed, and photographed the experiment shown in Figure 36.1. The elegant new interior design is the creation of Jeff Johnson. He also coordinated the book's layout and designed the cover. Carol Wigg, for the eighth time in eight editions, oversaw the editorial process. Her influence pervades the entire book—she created many BioBits, shaped and improved the chapter-opening stories, interacted with David McIntyre in conceiving many photo subjects, and kept an eagle eye on every detail of text, art, and photographs.

W. H. Freeman continues to bring *Life* to a wider audience. Associate Director of Marketing Debbie Clare, the Regional Specialists, Regional Managers, and experienced sales force are effective ambassadors and skillful transmitters of the features and unique strengths of our book. We depend on their expertise and energy to keep us in touch with how *Life* is perceived by its users.

Finally, we are indebted to Andy Sinauer. Like ours, his name is on the cover of the book, and he truly cares deeply about what goes into it.

David Sadava

Craig Heller

Gordon Orians

Bill Purves

David Hillis