Preface

Goals of the Twelfth Edition

The mission of Dr. Sylvia Mader's text, *Biology,* has always been to give students an understanding of biological concepts and a work knowledge of the scientific process. However, like the world around us, the process of teaching science is changing rapidly. Increasing instructors are being asked to engage their students by making content more relevant, while still providing students with a firm founda in those core principles on which biology is founded. These changes are clearly outlined in the AAAS/NSF report, *Vision and Change Undergraduate Biology Education* (2009). The eleventh edition of *Biology* was one of the first texts to address the principles of *Vision and Change* by integrating themes within the text. In this edition we expand on that effort with the development of a number of new resources and processes.

In addition to the evolution of the introductory biology curriculum, students and instructors are increasingly requesting digital resources to utilize as learning resources. McGraw-Hill Education has long been an innovator in the development of digital resources, and the *Biology* text, and its authors, are at the forefront of the integration of these technologies into the science classroom.

In this edition, the authors focused on the following areas:

1. utilization of the data from the LearnSmart adaptive learning platforms to identify content areas within the text that students demonstrated difficulty in mastering,
2. further development of the themes that connect the content of the text across multiple chapters,
3. development of a new series of videos and websites to introduce relevancy and engage students in the content,
4. refinement of digital assets to provide a more effective assessment of learning outcomes to enable instructors in the flipped, online, and hybrid teaching environments.

Relevancy

The use of real world examples to demonstrate the importance of biology in the lives of students is a key component of *Vision and Change* and an effective teaching strategy for introductory biology. The development of relevancy-based resources is a major focus for the authors of the Mader series of texts. Some examples include:

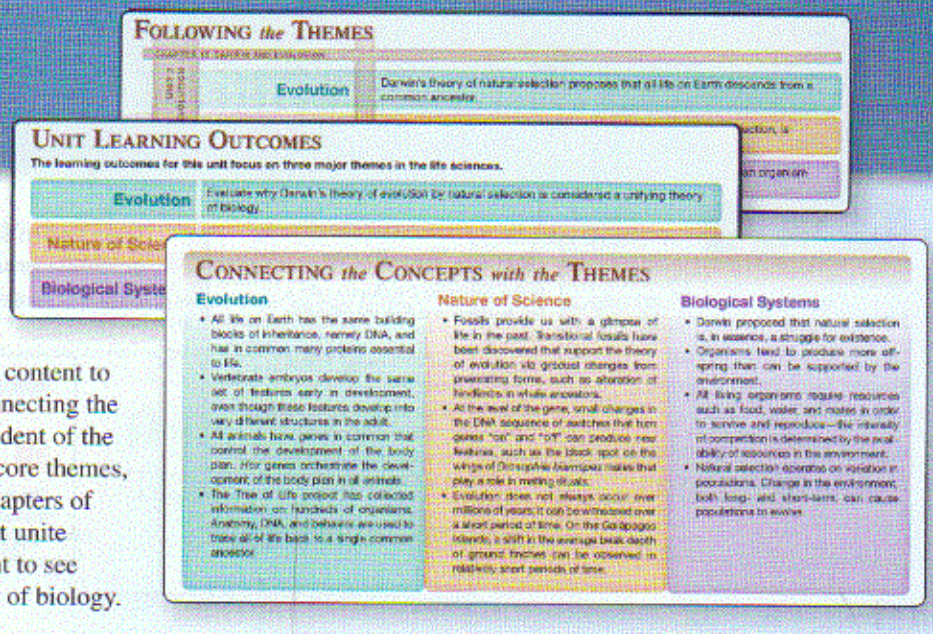
- A series of new chapter openers to introduce relevancy to the chapter. The authors chose topics that would be of interest to a nonscience major, and represent what would typically be found on a major news source.
- The development of new relevancy-based videos, BioNow Sessions, that offer relevant, applied classroom resources to allow students to feel that they can actually do and learn biology themselves. For more on these, see page ix.

- A new website, RicochetScience.com that provides update on news and stories that are interesting to nonscience maj The Biology101 project links these resources to the major topics of the text. The site also features videos to assist the students in recognizing the relevancy of what they are learning in the classroom.

Ricochet Science™

The Vision and Change document clearly identifies the need to integrate core concepts throughout the curriculum. We recognize that scientific literacy is not based upon the memorization of a series of facts. Instead, learning is based on establishing associations and links between what, at first glance appear to be diverse topics. The main themes we have chosen t emphasize include:

- Evolution
- Nature of Science
- Biological Systems



These themes are integrated into all aspects of the textbook, from the unit learning outcomes to the theme-based feature readings in the text. At the start of each chapter, "Following the Themes" introduces the relationship of the chapter's content to each of the themes. At the end of each chapter, "Connecting the Concepts with the Themes" not only reminds the student of the relationships between chapter content and the three core themes, but also acts as a prelude to topics in the next few chapters of the text. In essence, the themes act as the threads that unite the concepts throughout the text, enabling the student to see relationships from the molecular to ecosystem levels of biology.

Evolution Theme

Evolutionary change, along with the mechanism of natural selection, represents the unifying concept of the biological sciences. In essence, biological evolution is the thread that links all life together. Throughout this textbook, feature readings on this theme both demonstrate the process of evolution and illustrate how scientists study and measure evolutionary change. By following this theme through the book, students develop a better understanding of why evolution is a dynamic process, and one that has shaped, and will continue to influence, life on this planet.

Nature of Science Theme

Through the processes of observation, the application of the scientific method, and the use of both inductive and deductive reasoning, scientists study life. To develop a deeper understanding of the biological sciences, students must appreciate that the study of life is a process, and that this process has application in their everyday lives. This theme focuses not only on how biologists do science, but also on the influences scientific inquiry has on our understanding of our world.

Biological Systems Theme

From cells to ecosystems, all life is interconnected. Increasingly, scientists are becoming aware that small changes in the chemical composition of an ecosystem can have a tremendous influence on the life in that ecosystem. This theme was chosen to provide a holistic approach to the study of the life sciences, by demonstrating not only that all life is interconnected, but also that the principles regulating life at the cellular level play a role in physiology and ecosystem biology as well.

Assessment To help instructors assess their student's understanding of these core concepts, we have designed a series of Connect questions for each theme in each unit of the text .