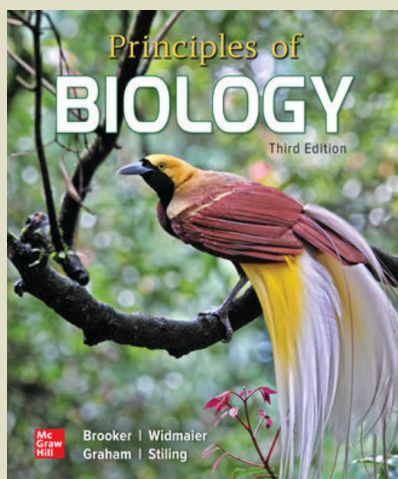


List of Changes



Principles of Biology 3rd Edition

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available in



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Principles of Biology is reflective of the shift taking place in the majors biology course from large and detail rich to short and conceptual, with a focus on new, cutting-edge science. A succinct and inviting text focused on central concepts, *Principles of Biology* helps students connect fundamental principles while challenging them to develop and hone critical thinking skills.

SEE LIST OF CHANGES ATTACHED.

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Content Changes to the Third Edition:

Chapter 1 An Introduction to Biology. This chapter has a new section on the adaptations that have occurred during the evolution of a family of species known as birds-of-paradise.

Chapter 2 The Chemical Basis of Life I: Atoms, Molecules, and Water. A Modeling Challenge has been added to Figure 2.2 to help students interpret models that depict the structure of atoms.

Chapter 4 Evolutionary Origin of Cells and their General Features. The topic of droplet organelles, which are organelles formed by liquid-liquid phase separation, has been added. An example is the nucleolus. A Modeling Challenge has been added that helps students understand the 9 + 2 array of microtubules found in cilia and flagella.

Chapter 5 Membranes: The Interface Between Cells and Their Environment. The topic of osmosis has been clarified to explain why water moves in a particular direction.

Chapter 6 How Cells Utilize Energy. A new section (Section 6.9) has been added on the topic of anaerobic respiration and fermentation, which includes two new figures.

Chapter 8 How Cells Communicate with Each Other and with the Environment. A Modeling Challenge has been added to Figure 8.9 that asks students to create a model that explains how the effects of estrogen are reversed.

Chapter 9 The information of Life: DNA and RNA Structure, DNA Replication, and Chromosome Structure. The information on chromosome structure has been updated by describing the role of SMC proteins in promoting the formation of radial loop domains (see Figure 9.21).

Chapter 10 The Expression of Genetic Material via Genes I. Transcription and Translation. New information regarding the spliceosome has been added.

Chapter 11 The Expression of Genetic Information via Genes II: Non-coding RNAs. Section 11.4 has been streamlined by focusing on microRNAs (miRNAs) and small-interfering RNAs (siRNAs).

Chapter 12 The Control of Genetic Information via Gene Regulation. Information has been added that describes how alternative splicing is regulated.

Chapter 13 Altering the Genetic Material: Mutation, DNA Repair, and Cancer. A Modeling Challenge has been added to Table 13.4 that asks students to create a model that explains how 5-bromouracil can cause a mutation.

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Chapter 14 The Eukaryotic Cell Cycle. The topic of checkpoints has been expanded and reorganized.

Chapter 16 Transmission of Genetic Information from Parents to Offspring II: Epigenetics, Linkage, and Extranuclear Inheritance. New information has been added regarding differences in epigenetic changes between finches in rural and urban environments.

Chapter 17 The Simpler Genetic Systems of Viruses and Bacteria. Section 17.1 from the second edition is now divided into two sections in the third edition.

Chapter 18 Genetic Technologies: How Biologists Study Genes and Genomes. A few of the newer methods of DNA sequencing are briefly discussed.

Chapter 19 Evolution of Life I: How Populations Change from Generation to Generation. A Modeling Challenge has been added to Figure 19.14 that asks students to propose a series of graphs that depicts the effects of diversifying selection.

Chapter 21 How Biologists Classify Species and Study Their Evolutionary Relationships. Information on the eukaryotic supergroups has been updated.

Chapter 22 The History of Life on Earth and Human Evolution. The topic of human evolution has been updated.

Chapter 23 Diversity of Microbial Life: Archaea, Bacteria, Protists, and Fungi. This chapter on the diversity of prokaryotic and eukaryotic microbial life was heavily revised in the second edition to integrate material previously covered in separate chapters. A Modeling Challenge was added to Figure 23.22 that asks the student to add endosymbiotic events to the eukaryotic phylogenetic tree.

Chapter 24 Microbiomes: Microbial Systems on and Around Us. This chapter, added to the second edition, integrates current information about microbes (archaea, bacteria, protists, and fungi) within complex organism-gene systems known as microbiomes, a major frontier of biological sciences. A Modeling Challenge was added to Figure 24.10 that asks the student to evaluate the different concepts of lichen microbiomes.

Chapter 25 Plant Evolution: How Plant Diversification Changed Planet Earth. A Modeling Challenge was added to Figure 25.10 that asks the student to predict the changes in carbon dioxide levels in Earth's atmosphere over time.

Chapter 26 Invertebrates: The Vast Array of Animal Life Without a Backbone. A new chapter-opening vignette describes how seemingly complex patterns in butterfly wings are linked to just a single gene. The implication of this work is that much of the Earth's biodiversity may be caused by relatively simple genetic changes. Several new BioConnections have been added to existing figures.

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Chapter 27 Vertebrates: Fishes, Amphibians, Reptiles, and Mammals. New opening paragraphs discuss the longevity of naked mole rats. Researchers have speculated that a more detailed knowledge of naked mole rat biology may unlock the secrets of aging for humans and other animals. Speaking of aging, we discuss how Greenland sharks are probably the oldest living animals on Earth. Since mammals are amniotes, a new Modeling Challenge added to Figure 27.11 asks students to make a drawing comparing the amniotic egg to reptiles and eutherian mammals.

Chapter 28 An Introduction to Flowering Plant Form and Function. A Modeling Challenge was added to Figure 28.10 that asks the student to draw a model of the cell wall of genetically modified plants.

Chapter 29 How Flowering Plants Sense and Interact with Their Environments. Some new images were commissioned specifically for this textbook, to aid student comprehension of key concepts. A Modeling Challenge was added to Figure 29.2 that asks the student to plan an experiment to be performed in space examining plant stimuli.

Chapter 30 How Flowering Plants Obtain and Transport Nutrients. Some new images have been incorporated to foster student understanding. A Modeling Challenge was added to Figure 30.9 that asks the student to draw models that show how soil nutrients that are cations are affected by acid rain.

Chapter 31 How Flowering Plants Reproduce and Develop. A Modeling Challenge was added to Figure 31.10 that asks the student to evaluate different aspects of synergids, how they interact with the egg cell and later when the pollen tube reaches the micropyle.

Chapter 32 General Features of Animal Bodies, and Homeostasis as a Defining Principle of Animal Biology. The concept of how water distributes in an animal's body fluid compartments has been elaborated on with a new Modeling Challenge.

Chapter 33 Neuroscience I: The Structure, Function, and Evolution of Nervous Systems. The description of animal nervous systems has been reorganized under the banner of "Evolutionary Connections" to emphasize how nervous systems evolved from simple nerve nets to complex systems such as those of vertebrates. A Modeling Challenge has been added on the topic of action potentials.

Chapter 34 Neuroscience II: How Sensory Systems Allow Animals to Interact with the Environment. New information has been added to the section on color vision in animals, including recent discoveries related to restoration of trichromatic vision in monkeys with dichromatic vision. A Modeling Challenge has been added that asks students to predict the consequence of two different but simultaneously occurring visual disorders in humans.

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Chapter 35 How Muscles and Skeletons Are Adaptations for Movement, Support, and Protection. Recent information that is revising scientists' understanding of the evolution of animal skeletons has been added. A Modeling Challenge has been added on the cross-bridge cycle, specifically how the cycle is arrested during rigor mortis.

Chapter 36 Circulatory and Respiratory Systems: Transporting Solutes and Exchanging Gases. The Quantitative Analysis feature that describes how blood pressure and resistance determine blood pressure has been supplemented with a Modeling Challenge that requires the student to further explore how these three important variables are related.

Chapter 37 Digestive and Excretory Systems Help Maintain Nutrient, Water, and Energy Balance and Remove Waste Products from Animal Bodies. The importance of an animal's microbiome to digestion is now emphasized. A more detailed description of the anatomy of alimentary canals and sphincters is included. A Modeling Challenge has been added that relates to antidiuretic hormone.

Chapter 38 How Endocrine Systems Influence the Activities of All Other Organ Systems. The complex feedback relationship between Ca^{2+} and parathyroid hormone has been edited for clarity and expanded upon with a Modeling Challenge.

Chapter 39 The Production of Offspring: Reproduction and Development. The Impact on Public Health section has been updated to reflect current statistical data on human reproductive or developmental diseases and disorders.

Chapter 40 Immune Systems: How Animals Defend Against Pathogens and Other Dangers. Recent new information regarding the evolution of toll-like receptors has been added. The structure and function of immunoglobulins have been elaborated upon with a new Modeling Challenge. The two major mechanisms of cytotoxic T-cell action are now distinguished.

Chapter 41 Integrated Responses of Animal Organ Systems to a Challenge to Homeostasis. The discussion of the structure, function, and (new to this edition) evolution of baroreceptors and the baroreceptor reflex has been expanded, including a new Modeling Challenge and new Evolutionary Connections feature.

Chapter 42 Behavioral Ecology: The Struggle to Find Food and Mates and to Pass On Genes. A new chapter-opening vignette describes how selective breeding of red foxes in Russia has produced different genetic lines of relatively tame foxes and more aggressive foxes. Genetic studies have shown how these behavioral differences are related to genetic changes in the fox's genomes.

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Chapter 43 Population Growth and Species Interactions. New technological breakthroughs in ecology, including the use of drones and phone applications, are described. New technology has allowed ecologists to better document wildlife abundance in remote and inaccessible locations and document the spread of tree species across the United States.

Chapter 44 Communities and Ecosystems: Ecological Organization of Large Scales. A new subsection in Section 44.6, together with Figure 44.20 and Figure 44.21, describes how the biomass distribution on Earth varies across taxa and location. Trees constitute by far the highest percentage of the Earth's biomass, about 80 percent.

Chapter 45 How Climate Affects the Distribution of Species on Earth. This chapter now provides greatly expanded coverage of the Earth's terrestrial biomes, with new text and many new figures. A new Modeling Challenge for Figure 45.11 asks students to use temperature and precipitation data to position the chaparral biome on a Whittaker plot.

Chapter 46 The Age of Humans. This chapter highlights new research that shows how weathering of the Earth's bedrock provides about a quarter of the nitrogen circulating through the nitrogen cycle. The discussion of eutrophication has been modernized using Lake Erie and Lake Washington as examples. Also, Figure 46.25 on the collapse of the Canadian cod industry has been updated, and Section 46.7 on invasive species has been simplified.

Chapter 47 Biodiversity and Conservation Biology. Section 47.2 provides a fuller discussion of the ethical reasons for conserving biodiversity, while Section 47.3 has simplified the debate around conservation strategies. The chapter, and the book, concludes with a new subsection on conservation and sustainability.

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