Biology: The Essentials, 3e
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Chapter by Chapter Changes

Chapter 1 (The Scientific Study of Life): Developed new mini glossary comparing sexual and asexual reproduction; revised figure 1.12 to include experimental design.

Chapter 2 (The Chemistry of Life): Clarified definitions in mini glossary of matter; added periodic table entry and definitions to figure 2.4; developed new table 2.3 to summarize water's characteristics; improved illustration of cellulose in figure 2.19 to show hydrogen bonds; omitted vitamin D as an example of a steroid; updated nutrition label in What's the Point? Applied to conform with latest FDA guidelines; wrote new Investigating Life on defensive chemicals in ants; simplified and improved summary figures for clarity.

Chapter 3 (Cells): Clarified functions of free-floating and membrane-bound ribosomes. Added the following ebook-specific learning tools: table summarizing cell junctions; table summarizing the structures in eukaryotic cells.

Chapter 4 (The Energy of Life): Explained how kinetic energy relates to an object's temperature; made small changes to section 4.1 to clarify the passage on energy transformations; clarified definition of negative feedback; improved illustrations of plant cells in figure 4.17. Added the following ebook-specific learning tool: table showing types of energy.

Chapter 5 (Photosynthesis): Expanded mini glossary of leaf anatomy; revised caption of figure 5.5 to clarify components of photosystems (based on SmartBook user data); improved description of electron transport chain in the light reactions; clarified passage on C4 pathway; wrote new Investigating Life on solar- powered salamanders. Added the following ebook-specific learning tool: table summarizing photosynthetic pigments.

Chapter 6 (Respiration and Fermentation): Changed chapter title to complement "Photosynthesis" chapter title; revised caption of figure 6.2 to include the role of electron carriers (based on SmartBook user data); clarified in several places through- out the chapter that proton is synonymous with hydrogen ion (H+); improved figure 6.9 to show how nitrogen from amino acids becomes a metabolic waste (based on SmartBook user data). Added the following ebook-specific learning tools: table showing where respiration occurs in prokaryotes and

eukaryotes; table comparing respiration and photosynthesis.

Chapter 7 (DNA Structure and Gene Function): Omitted the implication that transcription is a stage of protein synthesis (i.e., proteins are produced only in translation); added new mini glossary to help students understand the relationships between nucleotides, genes, chromosomes, and genomes (based on SmartBook user data); clarified that each cell contains many different tRNA molecules; improved figure 7.8 by zooming in on the codon/anticodon interaction (based on SmartBook user data); added photo of translation to complement the translation art in figure 7.9; expanded coverage of epigenetics, both in the main narrative and in Burning Question 7.1; added Ebola and Zika viruses to table 7.2, which lists viruses that infect humans; improved viral replication figure 7.18 to show receptors on the entire cell surface; wrote new subsection within section 7.8 explaining how influenza causes symptoms; improved and expanded mini glossary of viruses; clarified Investigating Life section and reworked figure 7.A to include evolutionary tree; improved summary figures 7.25, 7.26, and 7.28; added summary table 7.3 comparing viruses and cells. Added the following ebook-specific learning tools: table describing three types of RNA; tables summarizing the stages of transcription and translation (based on SmartBook user data); table summarizing regulated points in protein production.

Chapter 8 (DNA Replication, Binary Fission, and Mitosis): Improved definitions in mini glossary of cell division; used the words align and line up consistently (in referring to chromosome movements) to conform with changes in chapter 9; modified Burning Question 8.1 to include cancer cells; briefly mentioned newer cancer therapies (such as immunotherapy); wrote new Investigating Life essay that explains how evolutionary principles can be used in planning chemotherapy; added mini glossary of cell division terms to chapter summary.

Chapter 9 (Sexual Reproduction and Meiosis): Used the words align, line up, and orient consistently (when referring to chromosome movements); explicitly listed in the narrative three mechanisms that generate genetic variability and added new Figure It Out problem in section 9.5 (based on SmartBook user data); defined recombinant and parental chromatids to improve consistency with chapter 10 and added both terms to a miniglossary; revised figure 9.15 (Pull It Together) to improve the connections among the terms.

Chapter 10 (Patterns of Inheritance): Clarified some headings and subheadings to better reflect chapter content; changed alleles for yellow and green seeds from G and g to Y and y in art and narrative; clarified cookbook analogy by relating it back to chapter 7; added an explanation for why certain alleles are recessive; clarified that cells with incorrect chromosome numbers may not have exactly two alleles per gene; reworked Burning Question 10.1 to focus more on the warning label; improved mini glossary of genetic terms by adding some terms and revising others; improved illustration of test cross (figure 10.8); clarified explanation of the product rule; more clearly distinguished recombinant chromatids from recombinant offspring (based on SmartBook user data); clarified explanation of ABO blood group system; improved explanations of pleiotropy and many gene/one phenotype situations; connected environmental effects on gene expression to epigenetics; reworked figure 10.25 to add the frequency of each possible skin color phenotype; updated Investigating Life essay to include two-toxin strategy for slowing the evolution of Bt-resistant insects; added new summary figure 10.26 to show the connection between mutations and Punnett squares; improved summary figure 10.27 to better illustrate the light bulb analogy. Added the following ebook-specific learning tools: new figure depicting the P, F1, and F2 generations (based on SmartBook user data); new summary figure showing a timeline that includes the main genetics-related events described in the chapter

Chapter 11 (DNA Technology): Expanded passage on ethical issues related to transgenic organisms; added content on high-throughput DNA sequencing methods; updated data on DNA exonerations; added content on cloning in plants, including a new illustration (figure 11.10); added new subsection to section 11.4 on CRISPR-Cas9, including a new illustration (figure 11.15).

Chapter 12 (Forces of Evolutionary Change): Improved figure 12.8 to show the connection between natural selection and DNA; added table listing misconceptions about evolution and showing how a biologist would address each (based on SmartBook user data); added new Burning Question about whether there is a "pinnacle of evolution"; modified figure 12.13 to make the Hardy–Weinberg equations more prominent; modified figure 12.14 to include three phenotypes for directional selection; clarified the distinction between the bottleneck effect and natural selection; wrote new Investigating Life on antibiotic-resistant bacteria from livestock; reworked figure 12.24 (Pull It Together) to make it more informative.

Chapter 13 (Evidence of Evolution): Added the proposed Anthropocene epoch to geologic timescale (figure 13.2); improved figure 13.15 for clarity and to add a lemur ex- ample. Added the following ebook-specific learning tools: mini glossary of estimating a fossil's age; mini glossary of comparative anatomy.

Chapter 14 (Speciation and Extinction): Made small changes to several evolutionary trees to ensure consistent use of the word ancestor; added terms to mini glossary of speciation and extinction; revised Why We Care 14.1 to add new illustration and information about why extinctions are important; wrote new Burning Question 14.2 ("Did rabbits come from frogs?"); clarified the relation- ship between genus and species (based on SmartBook user data); wrote a new Investigating Life essay on plant "protection rackets." Added the following ebook-specific learning tools: mini glossary of reproductive barriers; new figure showing multiple ways to depict the same evolutionary relationships.

Chapter 15 (Evolution and Diversity of Microbial Life): Made small changes to several evolutionary trees to ensure consistent use of the word ancestor; clarified that the outer membrane is considered part of the cell wall in bacteria; added mini glossary of prokaryote anatomy and revised mini glossary of prokaryote diversity; reworked figure 15.12 to clarify aerobic and anaerobic habitats; foreshadowed in section 15.2C that proteobacteria and cyanobacteria are related to the bacteria participating in endosymbiosis, then returned to that idea in section 15.3A and in figure 15.19; clarified explanation of nitrogen fixation; referred specifically to human microbiota; wrote new Burning Question 15.2 about areas on Earth without life; added new figure 15.21 to illustrate the evolution of multicellularity; clarified basidiomycete life cycle in figure 15.35; added illustration (figure 15.37) showing fungi in everyday life; based on heat map data, clarified the differences between arbuscular mycorrhizae and ectomycorrhizae and between endophytes and mycorrhizae; revised figure 15.40 to show resources exchanged between the partners in a lichen. Added the following ebook-specific learning tools: mini glossary of types of algae; table of plasmodial and cellular slime mold life cycles; mini glossary of types of protozoa; mini glossary of fungal anatomy; mini glossary of fungal partnerships.

Chapter 16 (Evolution and Diversity of Plants): In section 16.1's narrative, clarified relationship between zygote and sporophyte (based on SmartBook user data); reworked figure 16.10 to clarify that fern gametophytes do not self-fertilize; in section 16.4, clarified that ovules develop into seeds in narrative and corresponding art. Added the following ebook-specific learning tool: table listing key plant-adaptations.

Chapter 17 (Evolution and Diversity of Animals): Clarified arrows depicting gastrulation in figure 17.5; added new mini- glossary of arthropod diversity; modified figure 17.30 to better high- light the three groups of primates; clarified that Ardipithecus species are extinct and mentioned the recently discovered H. naledi fossils; added evolutionary tree to figure 17.C (Investigating Life).

Chapter 18 (Populations): Updated demographic data for the world population in art and narrative; improved explanation of the demographic transition and added new il- lustration (figure 18.14); updated information on China's one-child pol- icy. Added the following ebook-specific learning tool: mini glossary of population growth.

Chapter 19 (Communities and Ecosystems): Made small corrections to convection cells in figure 19.4; added new figure 19.14 to illustrate mutualism and commensalism; updated data about mercury in tuna; added new Burning Question 19.2, comparing bottled water with tap water; clarified the meaning of the word eutrophication; wrote new Investigating Life essay on monarch butterfly migration.

Chapter 20 (Preserving Biodiversity): Added the term Anthropocene and a new illustration (figure 20.2) illustrating where human impacts on the biosphere are most intense; mentioned the acronym HIPPO at the start of the chapter; added landfills as a source of water pollution; improved narrative and figure 20.9 explaining acid deposition; updated narrative and improved figure 20.10 explaining greenhouse effect; added graph to figure 20.12 showing de- cline in the extent of Arctic sea ice; added advice for people who fish to Burning Question 20.5; clarified figure 20.19 (Pull It Together). Added the following ebook-specific learning tools: table listing consequences of global climate change; mini glossary of pollution.

Chapter 21 (Plant Form and Function): Added art of shoot apical meristem to figure 21.15; clarified that axillary bud and lateral bud are synonymous; wrote new Burning Question 21.2 about controlled burns; clarified that hormones are present in xylem sap; added photo of a wilted plant (figure 21.21) and a corresponding description of why plants wilt when soil is too dry.

Chapter 22 (Reproduction and Development of Flowering Plants): Clarified passage on flower structure; added mini glossary of the angio- sperm life cycle (based on SmartBook user data); clarified passage on coevolution between flowers and pollinators; clarified role of cotyledons in eudicots and monocots; added photo of coconut to figure 22.9 to show a water-dispersed fruit; added new Why We Care 22.1 on "talking plants"; annotated figure 22.15 to show how photoperiod affects flowering time.

Chapter 23 (Animal Tissues and Organ Systems): Modified art for simple columnar epithelium in figure 23.2 to better match the accompanying photo; added new Burning Question 23.1 on the body's reaction to food poisoning; clarified narrative and figure 23.8 to identify the stimulus, sensor, control center, and effector(s); added mini glossary of negative feedback; clarified definition of ectotherm. Added the following ebook-specific learning tools: mini glossary of animal anatomy and physiology; mini glossary of animal tissues; mini glossary of temperature homeostasis.

Chapter 24 (The Nervous System and the Senses): Added new mini glossary of neuron anatomy; clarified definitions of membrane potential and resting potential (based on SmartBook user data); clarified why the inside of a resting neuron has a net negative charge; labeled the voltage meters in figures 24.4 and 24.5 to clarify their function; added context to figure 24.13 illustrating the blood–brain barrier; added information about concussions to section 24.6; wrote new Burning Question 24.2 explaining whether we use 10% of our brain; improved figure 24.19 by showing context for the olfactory bulb and olfactory epithelium; added new mini glossary of vision; clarified in figure 24.24 that the overlying membrane in the cochlea does not consist of cells; expanded description of cochlear implants. Added the following ebook-specific learning tools: mini glossary of membrane potentials; mini glossary of smell and taste; mini glossary of hearing.

Chapter 25 (The Endocrine System): Added paragraph about negative feedback loops to section 25.1; clarified that internal hormone receptors may be in the cytosol or in the nucleus and elaborated that steroid hormones may either stimulate or inhibit protein production (based on SmartBook user data); completed descriptions of effects of ADH and oxytocin in figure 25.4; reworked Burning Question 25.1 to focus on endocrine disruptors; adjusted labels in figure 25.7 to add the role of the hypothalamus as a sensor; adjusted labels in figure 25.9 to add the role of the pancreas as a sensor; reworked figure 25.11 showing the correlation between obesity and diabetes; re- worked the What's the Point? Applied box to focus on chronic stress. Added the following ebook-specific learning tool: summary table of hormones and their functions.

Chapter 26 (The Skeletal and Muscular Systems): Clarified illustration of scoliosis (figure 26.3); revised figures in section 26.4 for clarity and improved page layout; improved description of the sarcomere and of the cross bridges in the sliding filament model; added a paragraph about sports balms to Burning Question 26.2; added mini glossary of the muscular system to the chapter summary. Added the following ebook-specific learning tool: table outlining the steps of muscle contraction.

Chapter 27 (The Circulatory and Respiratory Systems): Improved consistency between ABO blood type passage in section 27.1 and related material in section 10.6; clarified the roles of the pulmonary and systemic circulation, especially with regard to O_2 and CO_2 (based on SmartBook user data); wrote new Burning Question 27.3 on extreme exercise; added terms to the mini glossary of circulation; clarified blood pressure monitors in figure 27.13. Added the following ebook-specific learning tools: mini glossary of the heartbeat; mini glossary of breathing.

Chapter 28 (The Digestive and Urinary Systems): Improved consistency in the use of ions and salts throughout the chapter (based on SmartBook user data); added information about how a high- fiber diet lowers cholesterol and helps regulate blood sugar; updated figure 28.4 to reflect new nutrition label regulations; added Burning Question 28.1 about fad diets; clarified that the stomach does not absorb the proteins it begins to digest (based on SmartBook user data); clarified illustration of the large intestine (figure 28.19).

Chapter 29 (The Immune System): Improved explanation of lymph; clarified narrative, figure 29.7, and figure 29.10 to show clonal selection for both T cells and B cells; added paragraph about cancer immunotherapy; reworked figure 29.13 illustrating the effects of immune-deficiencies; clarified that mast cells and basophils participate in allergies; added new Burning Question 29.2 about tick-transmitted meat allergies; added narrative about "retraining" the immune system in children with peanut allergies.

Chapter 30 (Animal Reproduction and Development): Clarified description of external fertilization; improved explanation of how oocytes enter uterine tubes; changed sexually transmitted diseases to sexually transmitted infections to recognize that not all infections lead to visible disease symptoms; added a labeled sperm cell to figure 30.12 to remind students where the acrosome is (based on SmartBook user data); clarified two descriptions in table 30.4; improved the explanation and illustration (figure 30.15) of the placenta's structure and function; added labels to clarify the stages of childbirth in figure 30.18; added new summary figure 30.20 to illustrate the paths of sperm and egg cells. Added the following ebook-specific learning tools: mini glossary of embryonic support structures; new summary table showing a timeline of human development (based on SmartBook user data).

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