OpenStax Biology 2e transition guide

Why was Biology updated?

OpenStax undertakes full-scale revisions when it is pedagogically necessary or when authors and adopters agree that the textbook should be significantly reorganized or rewritten. When we make a revision of this size, we create a new edition of the textbook. The scope of change varies with each book, but generally OpenStax considers that anything greater than a 15% overall change warrants a new edition.

Global changes

Biology was updated to enhance clarity, accuracy, and currency. In that process, chapter revisions typically involved readability and content edits. Most chapters included both types of edits, but one type may be more predominant than others, and is labeled as such in the table on the following page.

Additional book-wide changes include

- Art was updated throughout the text, for either accuracy, clarity, visual appeal, or accessibility.
- Assessments were added to more than 35 of the chapters.
- The entire book's accessibility was analyzed and improved. Many figures were corrected to improve color contrast, alternative text was expanded, and navigation aspects were addressed.

Thematic Changes

- Increased focus on evolutionary linkages. This often takes the form of brief notes or examples that indicate the origins or connections to different species or clades. Some instructors may view these details to be extraneous, but because we include them only briefly, our authors and reviewers felt they were worthwhile.
- Increased balance regarding kingdom representation. The more balanced presentation aims to avoid animal-centricity. In particular, differences between plant and animal functions are more clearly laid out, and references that in the first edition pertained only to animals (e.g. using the word "body") have been altered.
- Updated phylogenetic information and a greater acknowledgement of the ongoing nature of these discussions.
- Life cycle specificity. Deeper discussion, examples, and implications of diploid/haploid aspects of reproduction.
- Balanced coverage of human impacts within the ecology unit. The significant impact of humans on various aspects of ecology cannot be overstated. However, in the first edition, references or details about human influences often overtook the concept at hand. For example, in the first edition, the human impact on a geochemical cycle often interrupted the explanation of that cycle. The emphasis is still very strong, but flows more logically to drive a more complete student understanding.

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Chapter revisions

Chapter(s)	General description	Specific change examples

Chapters 1-3	Readability and minor factual/ currency updates	• Over 700 readability edits in each chapter.
		• Image corrections for accuracy:
		  • For example, Figures 2.9, 2.10, 2.12 atomic structure revisions; Figure 1.6, changing scientific method verbiage from "correct" to "supported" hypotheses.
		• Updates to quantities and other data based on recent discoveries.
		  • For example, updating the time period of life formation on earth; changing the number of essential amino acids based on current research.

Chapters 4-6	Readability and more significant factual/currency updates	• Several hundred verbiage edits in each chapter.
		• Significantly revised artwork in chapter 4-5:
		  • Ch 4 Cellular Junction (Figs 4.28-4.31)
		  • Ch 5 Bulk Transport (Figs 5.20-5.23)
		• New assessments in each chapter.

Chapters 7-10	Moderate content and coverage edits	• Rewrites, currency, and accuracy updates at the sentence and paragraph level. • Revised to better represent plants and microorganisms in processes and descriptions, avoiding animal bias. • Minor but important figure revisions for accuracy and clarity, particular in the highly detailed illustrations of the Citric Acid Cycle (ch 7), Electron Transport Chain (ch 7), Photosynthesis (ch 8), and Cell Division (ch 10). • New assessments in each chapter.

Chapter 11	Significant content/ coverage edits	• Significant reworking of the Life Cycle portion in 11.2:
		  • Removing the titles and references to life-cycle types (diploid-dominant, haploid-dominant) in favor of more widely applicable treatment.
		  • This change ensures that the discussion applies to all organisms.
		  • The details are generally the same as in the first edition, but the labeling and referencing is removed, and plant-specific references have been added.
		• More coverage and clarification of crossover.
		• New assessments in each chapter.

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Chapters 14-15	Significant content/ coverage edits	• Chapter 14's changes are focused on the chemical basis for the concepts being explained.
		  • 14.2: The structure of the nuceic acid sugars is described in more detail
		  • 14.6: Includes a bit more discussion of the codon/base source of silent mutations.
		• Chapter 15
		  • 15.2: The major RNA transcription figure and its discussion were broken up into smaller components in order to present the material more gradually, particularly in light of some added detail to each component.
		  • 15.3: Added coverage on transcription factors
		  • New assessments in each chapter.

Chapter 16	Significant content/ coverage edits	• General content updating, focused on accuracy and currency more than simply readability. • Reworked section 16.2 to provide more baseline discussion of activators and repressors before moving into detail • Added detail to 16.4 on different types of transcription factors and promoters. • More clarifications of the implications and differences regarding DNA methylation and histone acetylation. • Improved figure 16.14 on proteasome. • New assessments.
Chapters 17-20	Readability edits	• Hundreds of verbiage and readability edits per chapter, particularly around consistency of voice, active voice, and clarity. • Content and approach remains generally the same. • Sizing or contrast edits to art, but not significant conceptual changes through art. • New assessments in chapters 18-20.
Chapter 21	Significant content/ coverage edits	• Introduction altered to set the stage and make clear the nature and context of viruses. • A new figure, 21.3, and has been added to demonstrate virus structures. Other figure numbers change as a result. • Figure depicting a virus binding to its receptor protein has been revised: the KSHV virus has been replaced by HIV. (Formally was figure 21.3, now 21.4.) • Art connection figure with complex viruses has been updated by including the influenza virus instead of an HIV virus. Caption has been revised. • In section 21.2, the plant viruses have been moved before the animal viruses, in order to better contrast the transit of viruses across cell walls and membranes. • New assessments.

Chapter 22	Significant content/ coverage edits Reordering of some topics	• 22.1: Table 22.2, Differences between Bacteria and Archaea, has been expanded in order to contrast more characteristics. • 22.3: Prokaryotic Metabolism includes greater detail, particularly on the means by which prokaryotes obtain energy. The portion on Prokaryotes and the Nitrogenc cycle has been updated to provide more specific examples . • 22.4: On Bacterial diseases includes more detail on the bubonic plague; coverage of foodborne diseases has been moved up before Biofilms and Antibiotics. • 22.5: Everyday Connection on Microbes on the Human Body has been moved to an earlier position in the section. • New assessments.

Chapter 23	Significant content/ coverage edits
	
	Reordering of some topics
		• Generally more data to support evolutionary models regarding protist origins.
		• 23.1: Significantly more detail on the arguments for endosymbiotic origins of mitochondria.
		• 23.2: More evolutionary and phylogenetic focus in the discussion of protist cell struture.
		• 23.3: Significant organizational and detail changes:
		  • Figure 23.9, Eukaryotic Supergroups, has been reordered. It provides a mapping for the reorganization of the remainder of the section.
		  • Generally, the three supergroups groups whose evolution is a result of primary endosymbiosis precede the three resulting from secondary endosymbiosis.
		  • Coverage of supergroup Archeaplastida has been moved up in the text, and augmented with several a subsection on Glaucophytes
		  • Ameobazoa is next, and now includes coverage of Gymnomobae.
		  • Opisthokonta is covered next, and now includes more coverage, including colonial slime molds. Rhizaria follows, and now includes Cercozoa.
		  • New coverage includes several new images.

Chapter 24	Moderate content and coverage edits	• 24.2:
		  • New figure on Fungal phyla.
		  • More coverage of basidiomycete life cycle, specifically around the diploid/ haploid aspects.
		• New assessments.

Chapter 25	Significant content/ coverage edits Reordering of some topics	• 25.1: Reorganization and detailing in Alternation of Generations portion, as well as more detail regarding sporangia in land plants. • 25.2: More detail on chlorophytes and the charophytes. • 25.4: More coverage of vascular tissue, including additional example of celery. Combined figures 25.23 and 25.24 into one figure and updated the supporting discussion. • New assessments.

Chapter 26	Significant content/ coverage edits
	
	Content additions
	
	Reordering of some topics
		• 26.1: Expanded coverage on the evolutionary context of seed plants, with specific focus on the spike moss Selaginella as a precursor.
		  • Additions to figure 26.2 to illustrate when certain types of plants appeared.
		• 26.2: More evolutionary background
		  • Introduces and contrasts the anthophyte and netifer hypotheses for context and scientific process.
		  • Significant changes in life cycle of confer subsection.
		  • Gnetophytes subsection reframed to cover their unresolved phylogenetic position.
		• 26.3: Moved subsection on fruit below life cycle of angiosperm.
		• New assessments.

Chapter 27	Significant content/ coverage edits
	
	Content additions
	
	Reordering of some topics
		• 27.1:
		  • First two subsections contain significant revisions in order to provide detail.
		  • The animal reproduction subsection contains additional detail on parthenogenesis, including several examples (turkeys, whiptail lizards, etc.).
		  • It also goes into more detail on animal embryo development, including examples.
		  • Art connection now contains coverage of the two clades without Hox genes: the Ctenophora and the Porifera.
		• 27.2: Clarity updates regarding relationships.
		  • Figure 27.6 revised: Several previously solid lines replaced by dotted ones, particularly on Eumetezoa.
		  • Subsection on Embryonic Development of the Mouth and Evolution Connection on the Coelom have have been thoroughly updated.
		• 27.3: Within subsection on Modern Understandings, another example of phylogenetic reorganization has been added -- Ctenophora as the basal clade of the animal kingdom.
		• New assessments.

Chapter 28	Major reorganization – dividing and reordering of sections Significant content/ coverage edits Content additions	• Chapter 28 has been expanded and reorganized. In the first editions, it had five sections. The second edition divides the Lophotrochozoa and the Ecdysozoa into two sections each, resulting in seven sections for the overall chapter. • 28 and 28.1 introductions substantially expanded to place invertebrates in greater context, and "set up" the remainder of the chapter. • 28.2: Overall expansion in detail, particularly in the subsection on Class Anthozoa, with added material on coral polyps and related organisms/ structure. • 28.3: Significantly more detail overall, with particular focus on the structural aspects of all Lophotrochozoa (helping to define and differentiate them), and the diversity of flatworms. Additional changes are found in the body description of rotifers, and the overall coverage of nemerteans. • 28.4: A new section comprised of just Molluscs and Annelids contains additional detail throughout, with focus on the Classification of Molluscs. Gastropods are expanded, particularly their unique developmental processes/ structures. • 28.5: The first portion of the now two-part treatment of Ecdysozoa. Compared to the first edition, additional detail is found about nematode morphology, a new subsection on Phylum Tardigrada • 28.6: Completes the Ecdysozoa, focusing solely on Arthropods. The subsections on each subphylum have been expanded and reordered: Chelicerata is presented first, with Hexapoda last. • A new table on the number of species in each invertebrate phylum demonstrates the vast number of arthropods as compared to others. • 28.7: Covers Deuterostomia. The Echinoderm subsection has additional coverage on the hemal system, as well as a significantly expanded subsection on classes, including several more examples. • New assessments.

Chapter 29	Significant content/ coverage edits
	
	Significant content additions
	
	Reordering of several topics
		• Introduction features two evolutionary innovations: quadrupeds and the amniotic egg
		• 29.1: In the subsection on chordates and the evolution of vertebrates, the coverage of cepholochordata and urochordata have been reversed, and the coverage of lancelets expanded. The subsection Craniata and Vertebrata has been renamed to Subphylum Vertebrata.
		  • The endoystyle is discussed as a characteristic of chordates.
		• 29.3: Characteristics of Amphibians has been expanded to include basic descriptions of its feeding strcutures and eyes. More detail in each of the subsections.
		• 29.4: Focuses more on the importance of the amnoiotic egg, including a list of the characteristics of the extraembryonic membrane. Additional coverage also includes the manner of lung ventilation.
		  • Additional subsections on dinosaurs and pterosaurs are intended to represent these important and somewhat familiar animals, as well as provide evolutionary links to birds and modern reptiles.
		  • Significant expansion of the section on Squamata – lizards and snakes.
		• 29.5: Additional focus on the types of feathers; figure 29.32 updated to include photos of various hawk feathers. Additional details include coverage of the structures related to preening and the cranial nerves.
		• The evolution of flight in birds has been greatly expanded and set off in its own subection.
		• 29.7 Retains the same structure, but includes more examples of various primates, including tarsiers.
		• New assessments.

Chapter 44-45	Minor content edits	• Greater detail in Fig 44.2 • Increased detail and clarity around the Karner blue butterly examples throughout the descriptions of the general levels of ecology • 45.7: Updates to population control methods • New assessments in both chapters.
Chapter 46-47	Significant content edits	• 46.2: Updates to energy flow within trophic levels of an ecosystem. • 46.3: Significant clarity edits to the biogeochemical processes and cycles. In particular, the impacts and influences, and ensuring that human activity impacts are still thoroughly covered, but not at the expense of the conceptual understanding. • In the first edition, the human influence on a cycle often interrupted the explantion of the cycle itself. That has been changed to cover the cycle components first, then the impacts. • 47.1: Updated mass extinctions • 47.4: Updated information on climate agreements (mostly Paris Climate Accord) and treatment on animal preserves. • New assessments in both chapters.