

New Features of *Algae* 4th Edition

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- Literature citations include many new references, reflecting prolific and exciting research progress made since the previous edition. New literature, much of it openly accessible, includes articles published through early 2022. At the same time, older literature citations have generally been retained to illustrate the history of discovery and encourage citation of fundamental literature. Review articles are commonly indicated.
- A new overview phylogeny illustration, generally at the class level, is presented at the beginning of most chapters that introduce eukaryotic algal phyla. Each illustration, based on multiple recent references, is designed to aid subsequent discussions of evolution. When branching patterns vary among studies, branching is shown as an unresolved polytomy. In many of the illustrations, dots indicate branches having highest support, consistent with this display convention in research articles. The new illustrations also note some of the key structural or reproductive innovations that define eukaryotic algal groups.
- New photos have been added to illustrate important new discoveries or to highlight groups that have received particular attention in the recent literature. An example is the new genus and species *Tsunamia transpacific*, named for the Pacific Ocean tsunami whose effects carried materials bearing this genus and other algae from Japan to the northwest U.S., where the materials were deposited as coastal beach drift. We thank colleagues who contributed photos, and (as for past new editions) will acknowledge their help by making a substantial financial contribution to aid student travel to international conferences.
- A significant number of taxonomic name changes have been incorporated.
- Navigation is aided by inclusion of a complete, clickable TOC.
- Text, captions, and most figure labels have larger font sizes for easier full-screen viewing.
- JPEGs of all book figures and tables are again available to instructors upon request.

Some Changes and Updates by Chapter:

Chapter 1 includes a new text box on photosynthesis, to aid readers who may not recall sufficient material from earlier training. This addition may aid comprehension of aspects of algal photosynthesis presented throughout the text.

Chapter 2 coverage of carbon concentration mechanisms employs a bulleted list, which may help readers to navigate this important but complex material more readily.

Chapter 3 contains more discussion of new methods, such as those used to detect algal toxins in food products or to investigate algal microbiomes.

Chapter 4 discussion of culture collections now includes brief description of methods used to obtain new algal isolates. Updated topics include finished vs draft genomic sequence; algal transcriptomics, proteomics, metabolomics; and genetic modification methods such as CRISPR.

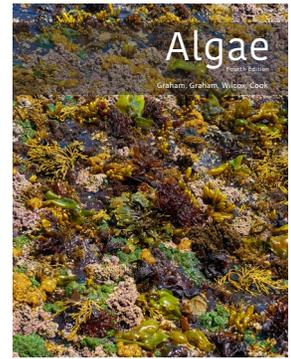
Chapter 5 now begins with an enhanced coverage of biological classification concepts and conventions, providing better background for subsequent chapters focused on taxonomic groups. For example, reader attention is drawn to the difference between expression of formal vs. informal group names (e.g., Chlamydomonadales vs chlamydomonadales).

Chapter 6 notes recent name change recommendations introduced by bacteriologists that reflect new information about cyanobacteria relationships, but retains terms traditionally used by botanists.

Chapter 7 incorporates a new color illustration that emphasizes the relationships of plastid-bearing eukaryotic algal groups to heterotrophic protists, indicated by gray shading. This illustration is designed to explain why subsequent chapters often include discussion of evolutionary histories that involve endosymbiosis and particular plastidless protists (e.g., Picozoa in the case of red algae).

Chapter 8 taxonomic section has been revised to recognize systematic changes.

Chapter 9 includes additional examples of plastid color variation among cryptomonads.



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Chapter 10 features the recognition that rappemonads are an early-diverging lineage of haptophytes.

Chapter 11 features a bulleted list of the defining features of major groups of dinoflagellates and related protists.

Chapter 12 includes a revised estimate of the number of diatom species and a recent example of the discovery of a new species (*Semiorbis eliasiae*). Pelagophyceae and Dictyochophytes are now included in this chapter, reflecting newer phylogenetic understanding of stramenopile diversification.

Chapter 13 encompasses a revised assemblage of photosynthetic stramenopiles, those not discussed in Chapters 12 and 14.

Chapter 14 has been revised to include raphidophyceans, as well as yellow-green and brown algae and associated smaller lineages.

Chapter 15 presents a better-resolved red algal class-level phylogeny, and features an updated, bulleted list of distinctive red algal features.

Chapter 16 features a bulleted list of distinctive features of the green algae (and the more inclusive Chloroplastida/Viridiplantae).

Chapter 17 includes some early-diverging core Chlorophyta classes (Chlorodendrophyceae and Pedinophyceae) that in previous editions had been illustrated along with prasinophytes.

Chapter 18 has been revised so that there are separate discussions of Ulvophyceae I and II and associated lineages, to reflect evidence that traditional Ulvophyceae is not monophyletic.

Chapter 19 features an enhanced list of fundamental discoveries made using the model chlorophycean *Chlamydomonas reinhardtii*.

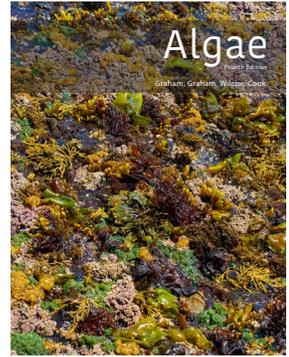
Chapter 20 includes a bulleted list of distinctive features of the streptophytes and a bulleted list of features that distinguish streptophyte algae from land plants (embryophytes).

Chapter 21 mathematical modeling problems have been moved to an appendix, discussion of allelopathy has been increased, and global change impact topics have been updated. This chapter also contains a focus on new research approaches to understanding herbivory effects.

Chapter 22, which in earlier editions contained both marine macroalgae and periphyton of marine and freshwater environments, now focuses on marine macroalgae. This change allows increased attention to global environmental change impacts on marine macroalgae, a rapidly expanding field of study.

Chapter 23 now focuses on periphyton, with expanded coverage of both marine and freshwater systems. This change allows increased attention to global environmental change on periphyton.

Chapter 24 includes new material on aerial transport of algal propagules among terrestrial environments, and the impacts of increasing wildfires on algal populations in arid and semiarid lands.



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