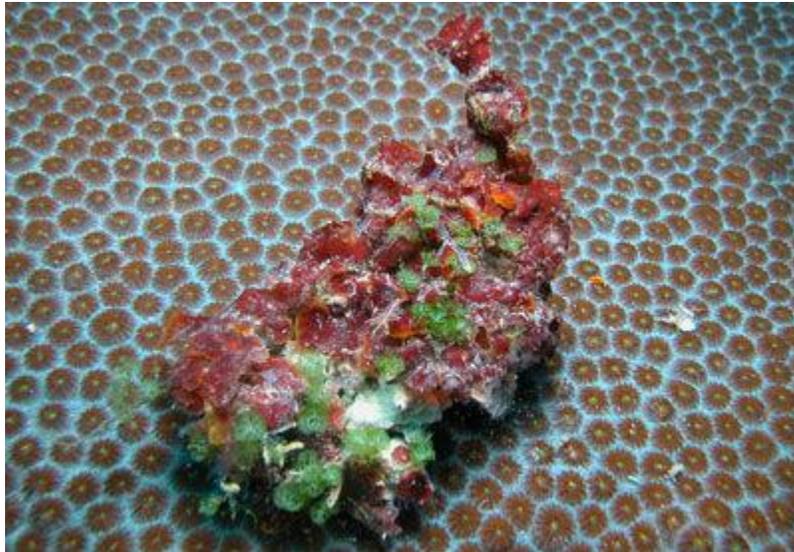


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## Algae



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### Defining Algae

The highly varied group of organisms we call "algae" includes terrestrial algae, snow algae, seaweeds, phytoplankton, and "pond scums" (which are composed of stringy masses of cyanobacteria, as well as true algae such as *Spirogyra*).

Algae are morphologically simple, chlorophyll-containing organisms that range from microscopic and unicellular (single-celled) to very large and multicellular. The algal body is relatively undifferentiated and there are no true roots or leaves. Algae are typically autotrophic, deriving their “food”, or energy, from their surroundings in the form of sunlight. They play an important role in food chains and in maintaining the oxygen supply on our planet.

Algae are sometimes considered plants and sometimes considered "protists" (a grab-bag category of generally distantly related organisms that are grouped on the basis of not being animals, plants, fungi, bacteria, or archaeans). According to recent phylogenetic studies of evolutionary relationships, some algae (the red algae and most green algae) are indeed most closely related to the land plants, but other algae are related to certain protist groups. Thus, the algae are a highly variable and genetically diverse group of organisms belonging to many different evolutionary lineages. This diversity is reflected in the

enormous variation exhibited by algae in terms of morphological, ultrastructural, ecological, biochemical, and physiological traits.

Algae of one kind or another have been around for more than 2 billion years. New algae are being discovered all the time, even entirely unknown phyla or classes. Based on the best available estimates (Guiry 2012; <http://www.algaebase.org>), there are around 37,000 species of "true" algae and around 4,000 cyanobacteria known today, with perhaps another 30,000 species awaiting discovery and description.

### **Some types of algae that may interest you**

Seaweeds: Multicellular marine algae, or seaweeds, are plant-like organisms that generally live attached to rocks or other hard substrata in coastal areas. They belong to three different groups, recognized since the mid-nineteenth century on the basis of thallus color: red algae (phylum Rhodophyta), brown algae (phylum Ochrophyta: class Phaeophyceae), and green algae (phylum Chlorophyta: classes Bryopsidophyceae, Chlorophyceae, Dasycladophyceae, Prasinophyceae, and Ulvophyceae). As a result of modern investigations (ultrastructural and biochemical studies and, more recently, phylogenetic analyses based on DNA sequencing), we now know that the differences among these three groups run far deeper than the color differences suggested by their names. The three seaweed groups differ considerably in many ultrastructural and biochemical features, including what photosynthetic pigments they contain, what chemical compounds they use for energy storage, the composition of their cell walls, the presence/absence of flagella, details of mitosis, the types of connections between adjacent cells, and the fine structure of the chloroplasts.

Some of the larger brown algae known as kelps, such as the giant kelp *Macrocystis pyrifera*, exhibit translocation (internal transport of organic materials and nutrients) and a similar process has been shown to occur in the green Charophytes, but translocation is not seen in most algal groups. In general, however, algae have little need for transporting nutrients through their bodies because they are, at some stage, surrounded by water and individual cells can therefore exchange materials directly with their surroundings.

Phytoplankton: Phytoplankton are the drifting, photosynthetic, mostly microscopic algae and cyanobacteria that capture energy from the sun and form the foundation of food webs in freshwater and marine habitats.

Blue-Green Algae: The organisms sometimes referred to as "blue-green algae" are actually a group of bacteria now known as cyanobacteria. However, because many are aquatic and photosynthetic, sometimes forming conspicuous colonies on the surface of stagnant freshwater, they can superficially resemble the true green algae. In fact, there is an important evolutionary connection: according to the now widely accepted endosymbiotic theory of organelle origins, the chloroplasts in the cells of modern green plants (including green algae) originated as cyanobacteria living within other organisms.

### **Where Algae Live**

Where are algae found? Just about everywhere on earth: in the sea (down to 250 m in some places); in rivers, lakes, and ponds; on trees, soils, and walls; and as symbiotic partners with fungi (as lichens) and with animals (e.g., in corals and in some protozoans and Cnidaria). Algae can be found just about everywhere where there is light with which to photosynthesize and where water is available for reproduction. Algae are important colonisers in hot springs and lava flows, these so-called extremophiles often thriving at extraordinarily high temperatures. If life exists elsewhere in our solar system, an alga-like organism is among the most likely to be found.

Reproduction in Algae: Most algae form some sort of spore, a reproductive cell that in algae is often motile (capable of motion). Various types of asexual reproduction are common in algae, but algae also reproduce sexually, forming genetically diverse gametes by meiosis, then joining two gametes from two different individuals to create a new individual. In some types of algae, this is a very simple kind of sex in which the algae themselves act as gametes, but in many other algae there are egg- and sperm-like cells and sex-attractant pheromones. It is likely that an alga was the first organism, around 1.5 billion years ago, to evolve something similar to the sexual reproduction we see in plants and animals today.

Tips for Pronunciation: Algae ("al'jee" or "al'gay", both are used today) is the plural; Alga ("al'ga") is the singular, but there is no such word in English as "algas" or "algas"!

#### References

Guiry, M.D. 2012. How many species of algae are there? *Journal of Phycology* 48: 1057-1063.