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FOCUS: Plant-like Protists

ESSENTIAL QUESTIONS:

- Can you describe the various classifications of protists and explain how scientists determine which category a protist belongs in?
- Can you describe the specialized organelles used by protists that allow them to survive with just a single cell?
- What are *Euglena* and what special adaptations do they use to carry out the basic life functions?
- What are *Volvox* and what special adaptations do they use to carry out the basic life functions?

What do we already know?

- Protists can be put into three categories: animal-like, plant-like, & fungus-like.
- Animal-like protists can be divided into 4 different groups: Sarcodines, flagellates, ciliates, & parasites.
- Animal-like protists are similar to animals because they are heterotrophs and most can move to obtain their food.

Plant-like protists

- Plantlike protists are commonly called algae or phytoplankton.
- Form the base of both freshwate and saltwater food webs.
- Carry out most of the photosynthesis on Earth that provides us with Oxygen.

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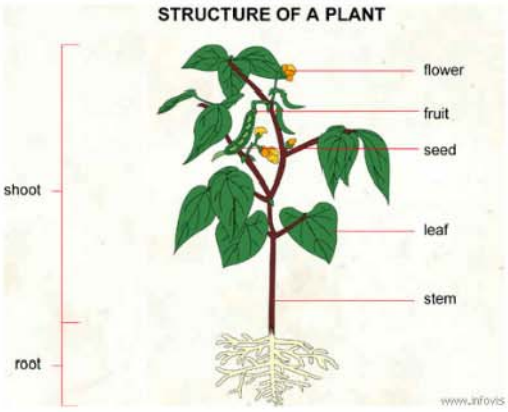

- **What makes them like plants?**
  - Plant-like protists are photoautotrophs, meaning they use the sun's energy to make their own food.
  - Their cell(s) contain a green pigment used to carry out photosynthesis called chlorophyll, as well as other pigments.
    - Algae can be many different colors, depending on the combination of pigments its cells contain, as well as the depth of water they live in.

- **What makes them different from plants?**
  - Many are single-celled.
  - Some live in colonies, a collection of single-celled organisms where the cells can become specialized to help the whole group survive.
  - Multicellular algae still have less complex cells and tissues than true plants.
  - Some cells of multicellular algae can break off and survive as a single cell.

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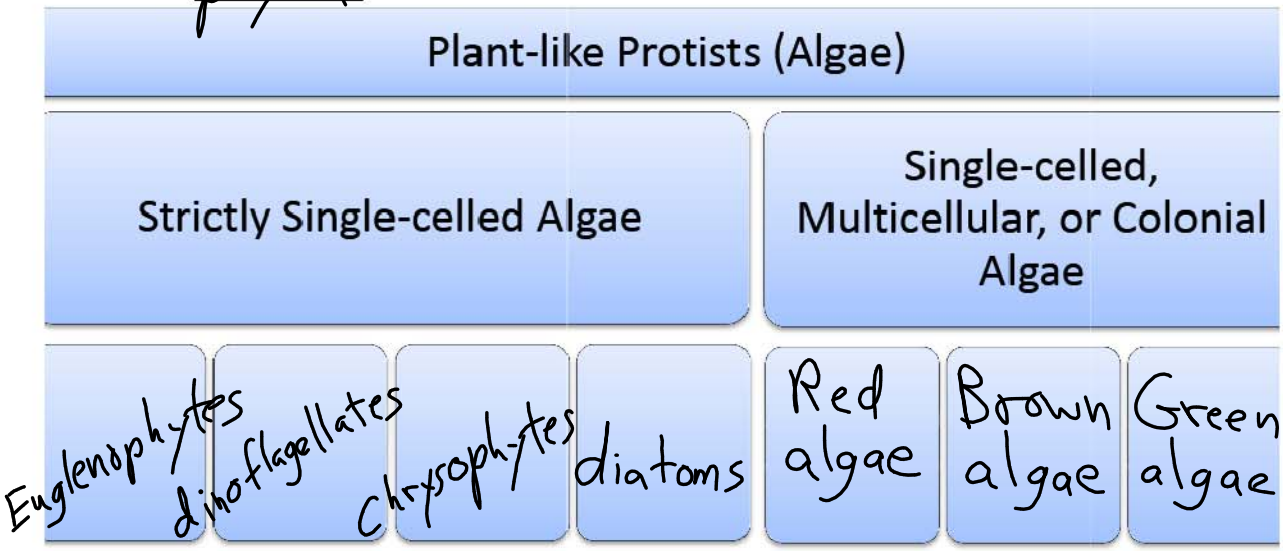
- Plant-like protists, or algae, can be classified into 7 different categories, or phyla.



Euglenophytes

- Plant-like protists characterized by having:
  - A green color caused by Chlorophyll used for photosynthesis
  - Two flagella (a short and a long) that helps it swim quickly through water in ponds or lakes.
  - A cluster of red pigment known as an eyespot that helps it find light for photosynthesis.
  - The ability to live as an autotroph in sunlight or as a heterotroph if sunlight is not abundant.
  - A strong cell membrane known as a pellicle that allows it to burrow into mud if there is not enough water to swim.

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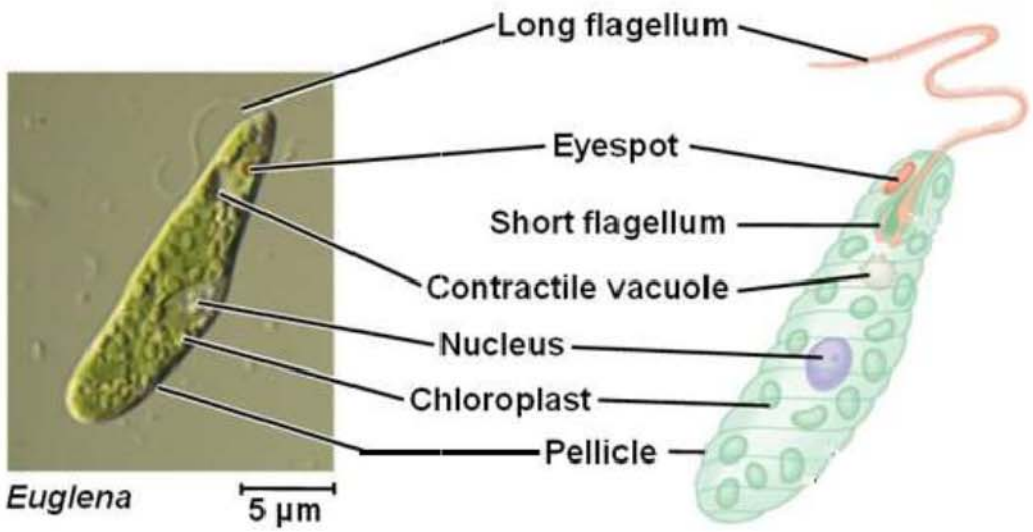
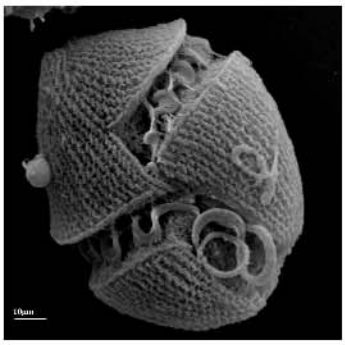
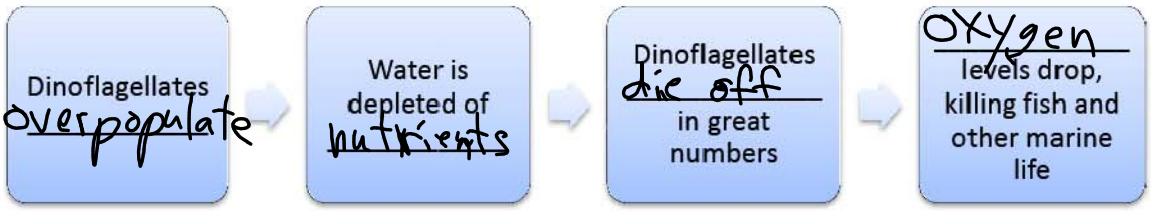




Dinoflagellates (dino- = "great" or "giant")

- Plant-like protists characterized by having:
  - Two flagella that wrap around and lay against the cell in deep grooves.
  - thick, armor-like cell walls.
- AKA: *Pyrrophyta* ("fire plants") because they are often bioluminescent.
- Cause red tides in areas of pollution.
  - Fertilizer or sewage runoff causes algal blooms (algae overgrowth).



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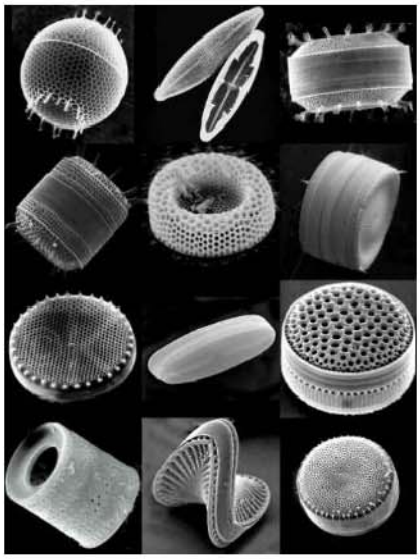
- Some dinoflagellates even produce a toxin in algal blooms that can be trapped by clams and oysters, causing severe illness in humans that eat them.

Chrysophytes

(chryso – "golden", -phyte = "plant")

- Plant-like protists characterized by having:
  - A yellow-green or golden-brown color caused by their gold-colored chloroplasts
  - A single cell, although rarely some will live in colonies by joining together in long threads.
  - The ability to live as heterotrophs in low sunlight.

Diatoms (di – "two", -atom – "particles")



- Plant-like protists characterized by having:
  - Thin, delicate cell walls made mostly of silicon, the main ingredient in glass.
  - two pieces of cell wall that fit together like a petri dish or jewel box.
  - Finely-etched patterns in their cell wall.

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- Diatoms are one of the most abundant organisms on Earth.
- Carry out more photosynthesis than all of Earth's tropical rainforests combined.

Red Algae

- AKA: *Rhodophyta* (rhodo – "red", phyta – "plant")
- Plant-like protists characterized by having:
  - chlorophyll and other pigments, giving the cells a red color.
  - The ability to photosynthesize even at very great depths (up to 260 m deep).
  - Mostly multicellular species.
- Often grow on coral reefs, helping to stabilize them.

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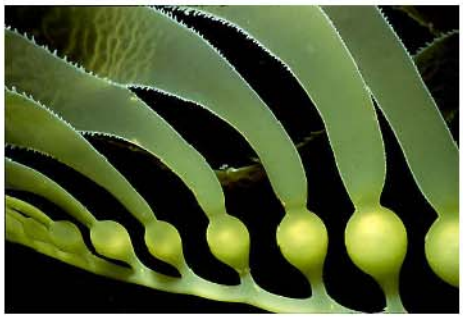
Brown Algae

- AKA: *Phaeophyta*
  - (phaeo – "dusky", phyta – "plant")
- The largest and most complex of all algae species.
- All species are multicellular and most are marine (ocean-dwelling).
- Examples:
  - Giant Kelp:
    - Form long stalks (up to 60 meters)
    - Use air bladders to keep the tall stalks upright.
    - Grow in groups called Kelp forests that create habitats and shelter from predators for marine mammals (manatees, sea lions, seals, otters, whales).
    - Where? – off the coast of California



  - Sargassum:
    - Form huge free-floating mats, sometimes several kilometers^2 in area.
    - Provides a food source and habitat for many species of fish in the open ocean.
    - Where? – off the coast of North Carolina, in the Sargasso Sea

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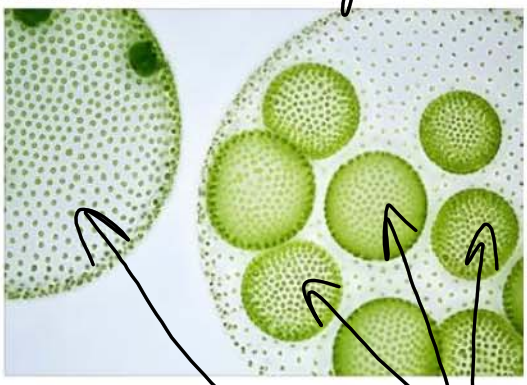
Green Algae

- AKA: *Chlorophyta* (chloro – "green", phyta – "plant")
- The most similar to land plants of the all the phyla of algae:
  - Green chlorophyll
  - Same type of cell wall (as plants)
  - Store glucose as starch in their cell walls
  - Big difference = no true tissues
- Found in freshwater, saltwater, and moist land environments.
- Most live as single-celled organisms, but several form colonies, and a few are multicellular.
- **Unicellular (single-celled) example: *Chlamydomonas***
  - Grows in ponds, ditches, and wet soil.
  - egg-shaped cell with two flagella and a single chloroplast.

- **Colony-algae example: *Volvox***
  - 500-50,000 cells arranged together to form a hollow sphere.
  - Work together using their dual flagella to move the colony.
  - Shows cell specialization
    - Cells closest to the light have larger eyespots
    - A few cells are dedicated to reproduction for the colony and produce daughter colonies within the original colony.



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- **Multicellular example: *Ulva***
  - AKA – sea lettuce
  - Found attached to the shoreline along rocky coasts
  - Most similar to land plants with several specialized cell types.