

# Kingdom Protista



A Mixed Bag  
of Organisms



# Kingdom Protista

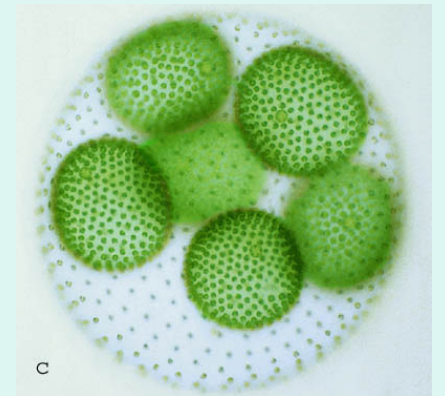
- Protists:
  - are eukaryotic (membrane bound nucleus and other organelles present).
  - may be unicellular or multicellular.
  - obtain nutrients by ingestion, absorption, or by photosynthesis.
  - reproduction is by sexual or asexual means.

# Kingdom Protista

- There are more than 50,000 species of protists.
- They are divided into 2 major categories:
  - autotrophic protists (plant like) such as algae
  - heterotrophic protists (animal like) such as protozoans, slime molds, and water molds

# Autotrophic Protists (algae)

- There are about 20,000 species of algae.
- Most algae are aquatic, but some grow in soil and on tree bark.
- Many algae are microscopic and float in oceans and lakes.
  - They are called phytoplankton.
    - Phyto = plant
    - Planktos = wandering



# Autotrophic Protists (algae)

- They contain chlorophyll and carry on photosynthesis, so they are an important food source for many marine animals.
- They form the basis for all life in the oceans.
- They produce 70-90% of the oxygen in the atmosphere.

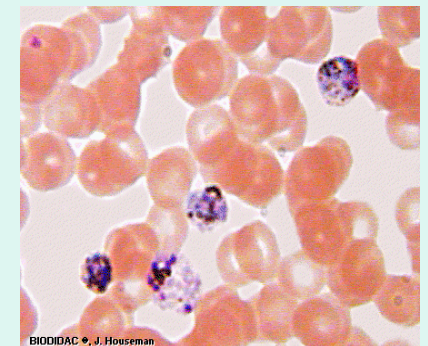
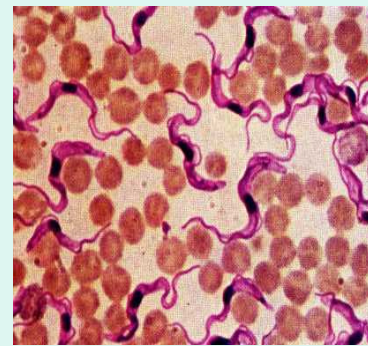


# Heterotrophic Protists (Protozoans)

- Characteristics similar to animals
  - heterotrophic
  - ability to move
- Habitat:
  - moist terrestrial environments
  - fresh and salt water
  - parasites of organisms
  - unicellular

# Heterotrophic Protists (Protozoans)

- 4 major Phyla (based on how they move)
  - Phylum Sarcodina = pseudopods
  - Phylum Ciliophora = cilia
  - Phylum Zoomastigina = flagella
  - Phylum Sporozoa = nonmotile



# The Protist Kingdom

## Protozoans and Algae



# Heterotrophic Protists

- The following are heterotrophic protists.
- Called the **PROTOZOANS**

# Phylum Sarcodina

- Example: amoeba
- Move using pseudopods = “false feet”.
  - Motion is called amoeboid movement.
- Shape of amoeba is always changing.
- Pseudopods also used for feeding purposes.



# Phylum Sarcodina

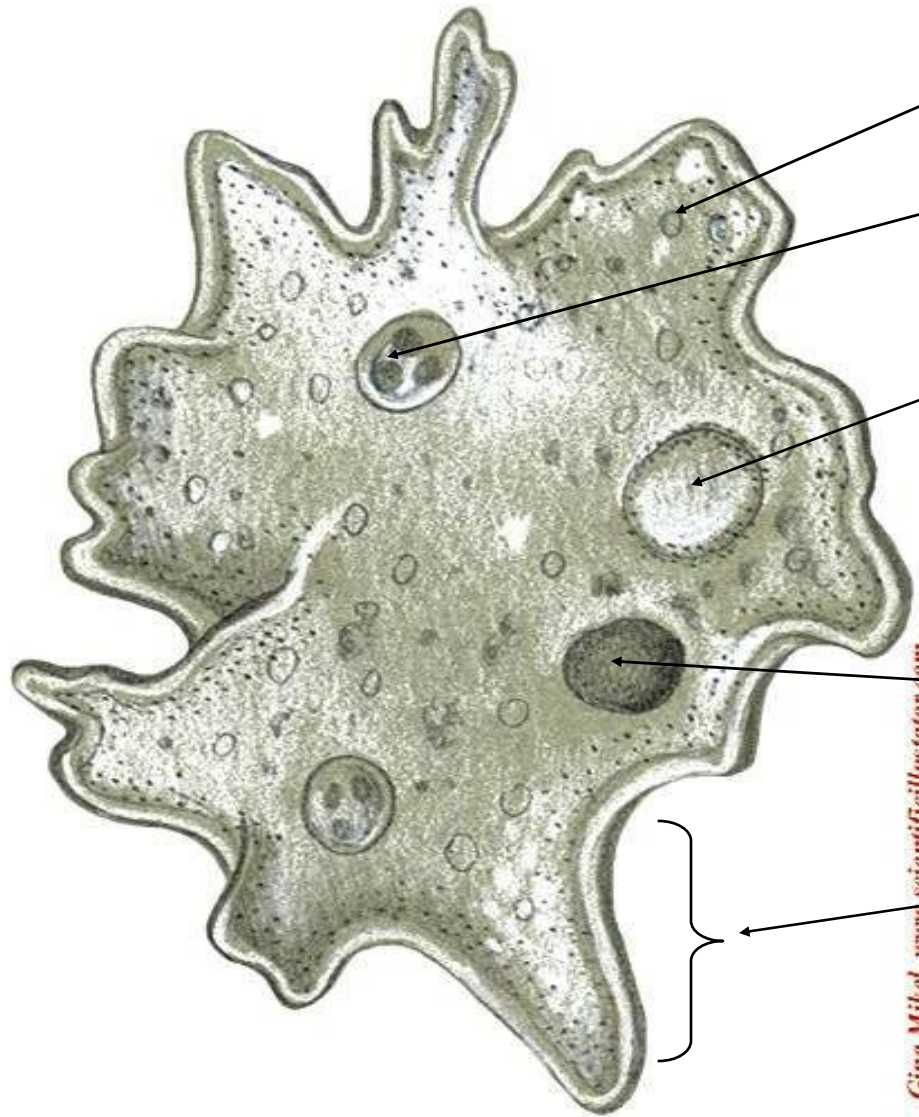
- Amoebas eat algae and other protists.
- Have a contractile vacuole that is used to eliminate excess water and liquid waste.
- Respond to stimuli
  - move toward food
  - move away from touch, light, and toxic chemicals

# Phylum Sarcodina

- Other examples include radiolarians which have hard calcium carbonate exoskeletons
  - Form White Cliffs of Dover



# Amoeba Diagram



Lysosome

Food vacuole

Contractile vacuole

Nucleus

Pseudopod

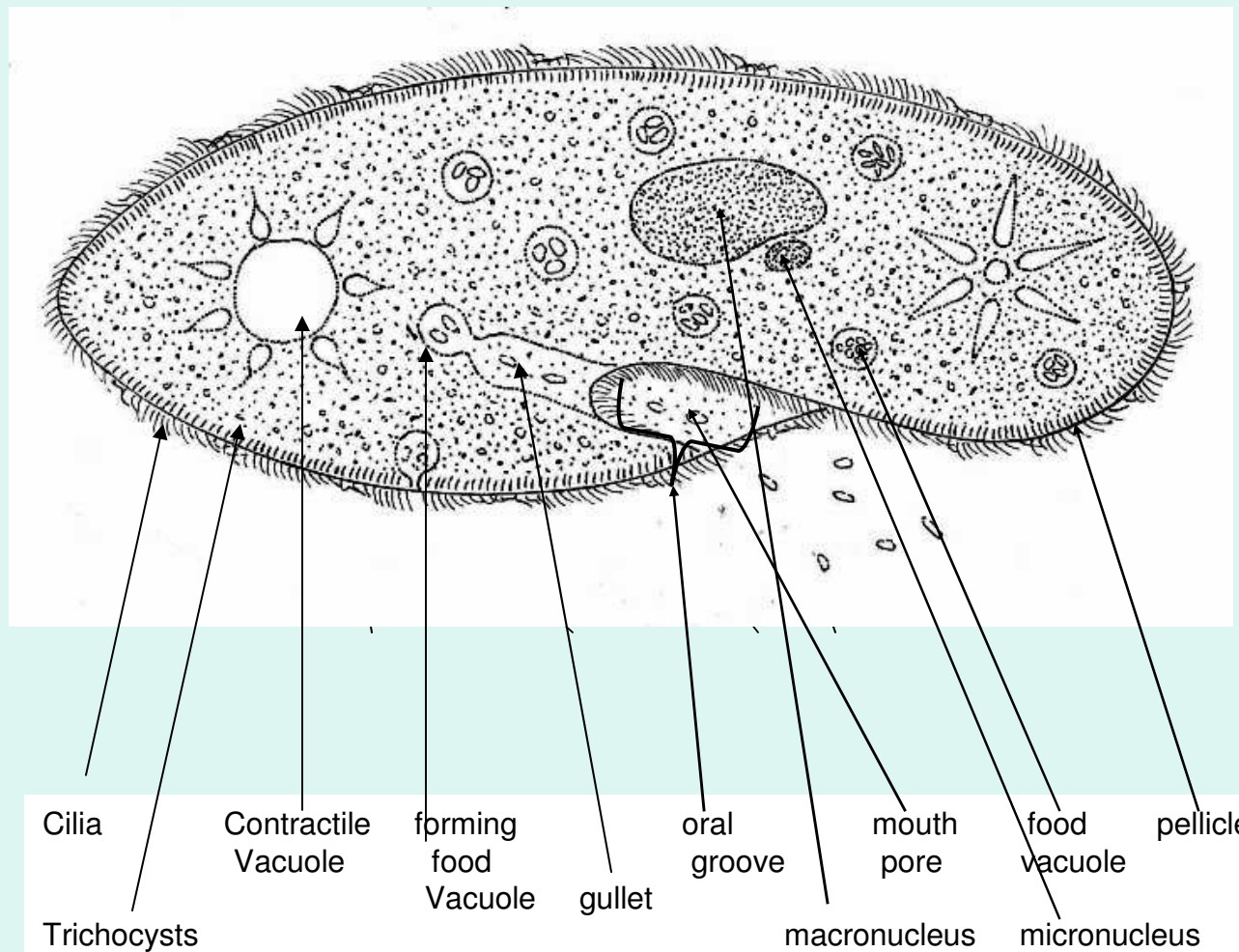
# Phylum Ciliophora

- Example: paramecium
- Covered with cilia—body also rotates as it swims causing a spiraling movement
- Feeds on algae, bacteria, yeast, and other protozoans through the oral groove.
- Contractile vacuole present for waste elimination.
- Thick outer covering called the pellicle.

# Phylum Ciliophora

- 2 nuclei
  - macronucleus – controls most cell processes
  - micronucleus- control reproduction
- responds to stimuli
  - move toward food and optimum temperature
  - move away from: extreme temperatures, areas with little or no oxygen, and toxic chemicals
  - defense mechanism = trichocysts –long thread like structures that shoot out when the paramecium is threatened.
- Other examples: Stentor, Vorticella

# Paramecium Diagram



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<http://www.biology-resources.com/drawing-paramecium.html>



# Phylum Zoomastigina (Mastigophora)

- Example: Trypanosoma
- Move using one or more whip like flagella
- Some are free-living; some are parasitic.
- Parasitic forms attack mammals, birds, reptiles, amphibians, and fish.

# Phylum Zoomastigina (Mastigophora)



- Causes African Sleeping Sickness
  - trypanosomes in blood of mammal
  - vector = Tsetse fly- bites the mammal and it gets the trypanosome
  - Tsetse fly bites a human
  - In human, trypanosome multiplies in the blood and produces toxins.
  - Blood cells are destroyed.
  - Symptoms: Headache, fever, sleepiness, can lead to death.

# African Sleeping Sickness



# Phylum Sporozoa

- Example: Plasmodium
- nonmotile
- parasitic
- reproduces by producing spores



# Phylum Sporozoa

- Causes malaria
  - Kills more than 1 million people per year.
  - Vector= female Anopheles mosquito
  - Female mosquito bites an infected person.
  - Spores are produced in the mosquitoes body
  - Female mosquito bites another person and transfers plasmodium spores to their blood.
  - Spores go to the liver and reproduce in the red blood cells (RBC's)
  - RBC's burst and release new spores into the body (harmful to the immune system).

# Importance of Protozoans

# Importance # 1

- Causes diseases in humans
  - amoeba = amoebic dysentery
  - trypanosome – African Sleeping Sickness
  - Plasmodium = malaria
  - Giardia = giardiasis (infected water)
  - Toxoplasma = toxoplasmosis (cat feces)

# Importance # 2

- Members of the planktonic organisms found in the oceans.
  - plankton – small organisms that float in the water and serve as food for larger organisms
  - heterotrophic = zooplankton
  - autotrophic = phytoplankton

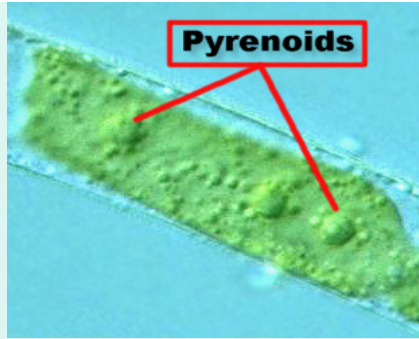


# Importance # 3

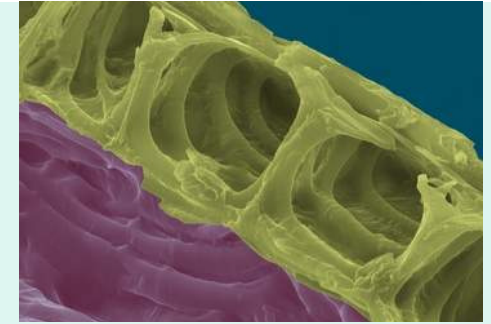
- Some members of Phylum Sarcodina have calcium carbonate (lime) shells.
- When they die, the shells sink and accumulate on the ocean floor (limestone).

# Algae

## Structure and Function



# Structure



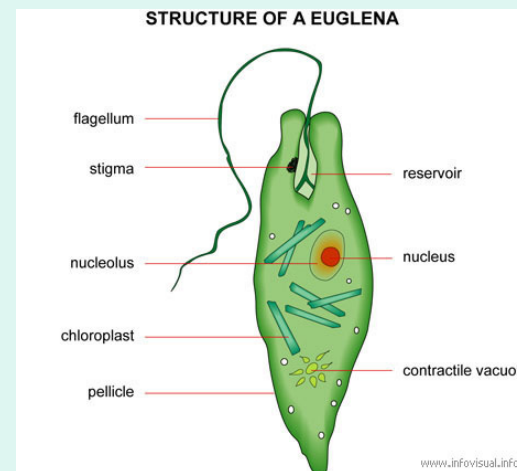
- Most algae have cell walls made of cellulose.
- Some are made of silica (main ingredient of glass).
- Algae cells contain chloroplasts of different sizes and shapes.
- These chloroplasts often contain **pyrenoids** which are particular areas of the chloroplast where sugar is converted to starch and stored.

# Arrangement

- There are many different types of algae.
  - Some are single celled, some are filaments made up of rows of cells, and some are multicellular having a body called a **thallus**.
  - Each cell in a thallus acts separately from any other and does not form complex structures.

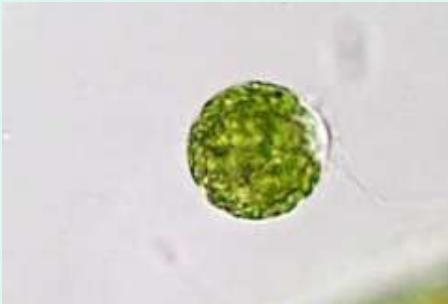
# Arrangement

- Some algae consist of single cells that swim by use of a flagella.
  - Algae that have flagella differ from each other in how many flagella they have and the position of the flagella on the cell.



# Zoospores

- A **zoospore** is produced by a multicellular algae and has a flagella.
  - It is a motile, asexual spore.

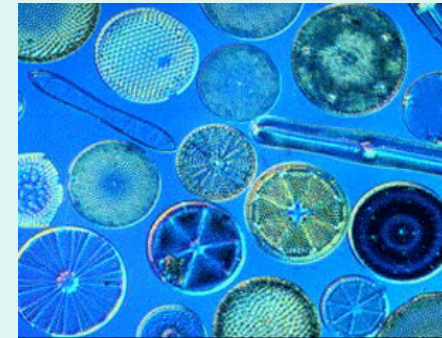


# Autotrophic Protists

- The following are all autotrophic.
- Make own food from sunlight

# Classification

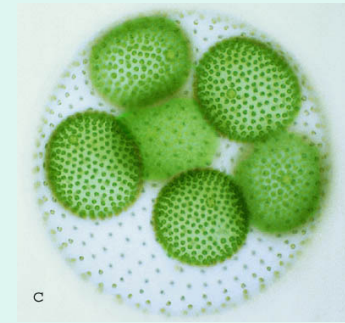
- There are 6 phyla of algae.
  - Euglenophyta (euglena)
  - Chrysophyta (golden algae  
= diatoms)
  - Pyrrophyta (Peridinium  
= dinoflagellates)





# Classification

- Chlorophyta (green algae)



- Phaeophyta (brown algae = kelp, seaweed)



- Rhodophyta (Red algae= seaweed)



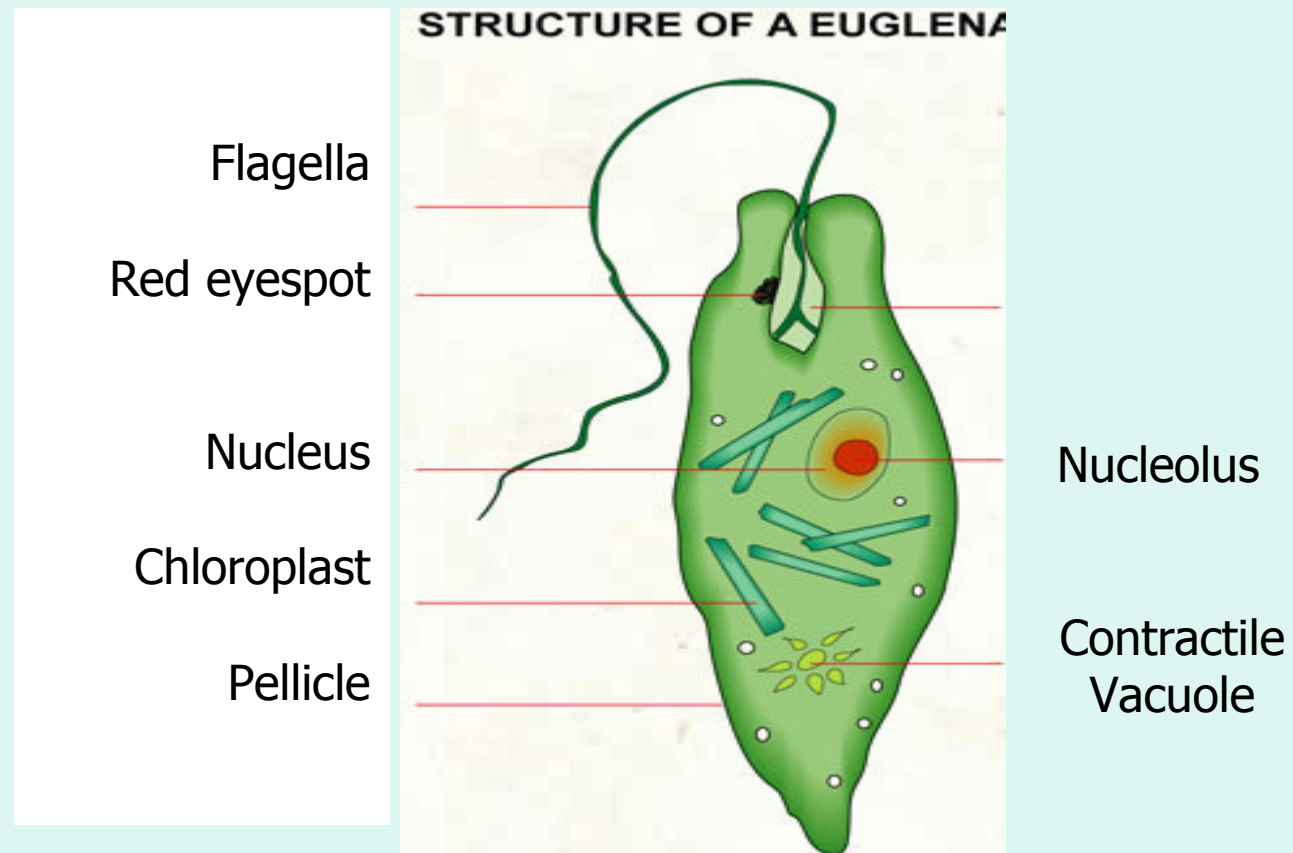
# Phylum Euglenophyta

- Example: *Euglena*
  - Has characteristics similar to both plants and animals.
  - Photosynthetic when light is available.
  - Heterotrophic when no light is available, it will absorb nutrients from surroundings.
  - Unicellular

# Phylum Euglenophyta

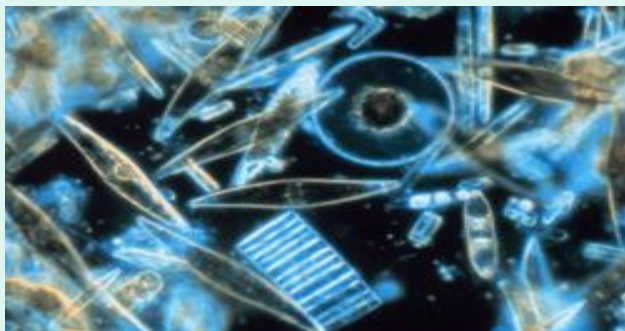
- Common in puddles and ponds
- Flagella provides movement
- Red eyespot present that is light sensitive.

# Phylum Euglenophyta



# Phylum Chrysophyta (golden algae)

- Example: diatoms
  - Golden color due to yellow and brown pigments
  - Cell walls are glasslike and made of silica.
  - Composed of 2 halves (like a pill box).
  - Many designs with different patterns.



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# Phylum Chrysophyta (golden algae)

- When the organism dies, the shell sinks to the bottom of the ocean. The accumulation of the shells creates diatomaceous earth.
- This is mined and used as a metal polish, in tooth paste, and face scrubs, in insulation and in filtration systems.

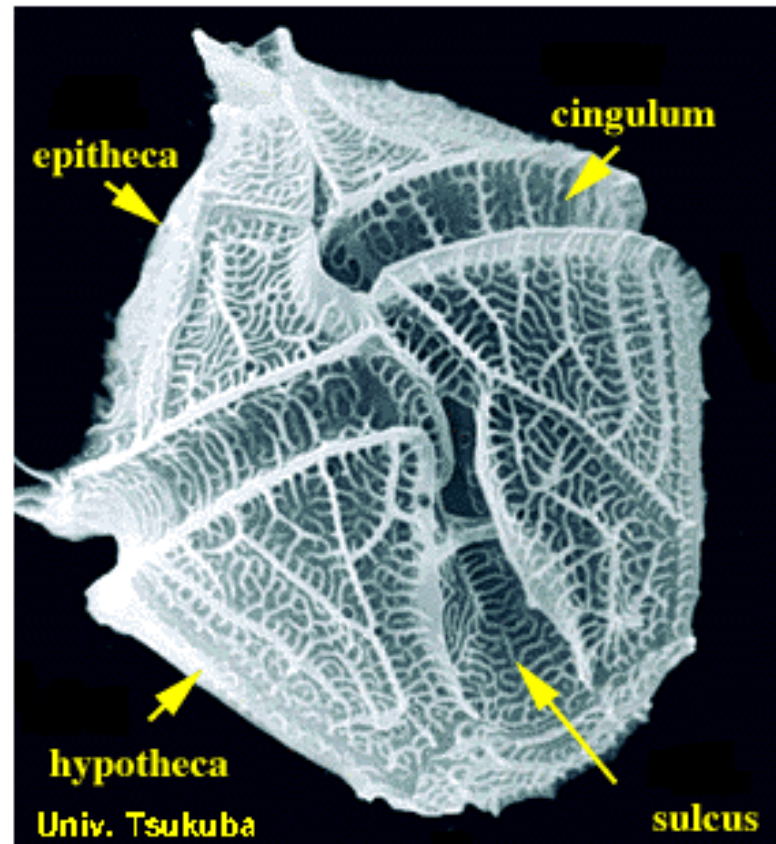
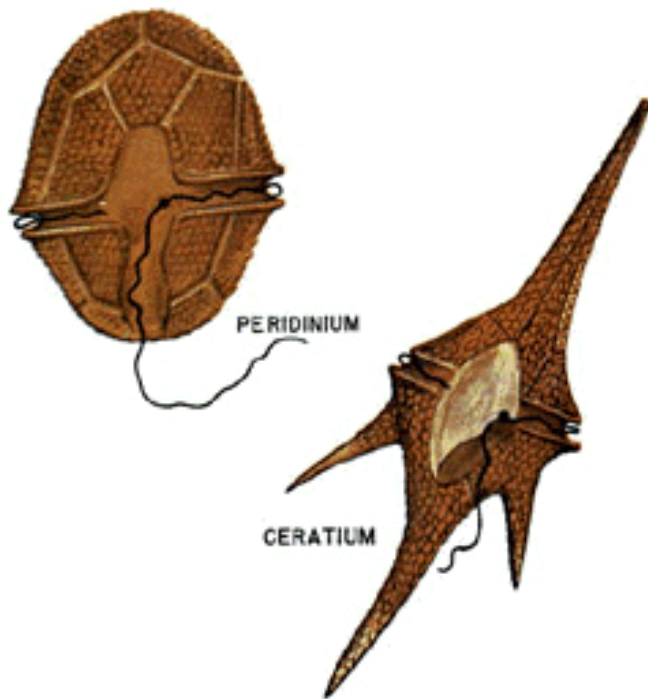
# Phylum Pyrrophyta (Dinoflagellata)

- Example: dinoflagellates
  - Composed of many armor plates made of cellulose and silica.
  - Flagella provide movement.
  - Some produce powerful toxins which contaminate the water—may also color the water
- Example: Red Tide—Shellfish that swim in the red tide are toxic for consumption.
- Some are capable of bioluminescence—the ability to produce light.



# Examples of Dinoflagellates

## Dinoflagellates





# Red Tides



[shiftingbaselines.org/blog/archives/000523.html](https://shiftingbaselines.org/blog/archives/000523.html)

[serc.carleton.edu/.../redtide/general.html](https://serc.carleton.edu/.../redtide/general.html)

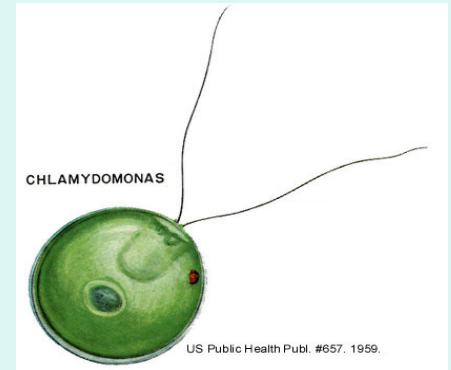
# Phylum Chlorophyta (green algae)

- There are over 7000 species of green algae.
- Most are microscopic and live in fresh water or on land.
- There are some marine forms.
  - Example: *Ulva* (sea lettuce)

# Chlorophyta

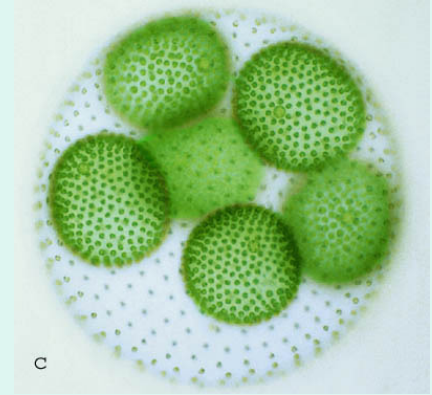
- Plants are thought to have evolved from the green algae because:
  - Both groups have the same photosynthetic pigments.
  - Both have cellulose in the cell walls.
  - Both store their food as starch.
    - There are 4 major forms of green algae

# Chlorophyta



- Unicellular
  - Example: *Chlamydomonas*—common algae in freshwater ponds that has a cup shaped chloroplast and 2 flagella of the same size.
  - There are some unicellular green algae that do not have flagella.
  - Many of these live in the soil or on the bark of trees.

# Chlorophyta



- Colonial
  - Example : *Volvox* (thousands of cells in one colony)
  - Each cell is held together with the other cells by strands of cytoplasm.
  - Each cell is positioned with the flagella on the outside and when they beat, the colony moves as one organism. (rolls)

# Chlorophyta

- Filamentous
  - Example: *Spirogyra* and *Oedogonium*
  - These are algae that grow in freshwater ponds and streams.



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# Chlorophyta

- Multicellular
  - *Ulva* (sea Lettuce)
  - Marine form (salt water)



# Phylum Phaeophyta (brown algae)

- Examples: seaweeds such as kelp, *Sargassum*
  - Found in cold ocean waters.
  - Shallow water
  - Anchors to bottom with holdfasts
  - Air bladders keep thallus upright under water





# Kelp- A Common Brown Algae



- Largest type = kelp
  - Attaches to ocean floor or rocks.
  - Grown commercially for:
    1. food
    2. to produce alginates which are thickening agents in foods, cosmetics, and paints.
- Sargassum Sea—covered with floating masses of Sargassum

# Phylum Rhodophyta (Red Algae)

- Example: seaweeds such as dulce
- Found in warm ocean waters
- Grow at great depths
- Contain cellulose, agar, and carrageenan
  - Carrageenan is used in foods to prevent the separation of mixtures, such as chocolate milk and ice cream



# Fungus Like Protists

- **Fungus-like Protists (also heterotrophic)**

- look like a fungus
- get nutrients from dead and decaying matter
- 2 groups
  - slime molds
  - water molds



[geocities.com/ymike2002/protista.htm](http://geocities.com/ymike2002/protista.htm)

