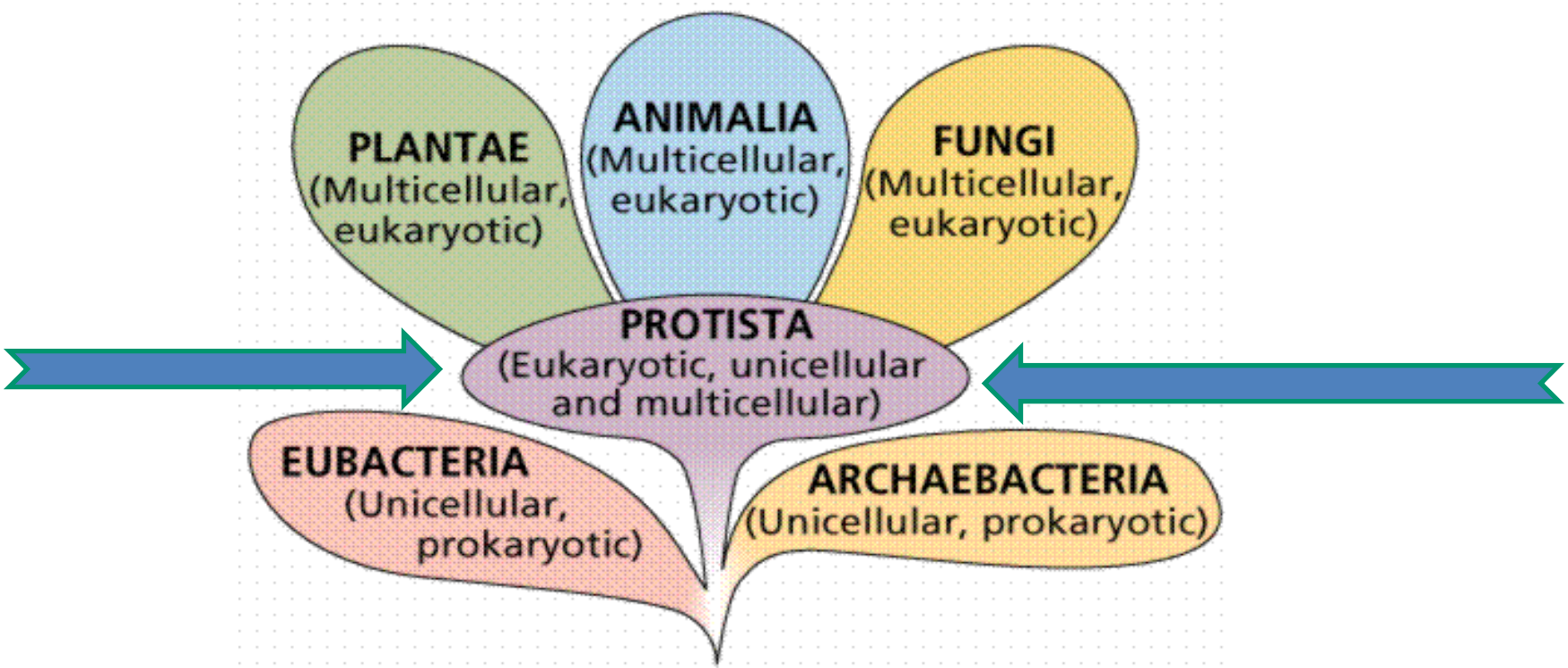
# Protists and Fungi

Chapter 19

# Domain Eukarya
# Kingdom Protista

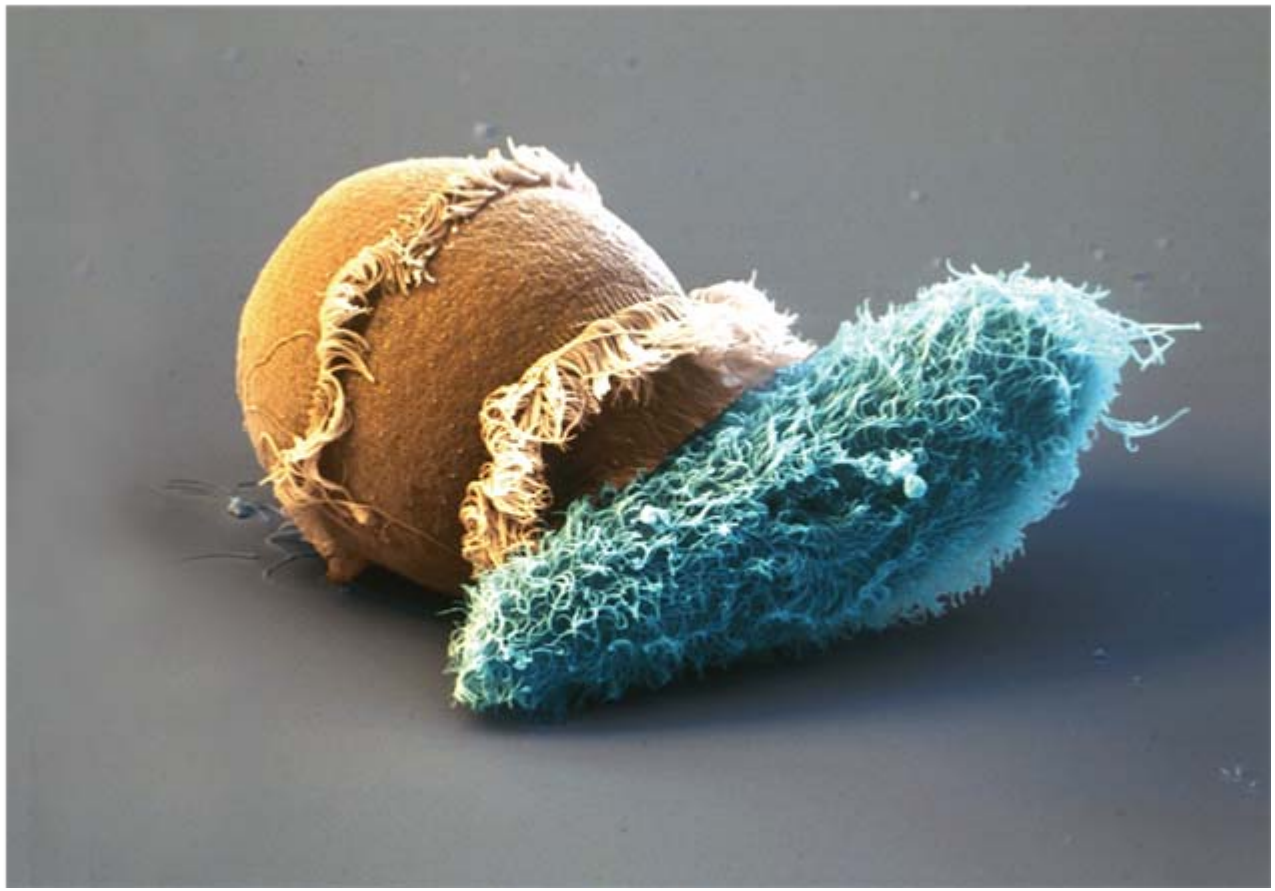


# Protists and Fungi

- Both are eukaryotes
- Both have nuclei and membrane bound organelles
- Found in water, moist soil, and in other organisms

## KEY CONCEPT

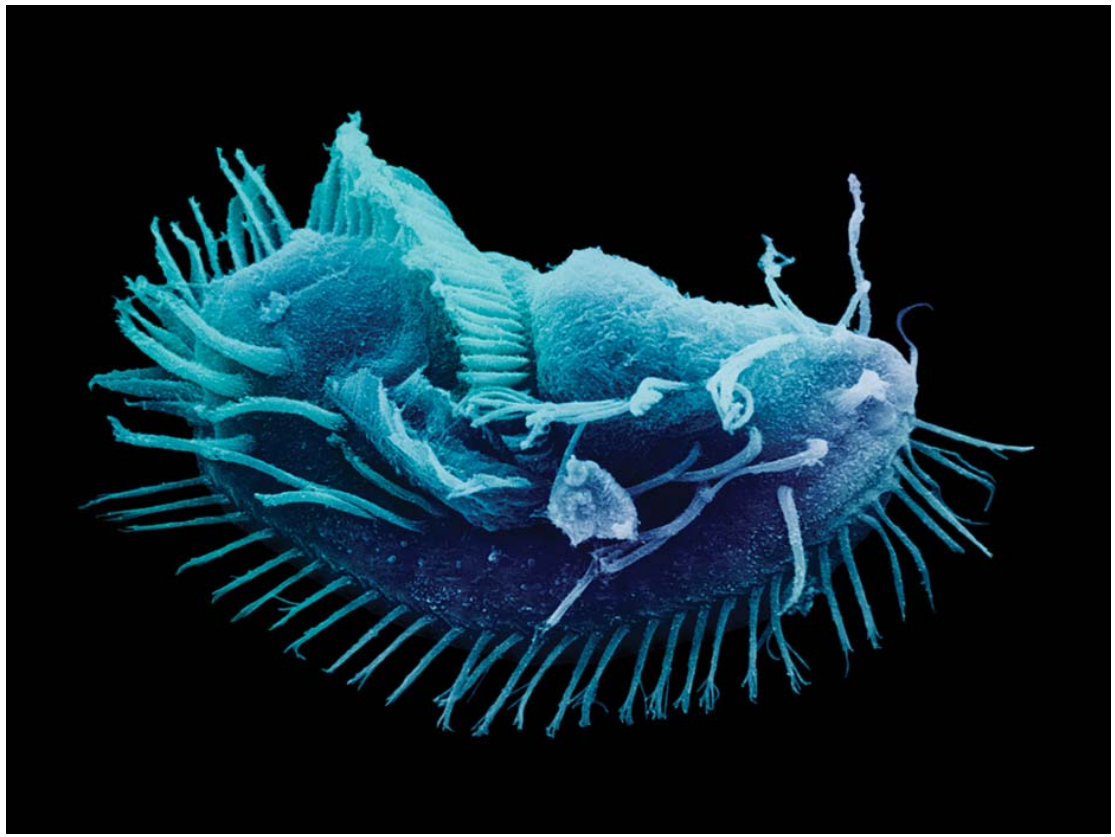
**Kingdom Protista is the most diverse of all the kingdoms.**



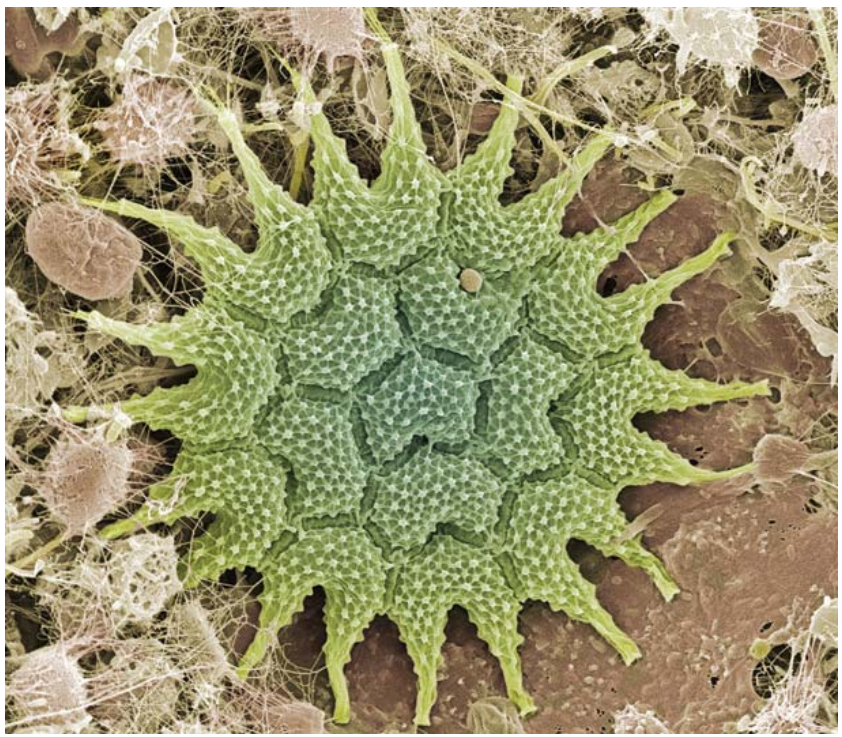
# Protists can be animal-like, plantlike, or funguslike.

- Protists are eukaryotes that are not animals, plants, or fungi.

- Animal-like protists consume other organisms.
  - Heterotrophs, consume organic matter
  - single-celled



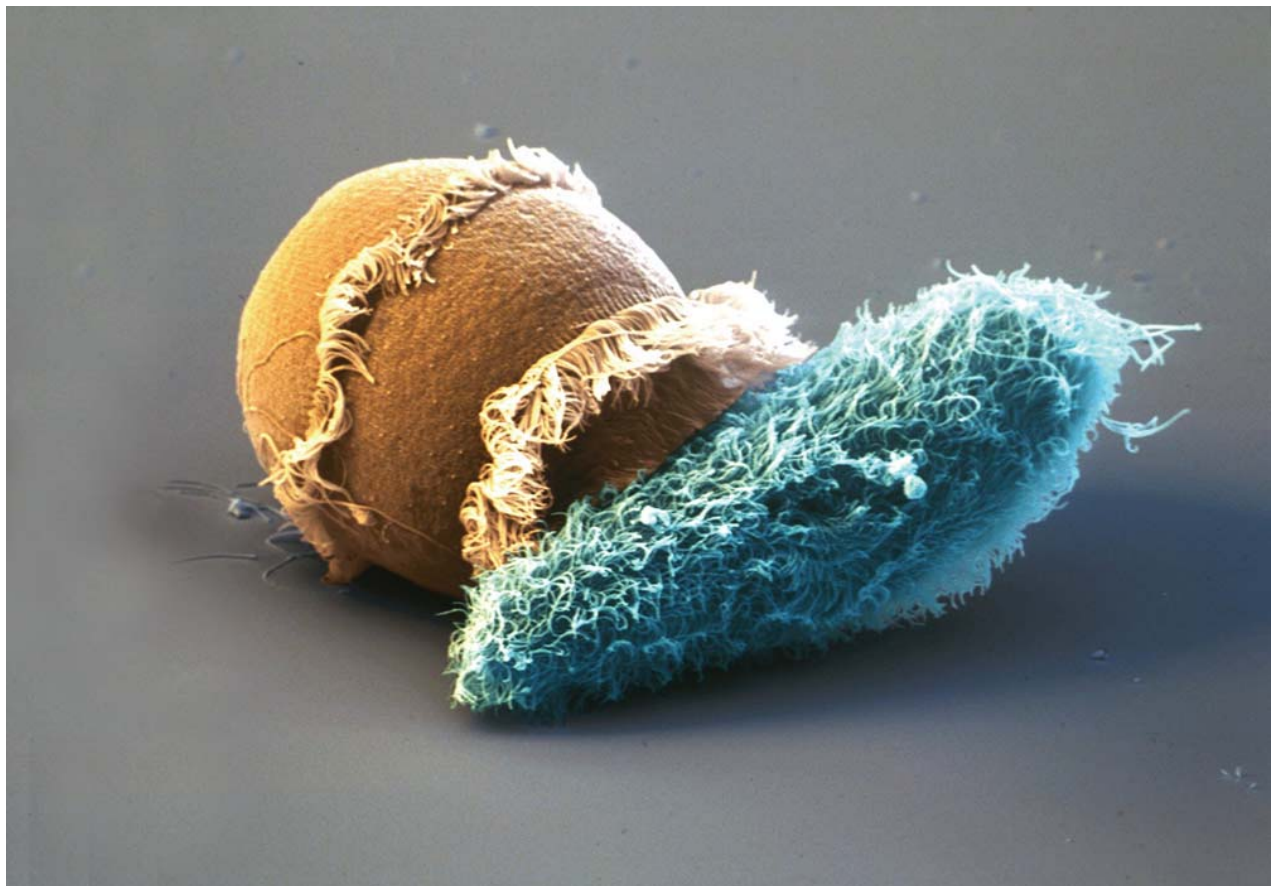
- Plantlike protists are photosynthetic.
  - single-celled, colonial, or multicellular
  - no roots, stems, or leaves
  - Lack true roots, stems, leaves



- Funguslike protists decompose dead organisms.
  - Heterotrophs
  - No chitin in cell walls
  - can move, whereas fungi cannot

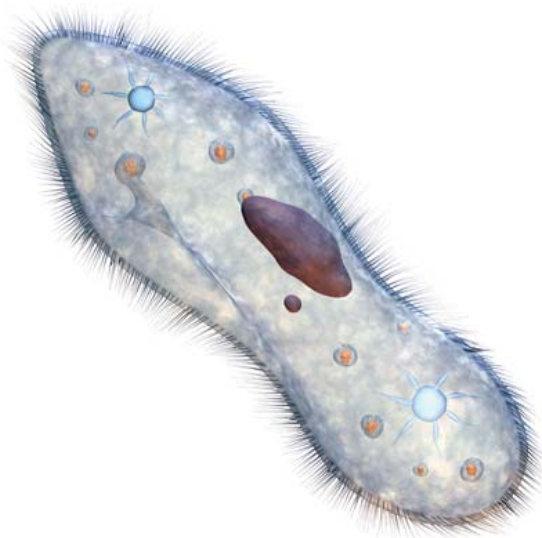
# KEY CONCEPT

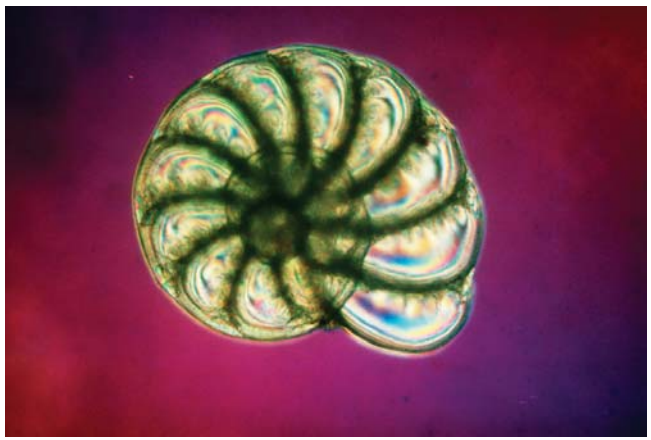
**Animal-like protists are single celled heterotrophs that can move.**

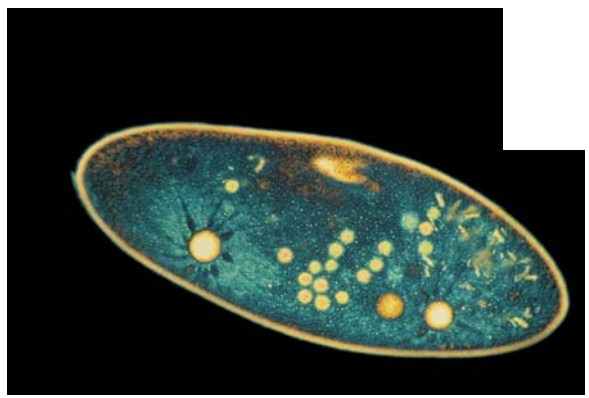


Animal-like protists are often called protozoa.

Animal-like protists move in various ways.





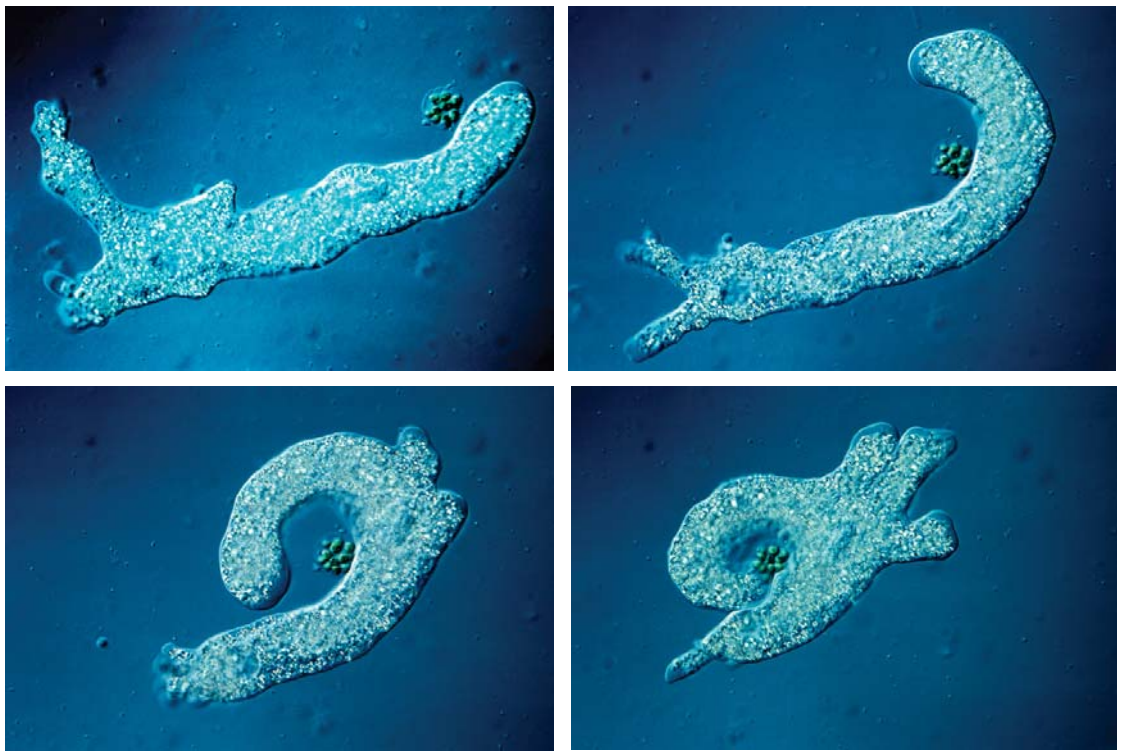


# Major groups of protozoans

- Amoeba
- Flagellate
- Ciliate
- Sporozoan

- Protozoa with flagella are zooflagellates.
  - flagella help zooflagellates swim
  - more than 2000 zooflagellates
  - Flagellates whip their tails back and forth to propel the cell.

- Some protists move with pseudopods.
  - change shape as they move
  - amoebas

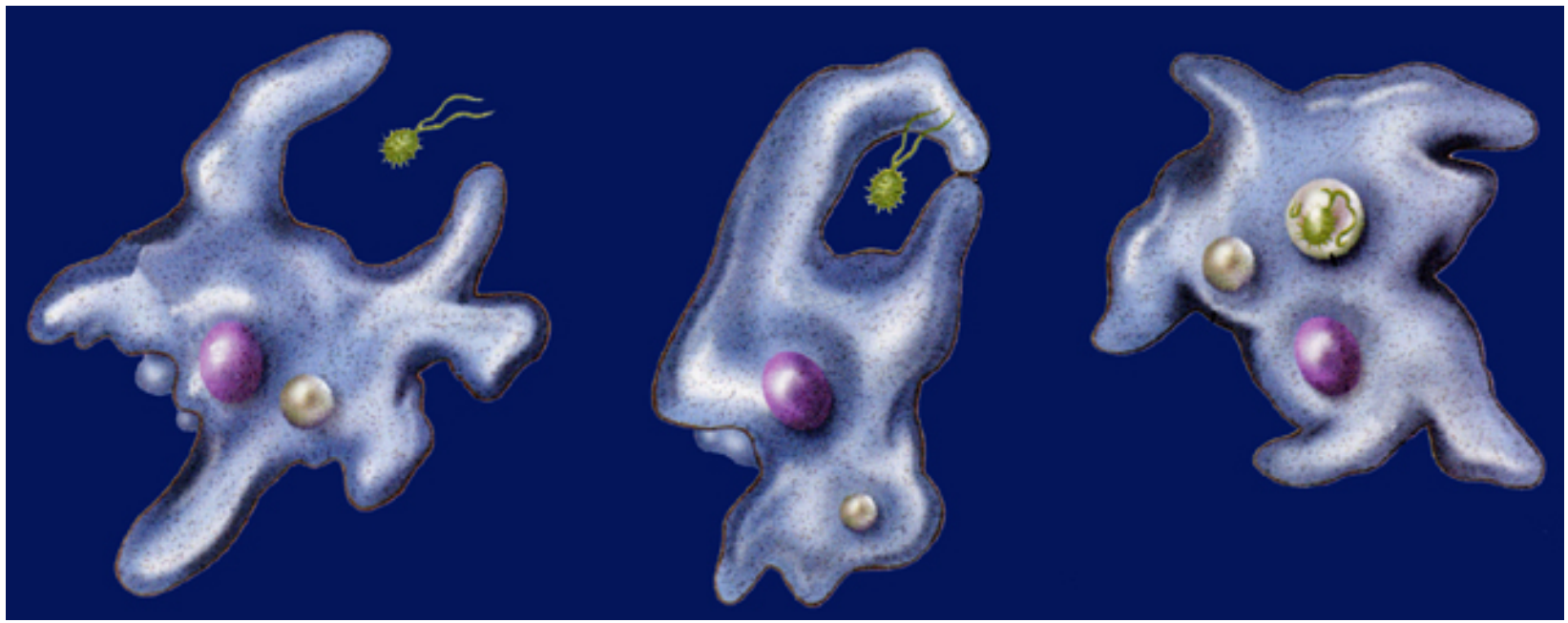


# Movement with pseudopods

- **<u>Pseudopod</u>**: “false foot”

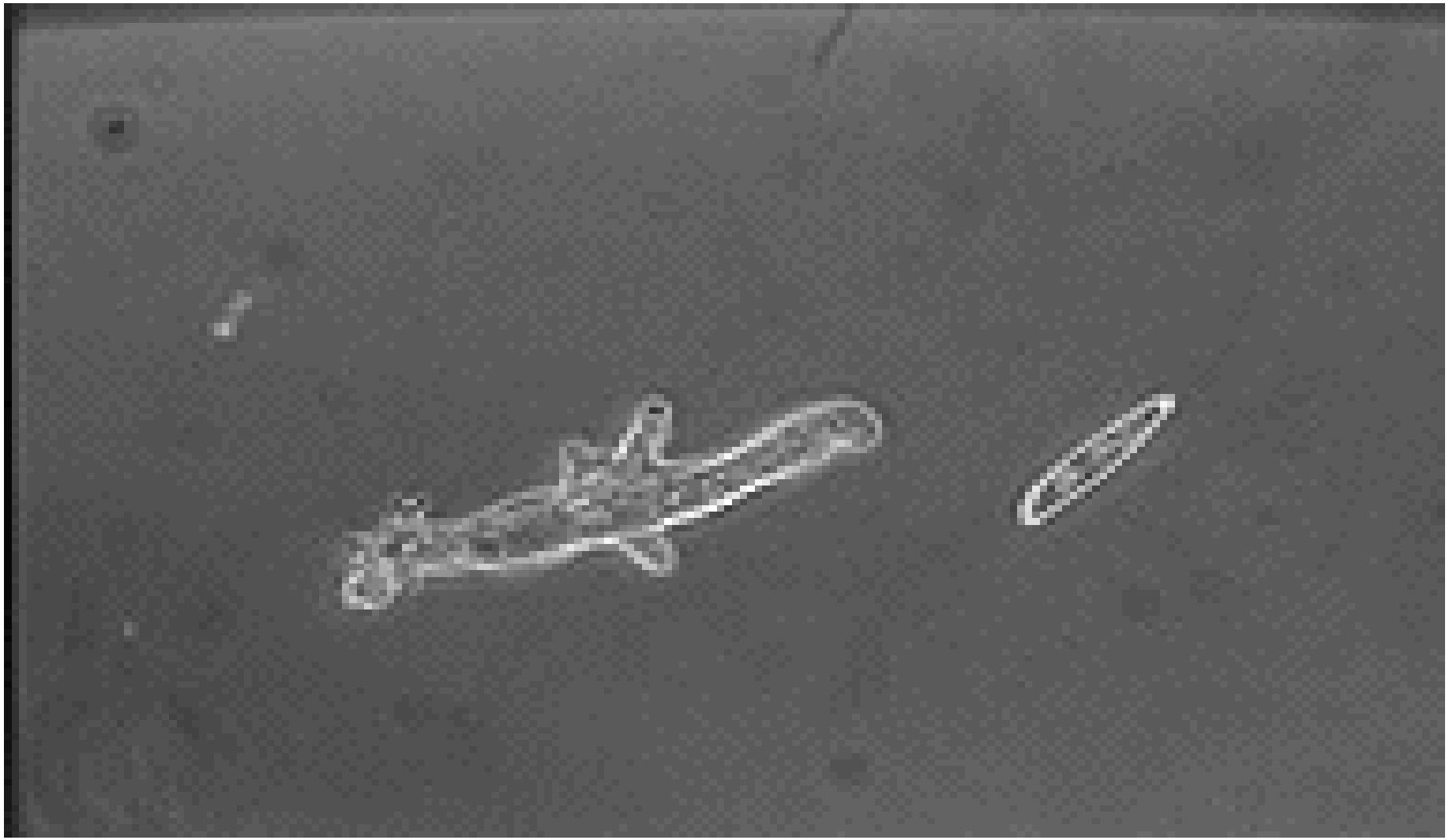
Amoeba, shapeless cells

# Feeding with pseudopods

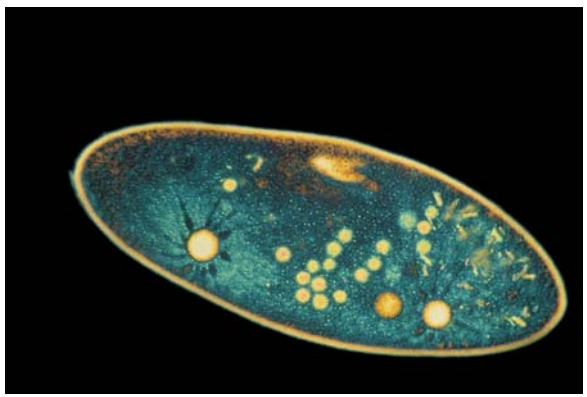


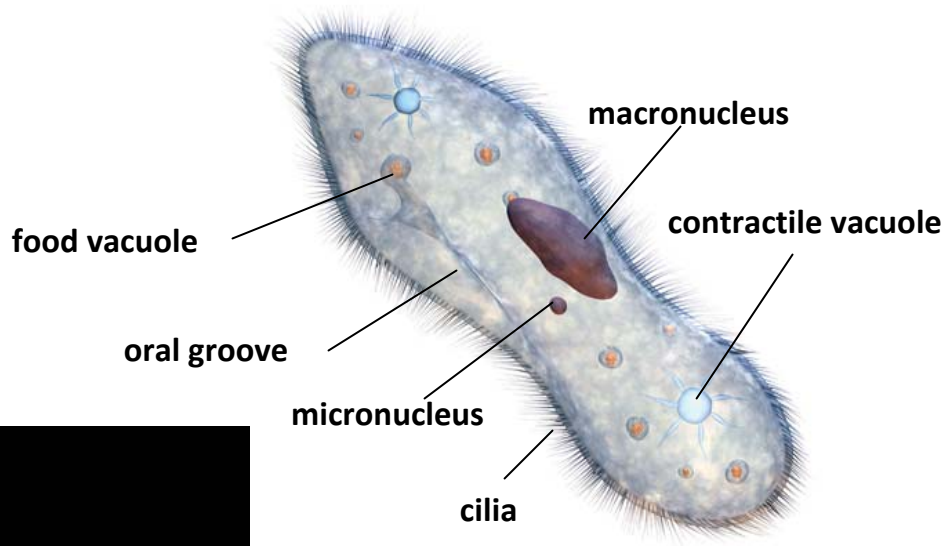
The extensions of the cellular body surround food particles, which the amoeba then draws into itself for digestion.

# Amoeba eating Paramecium



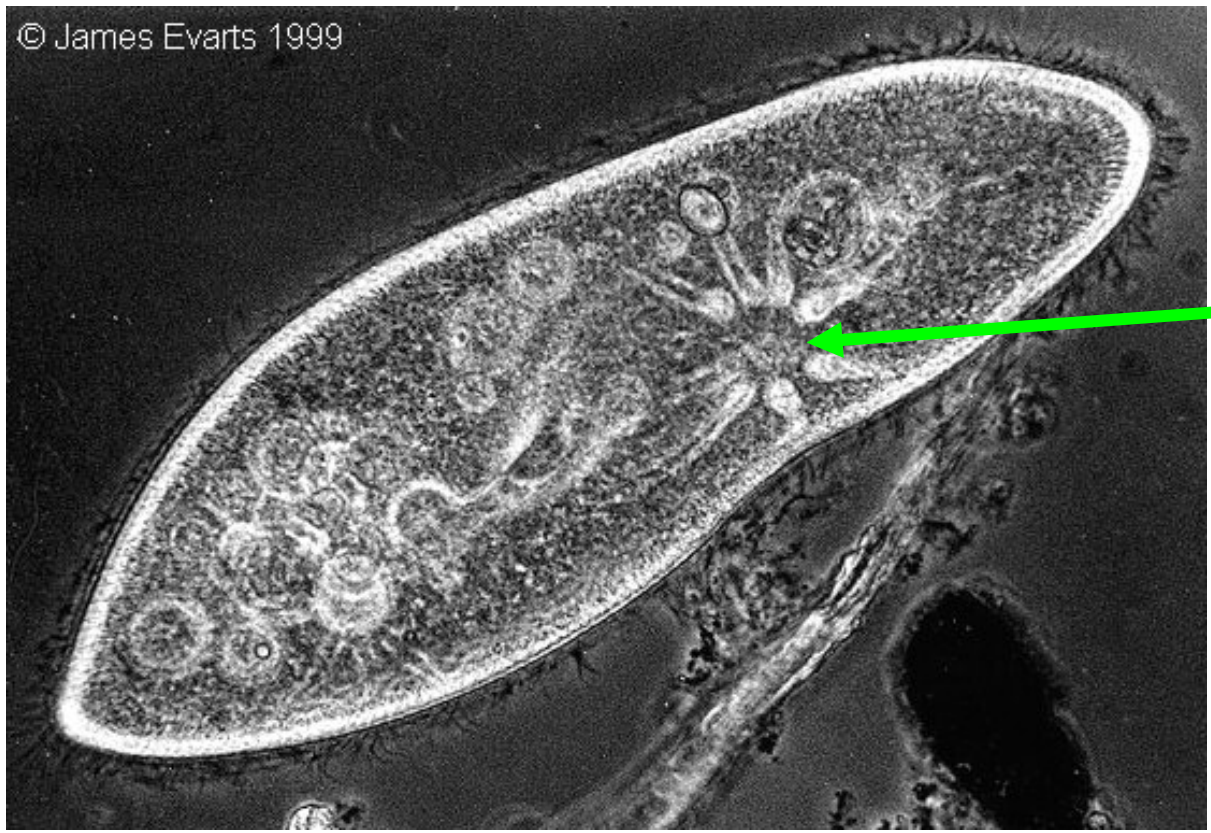
- Some protozoa move with cilia. Cilia help protists swim and capture food
- more than 8000 ciliates





# Movement with cilia

- Note the fine cilia that surround the paramecium, making a “halo glow.”

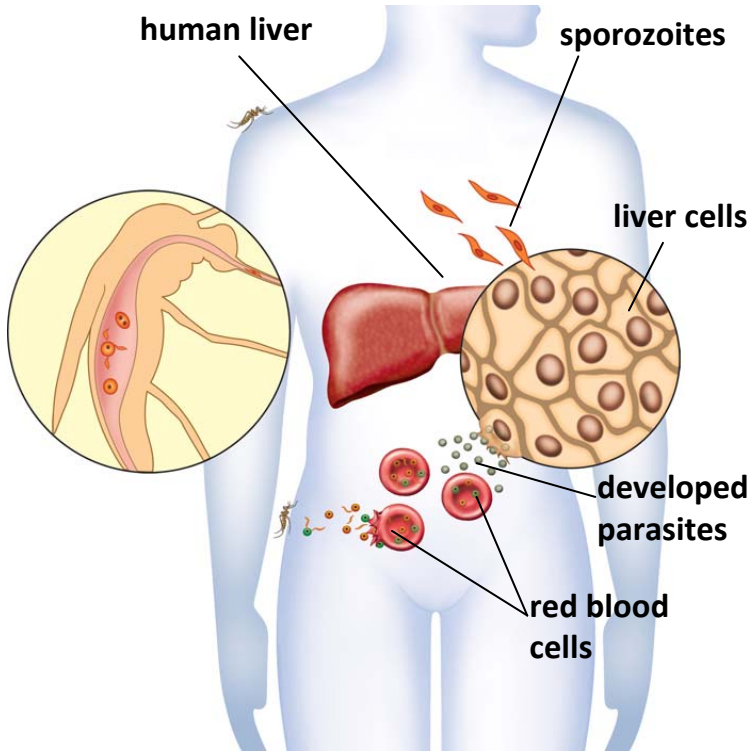



Notice the starburst shaped organelle, the contractile vacuole that helps to pump out excess water.

Note macro and micro nuclei

# Some animal-like protists cause disease.

- Malaria is caused by *Plasmodium* and spread by mosquitoes.
- Sleeping sickness is caused by *Trypanosoma* and spread by flies.
- A giardia infection is caused by *Giardia* and spread through water.




Malaria Infection

# Sporozoans: parasitic protozoans

- Disease causing
- Produces spores within **host cell**
- **Spore**: reproductive cell that forms without fertilization and produces a new organism
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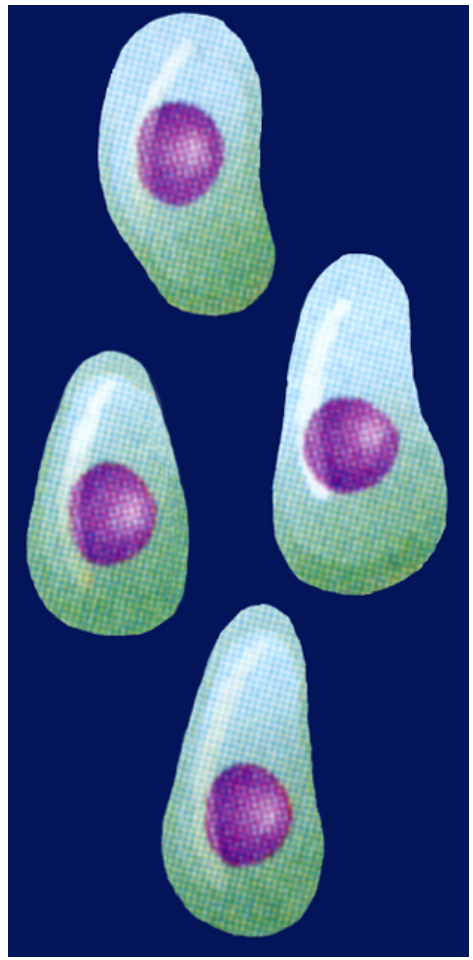
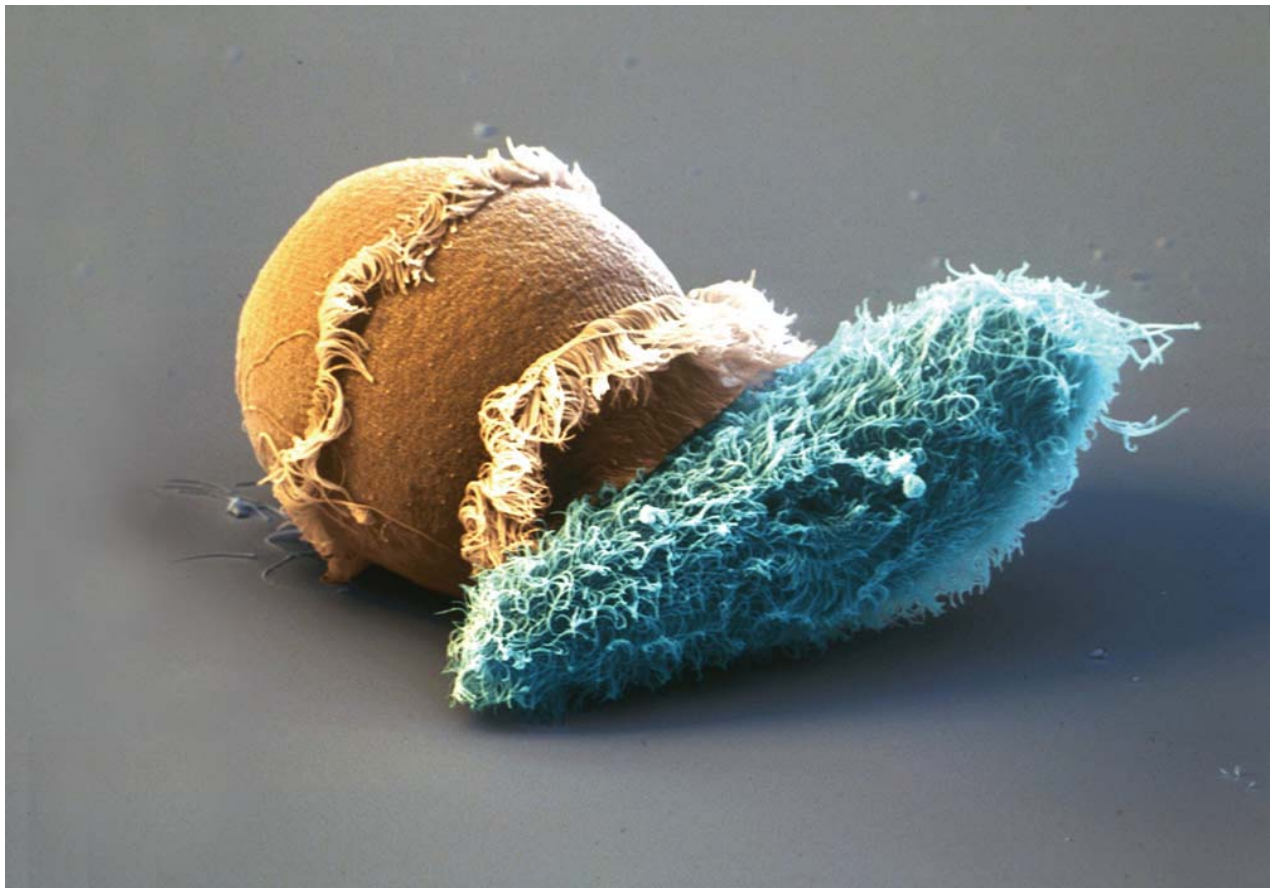


# *Plasmodium*, cause of malaria

- The protist is transmitted through a mosquito bite to a human host.
- The protist reproduces inside the human red blood cells, making them puckered and unable to carry oxygen to the body.

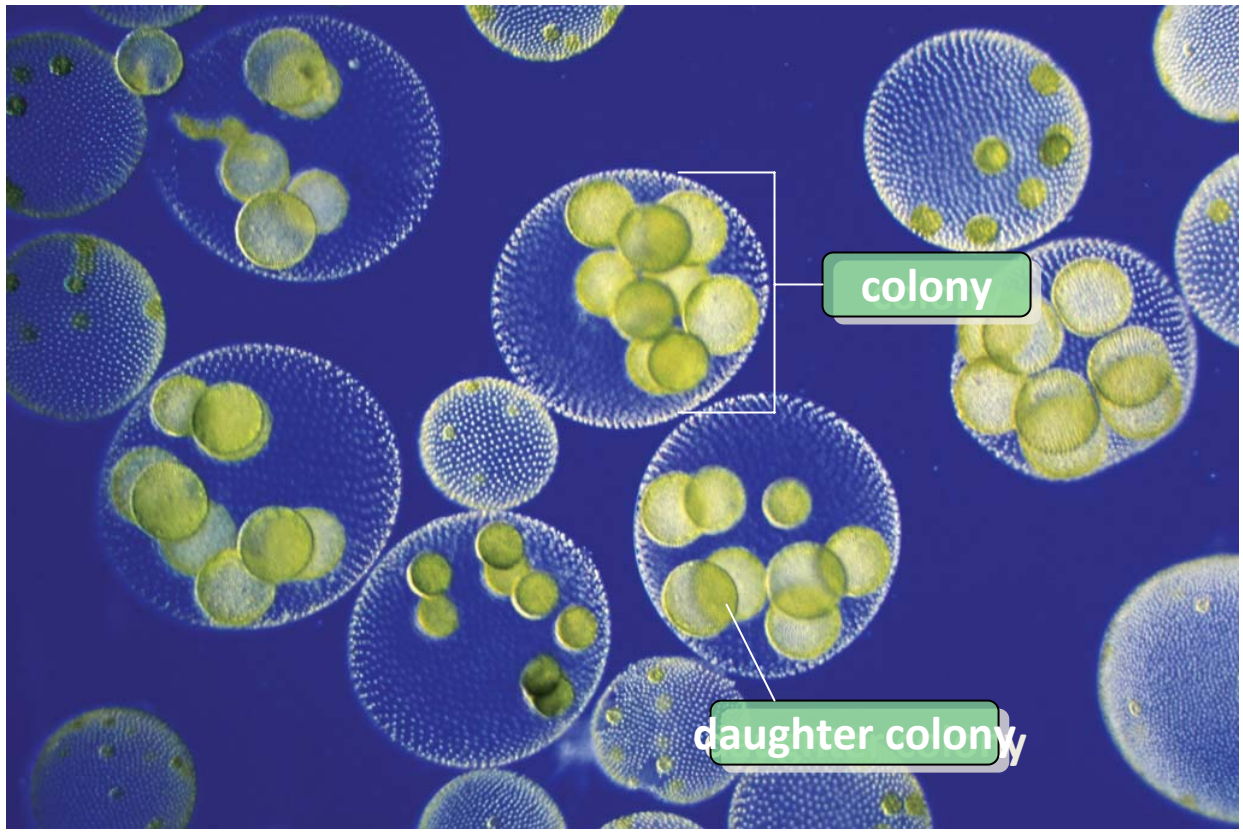
## KEY CONCEPT

**Algae are plantlike protists.**



# Plantlike protists can be single-celled or multicellular.

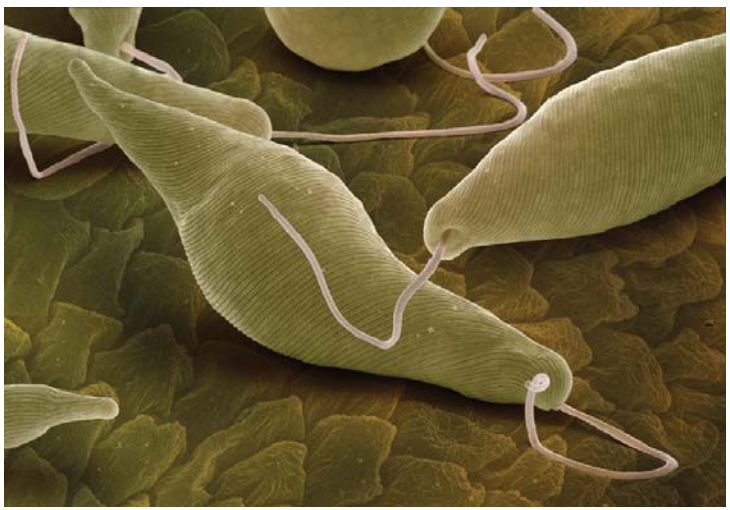
- Photosynthetic plantlike protists are called algae.

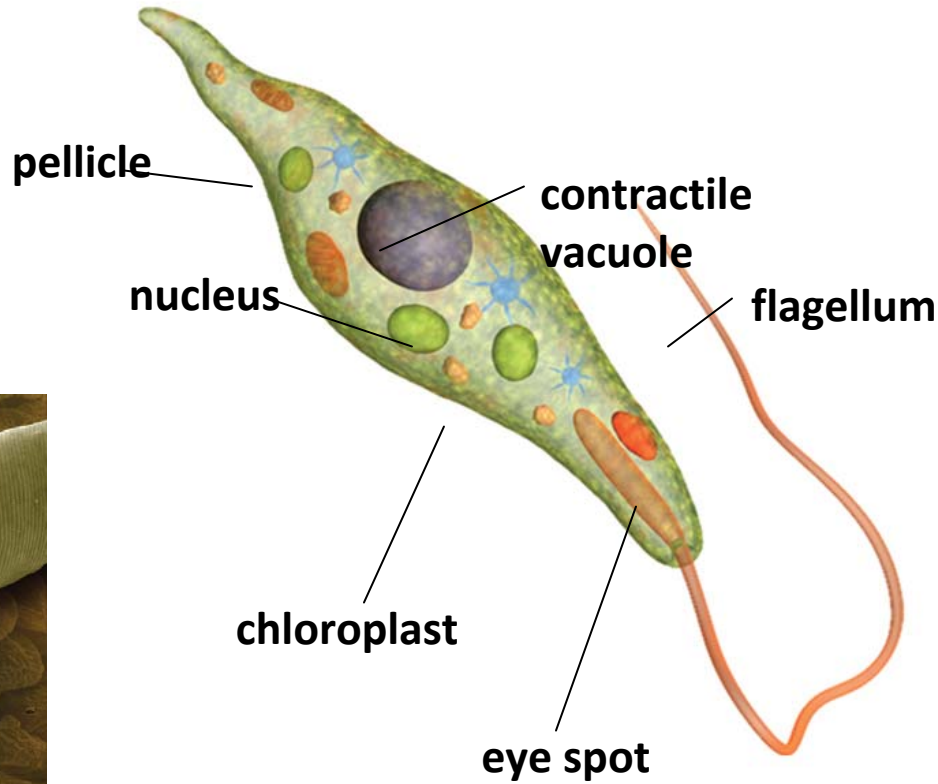


# Major groups of algae

- Euglenoid
- Diatom
- Dinoflagellate
- Green algae
- Red algae
- Brown algae

- Euglenoids are a large group of plantlike protists.
  - mostly photosynthetic
  - some heterotrophic
  - single-celled
  - one or two flagella





- Dinoflagellates are mostly marine plantlike protists.
  - have two flagella
  - may be bioluminescent
  - have stiff protective plates
  - can cause red tide
  - neurotoxin

# Diatoms: golden algae

- Shells made of silica (major component of glass)
- Carotenoid pigment
- Unicellular
- Photosynthetic
- Various shapes
- Oily inside
- Paint, polish, abrasives

- Multicellular algae are classified by their pigments.
  - Green algae contain chlorophyll a and b.
  - Brown algae contain chlorophyll c.
  - Red algae contain chlorophyll a and phycoerythrin.

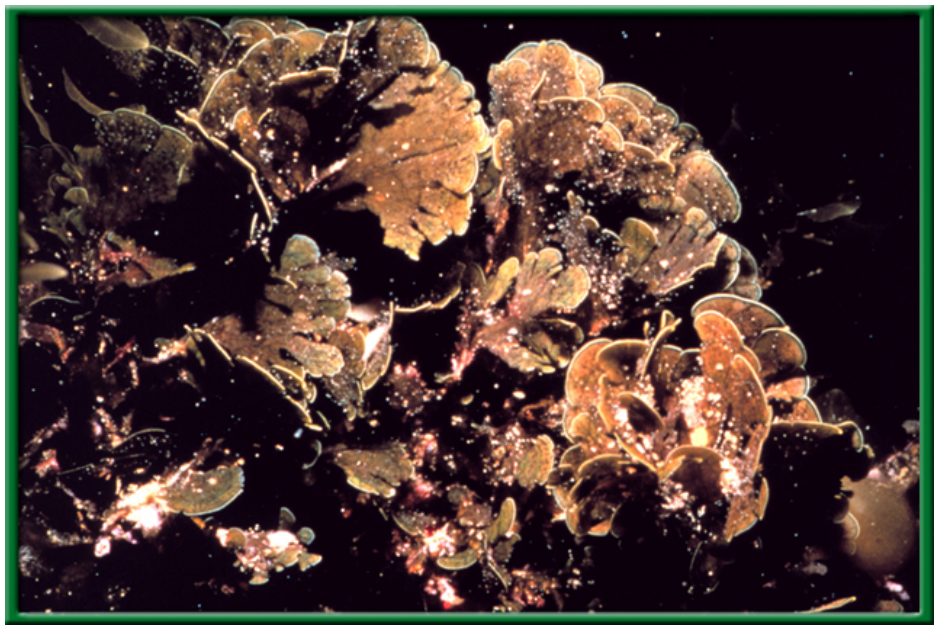
# Red algae

- Multicellular
- Commonly called seaweed
- **Thallus**: Seaweed body that attaches to a surface
- Found deep in the ocean because they can use the light that filters to the bottom for photosynthesis
- used in foods, emusifiers, lipstick
- Agar, used as a thickening agent in ice cream

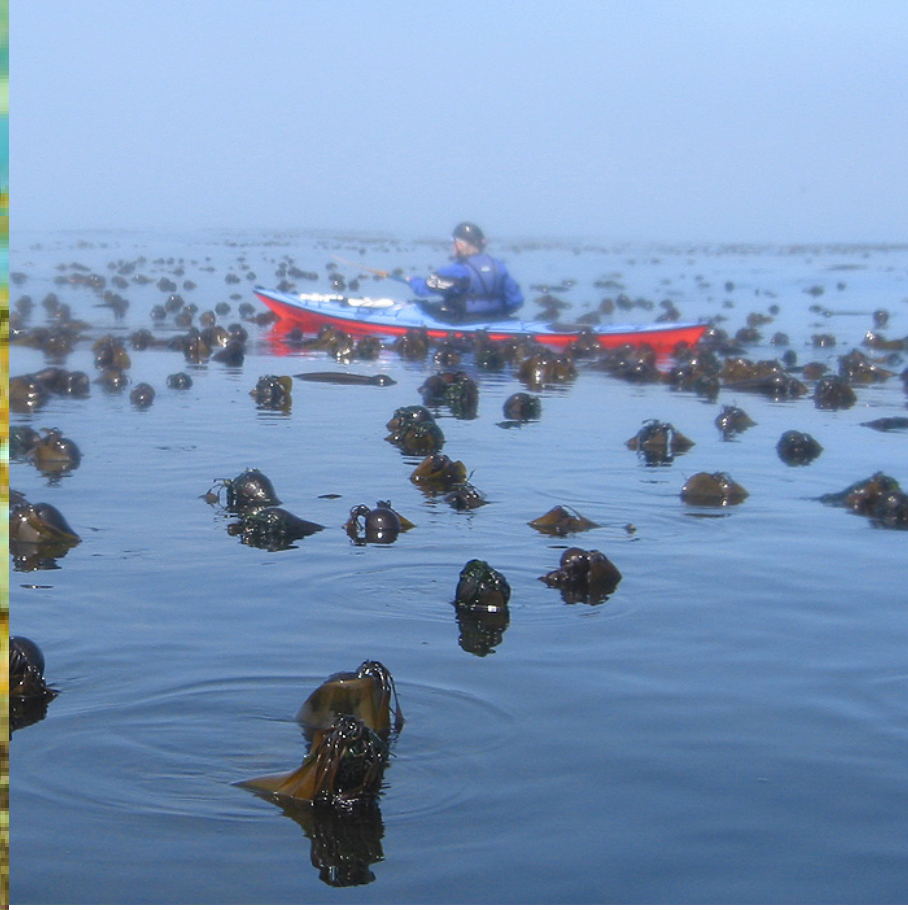
# Red algae

# Brown algae

- Mostly multicellular
- Mostly in cool, marine waters
- **Air bladders** in thallus keeps the algae floating

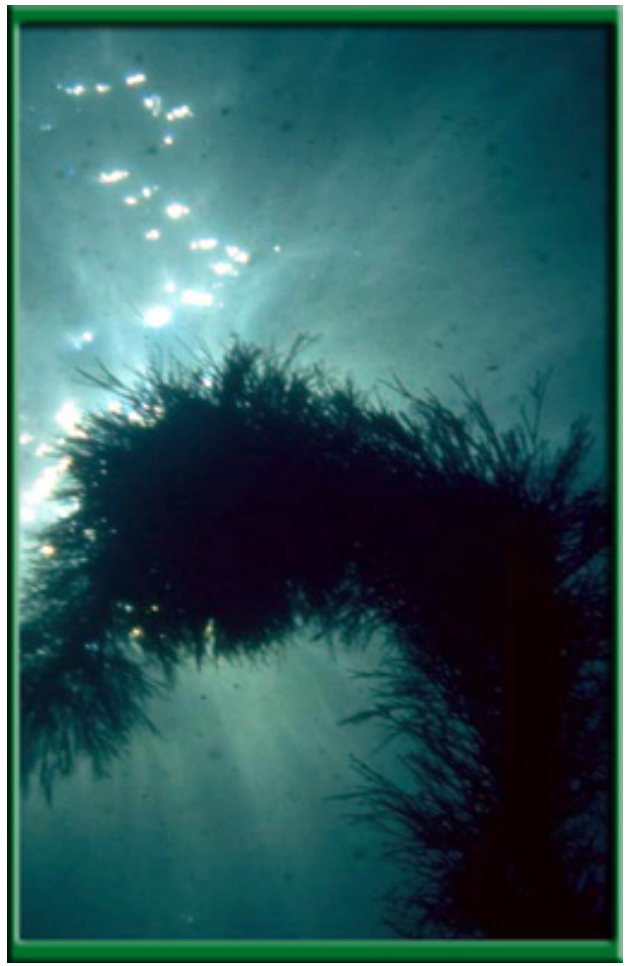


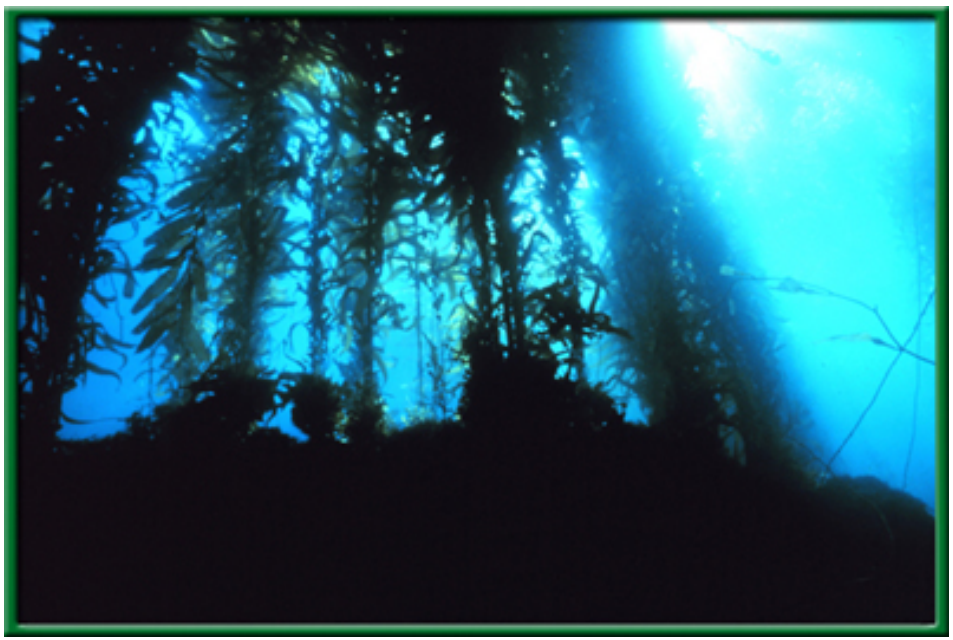

Durvillaea



# Kelp forests

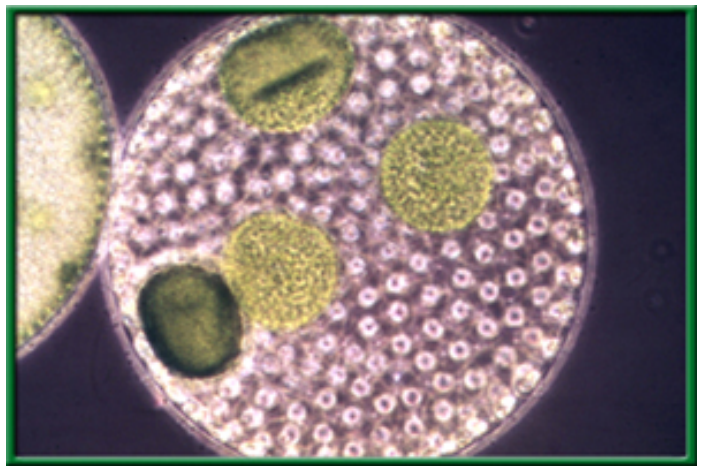
- Dense growth of brown algae
- Habitat for many marine animals





# Green algae

- Most diverse
- Chlorophyll-rich
- Can grow anywhere, even in fur of sloth (below)



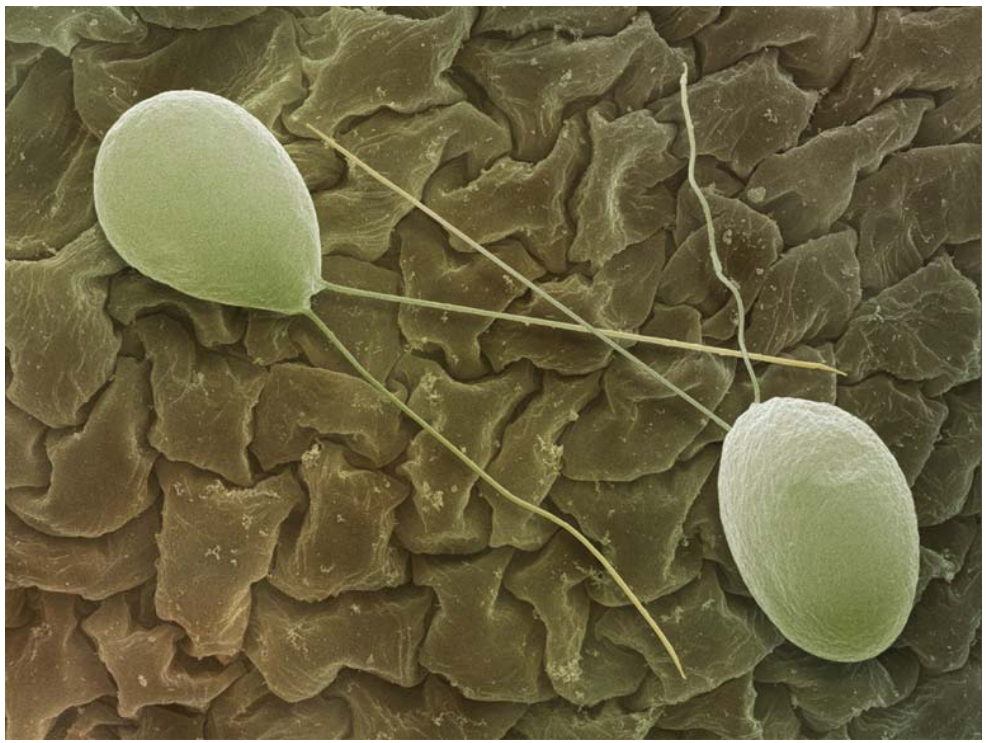
Colonial algae called *Volvox*

# Unicellular green algae

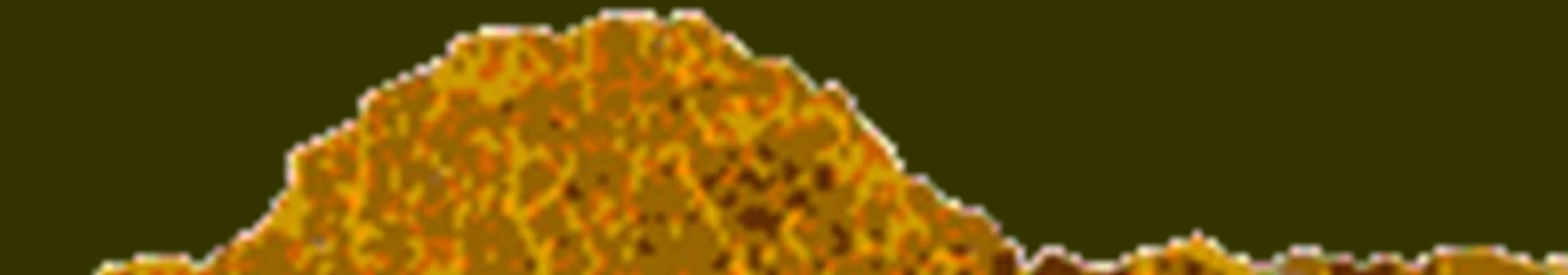
# Multicellular green algae

# Many plantlike protists can reproduce both sexually and asexually.

- All algae can reproduce asexually.
  - Multicellular algae can fragment.
  - *Chlamydomonas* divides into zoospores.



# Fungus-like protists resemble fungi during some part of their life cycle



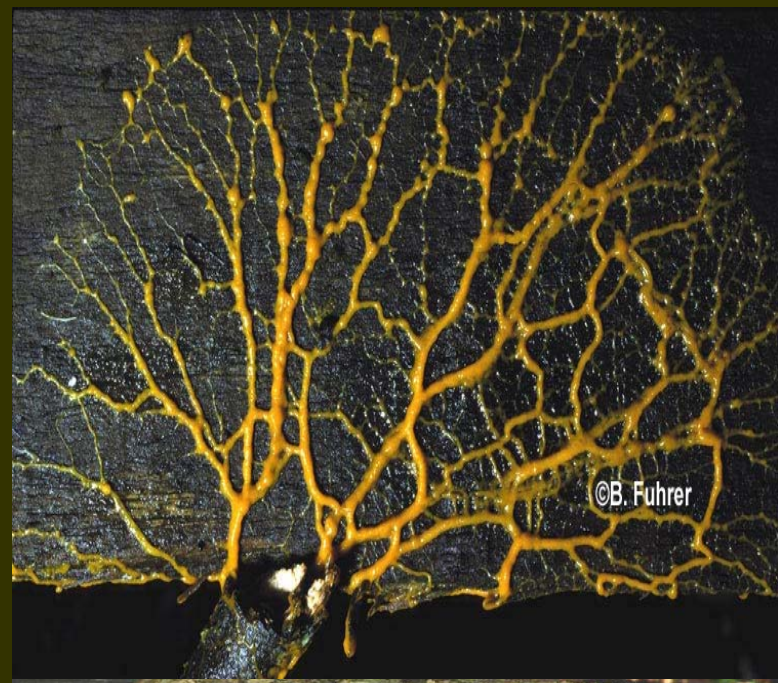
# Fungus-Like Protists

- **Heterotrophs w/cell walls.**
- Reproduce by forming **spores.**
- All **move** at some point in their lives.

- **Three types of fungus-like protists:**
- **Plasmodial Slime molds**
- **Cellular Slime Molds**
- **Water molds**

# Plasmodial Slime Molds

- ***Myxomycota***
- Heterotrophic, amoeboid mass called *plasmodium*
- **A huge single cell w/ millions of nuclei that moves**.
- Ingests bacteria, fungal spores, & other smaller protozoa





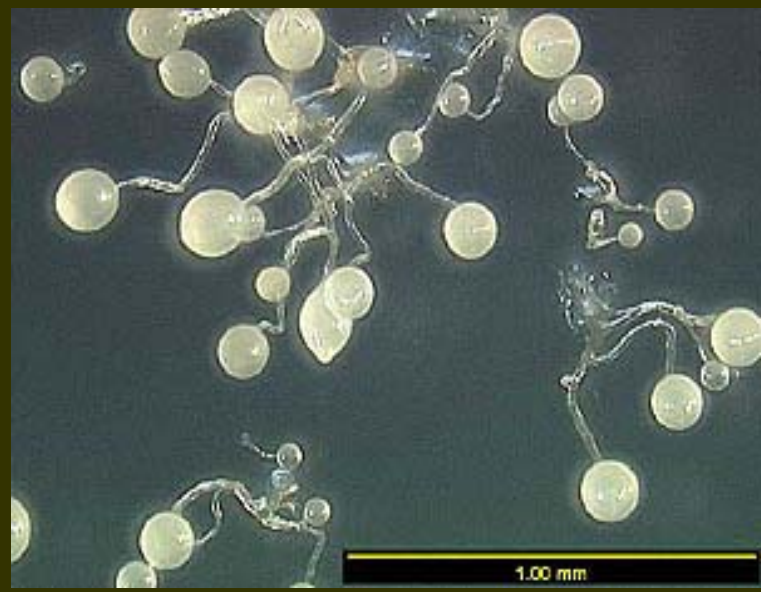
http://www.youtube.com/watch?v=CIEggUBoivY&feature=related&safety_mode=true&persist_safety_mode=1

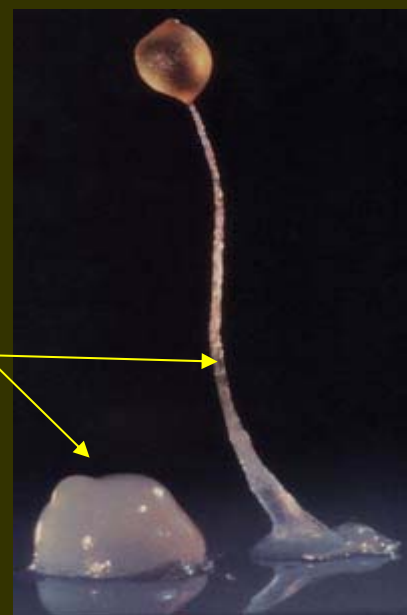
# Cellular Slime Molds

- **Acrasiomycota**
- **Exist as individual cells during feeding stage (ameba-like).**
- **Cells move like amoeba; feed via phagocytosis**
- Spend most of life cycle as single cell/ like ameba
- **Heterotrophic, multi-celled mass before reproduction**

# Cellular Slime Molds

- Ameba-like cells (single cell) during feeding phase
- Cells join up to form slug-like mass(chemotaxis)
- Slugs crawl through dung, soil, rotting mushrooms, decaying leaves & other organic material
- When food is gone, **ALL** slugs in area join together to create a **multicelled pseudoplasmodium,** a "fake plasmodium."
- Slugs w/in mass differentiate into fruiting body w/ spores



- http://www.youtube.com/watch?v=bbVhUIG7ug&feature=related&safety_mode=true&persist_safety_mode=1


A


B
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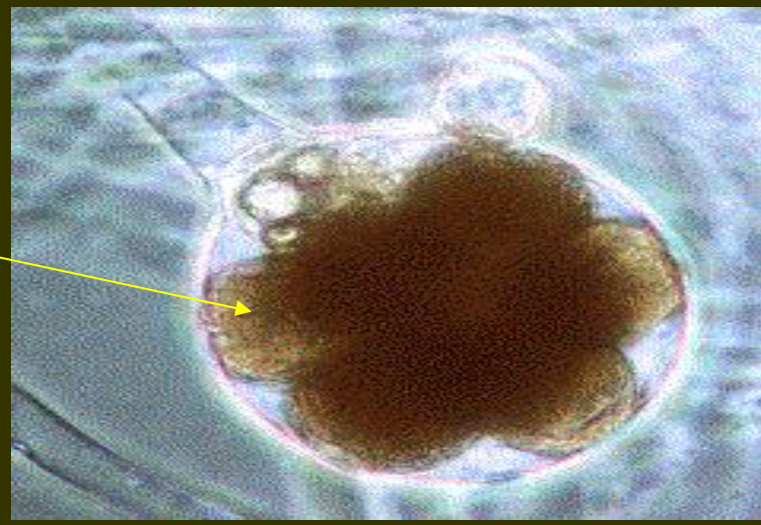
# Water Molds Oomycota

- **Oomycota**" = "egg fungi"
- Refers to large round **oogonia**, or structures containing female gametes,
- Live in water or moist environments
- Look like tiny threads with fuzzy covering
- Decomposers; absorb molecules
- Attack food such as potatoes, cabbage, & corn & can destroy whole crops



# Ireland: The Great Famine

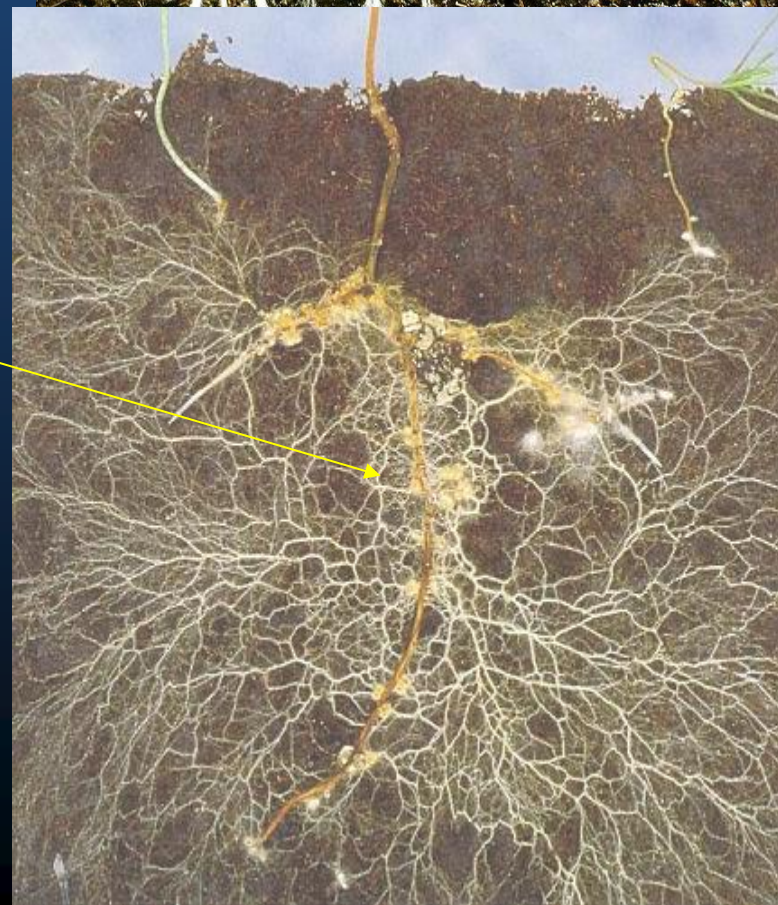
- Water mold devastation between the years of 1845 -1860.
- Growing seasons was a cold & damp one
- The culprit = *Phytophthora infestans*
- Infested ALL of the potato crops in Ireland.
- 1/3 of Ireland's population died of starvation.


FUNGI

# Fungi Nutrition

- Are **heterotrophs; main decomposers in every ecosystem**.
- Most are **saprotrophic=** decompose dead matter.
- Many are **parasitic =** obtain nutrients from living organisms (scab, athletes foot, Dutch elm disease, thrush, lung infections).
- **Food industry-** mushrooms, yeast (bread & alcohol making)
- **Medicine** –penicillin (Alexander Fleming's discovery
- **Lichen**- m**utalistic relationship w/algae**

- Some are **mutualistic**
- Hyphae of some symbiotic fungi become specialized for penetrating the cells of the host. These hyphae = ***mycorrhizae*.**
- Mycelium & mycorrhizae absorb nutrients & water & assist host plant



- Some form Symbiotic relationships
- algae + fungus = LICHEN
- Secrete acid; acid breaks down rock
- Usually first organisms to colonize bare rock or bare soil

•Others are **poisonous**; & used as intoxicants as far back as 4,000 years ago

- FUNGI have extracellular digestion
- FUNGI secrete enzymes into environment & absorb the nutrients produced.
- FUNGI store food as glycogen (like animals).
- Plants & green algae store their food as starch.

# Structure

- Multicellular fungi are composed of filaments called ***hyphae*** (singular: hypha).
- Hyphae may be branched.
- Dense mass of hyphae is called a **mycelium**.

- Fungi have cell walls (like plants) but cell walls made of ***chitin***, which = exoskeleton of arthropod (insects, crayfish, etc.).
- FYI . . . Cell walls of plants & some protists are made of cellulose.

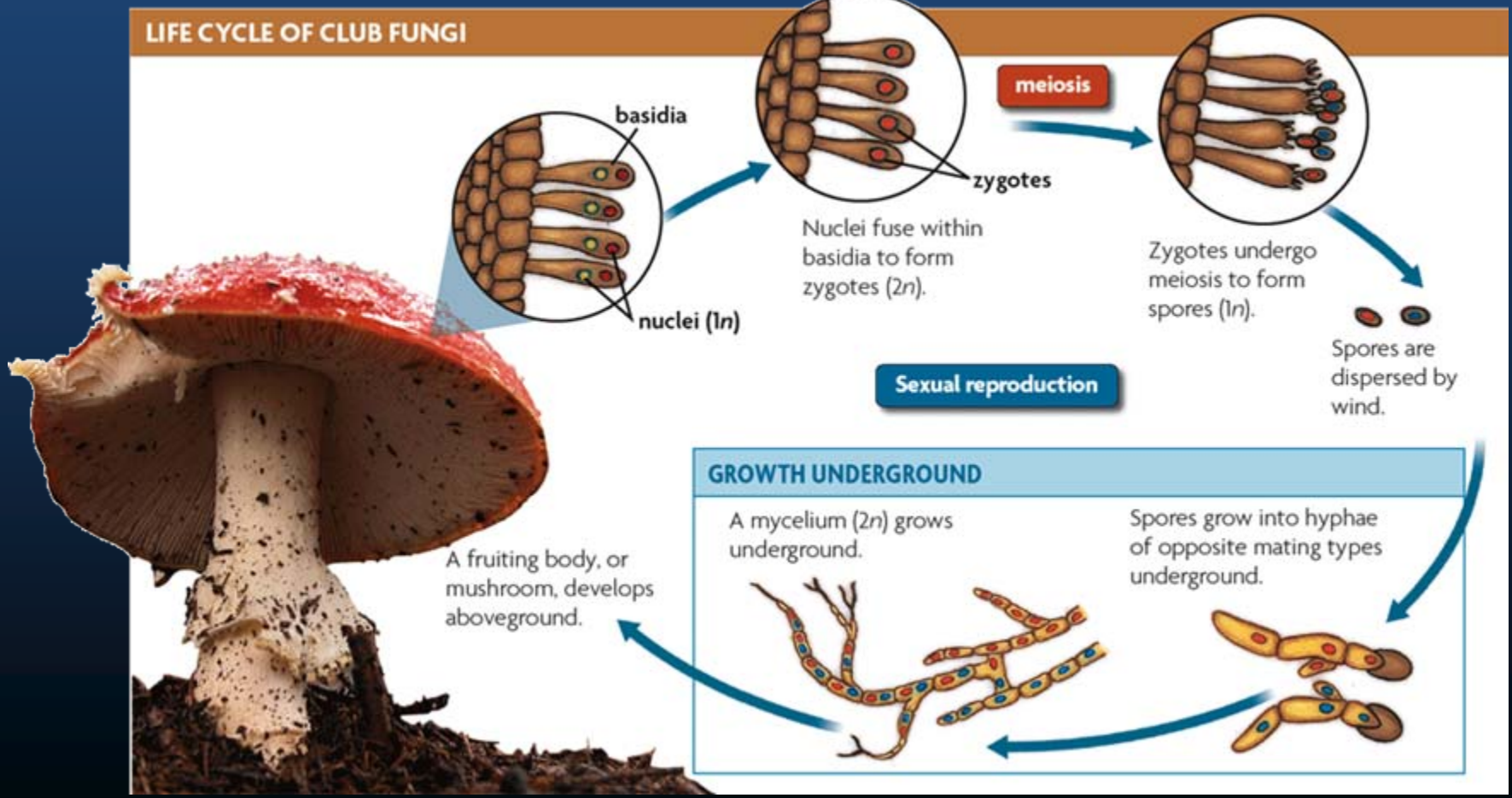
- Most fungi do NOT have flagella in any phase of their life cycle.
- FUNGI move toward food by growing toward it.

# Reproduction

- Fungi are categorized into phyla (divisions) based on the type of structures produced during sexual reproduction.

– life cycles may include either sexual or asexual reproduction or both

REPRODUCTION OF CLUB FUNGI (there are other forms as well)



# Pathogenic fungi-

- **<u>Human diseases</u>** - athlete's foot, ringworm, candidiasis/thrush, AIDS patients susceptible to lung infection by *Aspergillus*
- <u>Mold spores-</u> can cause allergic response (autoimmune)