

**Chapter 27**  
**Microbial Eukaryotes: Protists**

Domain Bacteria    Domain Archaea    Domain Eukarya

Common ancestor

**General Characteristics**

- Classification criteria
  - eukaryotes
  - not animal, plant or fungi

**Great Diversity**

euglenoids  
dinoflagellates & ciliates  
brown algae & diatoms  
red algae  
green algae  
miscellaneous?

**Problems with Protist Classification**

- Too Diverse!

Bacteria    Archaea    Euglenozoa    Alveolata    Stramenopila    Rhodophyta    Chlorophyta    Streptophyta (include land plants)    Choanoflagellida    Animals

**Theory of Endosymbiosis**

internal membrane system    aerobic bacterium    mitochondrion

Ancestral eukaryotic cell    Eukaryotic cell with mitochondrion

chloroplast    photosynthetic bacterium

Eukaryotic cell with chloroplasts

*Paramecium* & symbiont *Chlorella*

**Protist Diversity**

- The full spectrum of modes of life
  - from unicellular to multicellular
  - autotrophic to heterotrophic
  - asexual to sexual reproduction
  - pathogenic to beneficial
  - sessile to mobile

### Mobility

- How protists move
  - flagellum
  - cilia
  - pseudopod

### Protist Diversity

- Animal-like protists
  - heterotrophs, predators
    - Amoeba
    - Paramecium
    - Stentor

Paramecium with food vacuoles stained red

Amoeba ingesting a Paramecium

### Protist Diversity

- Plant-like Protists
  - autotrophs, photosynthesis
    - Euglena
    - algae
    - diatoms

### Protist Diversity

- Parasitic & pathogenic Protists
  - malaria
  - Giardia
  - trypanosomes

Plasmodium

Giardia

Trypanosoma

### Protist Diversity

- Beneficial & necessary Protists
  - phytoplankton
    - small algae + diatoms
    - much of the world's photosynthesis
    - produces ~90% of atmospheric oxygen
  - zooplankton
    - heterotrophic protists +
    - key ecological role at base of marine food web