



Chapter 28~
The Origins of Eukaryotic Diversity

The Endosymbiotic Theory

The evolution of the eukaryotic cell led to the development of several unique cellular structures and processes.

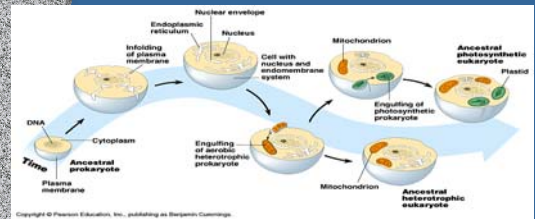
- These include the
 - membrane-enclosed nucleus
 - the endomembrane system
 - Mitochondria & chloroplasts
 - the cytoskeleton, 9 + 2 flagella
 - multiple chromosomes of linear DNA with organizing proteins
 - life cycles with mitosis, meiosis, and sex.

How did Eukaryotes come to be?

- One trend was the evolution of multicellular prokaryotes, where cells specialized for different functions.
- A second trend was the evolution of complex communities of prokaryotes, with species benefiting from the metabolic specialties of others.
- A third trend was the compartmentalization of different functions within single cells, an evolutionary solution that contributed to the origins of eukaryotes.

The Endosymbiotic Theory

- Infoldings of plasma membrane contributed to the creation of the endomembrane system.
- Mitochondria and chloroplasts were formerly from small prokaryotes living within larger cells (Margulis)



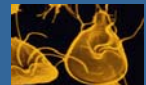
Protists

- Ingestive (animal-like); protozoa
- Absorptive (fungus-like)
- Photosynthetic (plant-like); alga



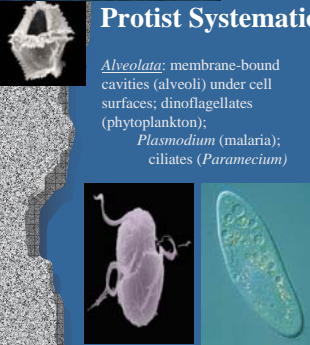
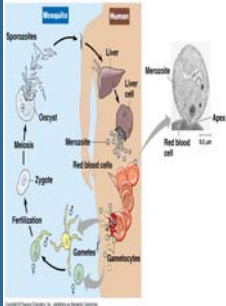
Protist Systematics & Phylogeny, I

- 1- Archaezoa - Groups lacking mitochondria; early eukaryotic link; *Giardia* (human intestinal parasite; severe diarrhea); *Trichomonas* (human vaginal infection)
- 2- Euglenoids; autotrophic & heterotrophic flagellates; *Trypanosoma* (African sleeping sickness; tsetse fly)

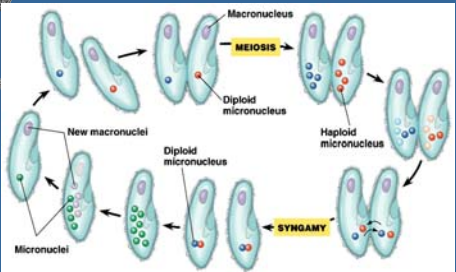


Protist Systematics & Phylogeny, II

Alveolata: membrane-bound cavities (alveoli) under cell surfaces; dinoflagellates (phytoplankton); *Plasmodium* (malaria); ciliates (*Paramecium*)

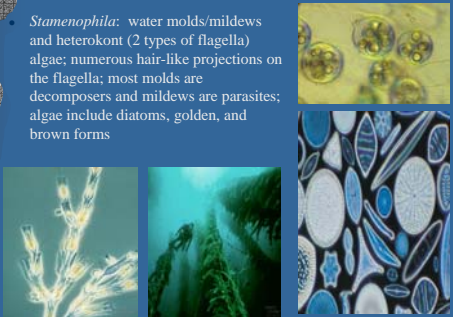



Ciliate Reproduction



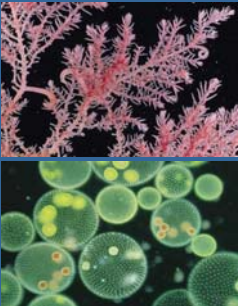
Protist Systematics & Phylogeny, III

- Stamenophila*: water molds/mildews and heterokont (2 types of flagella) algae; numerous hair-like projections on the flagella; most molds are decomposers and mildews are parasites; algae include diatoms, golden, and brown forms




Protist Systematics & Phylogeny, IV

- Rhodophyta*: red algae; no flagellated stages; phycobilin (red) pigment
- Chlorophyta*: green algae; chloroplasts; gave rise to land plants; *volvox*, *ulva*



Protist Systematics & Phylogeny, V

- Affinity uncertain:
- Rhizopods*: unicellular with pseudopodia; *amoebas*
- Actinopods*: 'ray foot' (slender pseudopodia); *heliozoans*, *radiolarians*



Protist Systematics & Phylogeny, VI

- Mycetozoa*: slime molds (not true fungi); use pseudopodia for locomotion and feeding; *plasmodial* and *cellular* slime molds

