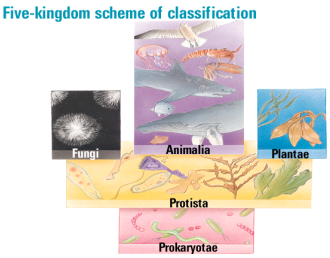
Chapter 12

Algae & Protists

Five-Kingdom Classification

- ✓ Monera
- ✓ Protista
- ✓ Fungi
- ✓ Plantae
- ✓ Animalia



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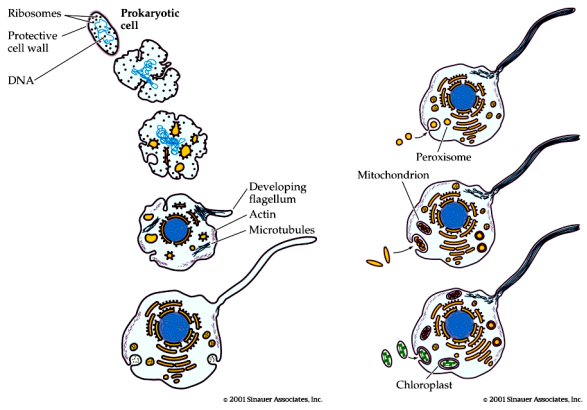


Endosymbiotic Hypothesis

- ✓ 1. Nuclear envelope and E.R. presumed to have evolved from invagination of cell or plasma membrane
  - ✒ (Circular naked DNA to linear DNA packed on histones)
- ✓ 2. Purples non-sulfur or Rhizobial or Rickettsial bacteria gave rise to mitochondria
- ✓ Cyanobacteria (prochlorobacteria) gave rise to chloroplasts
- ✓ 3. Lynn Margelis suggested spirocheates gave rise to eukaryotic flagella
- ✓ Peroxisome maybe endosymbionic

Testing the Hypothesis -

Chlorella inside a *Paramecium*

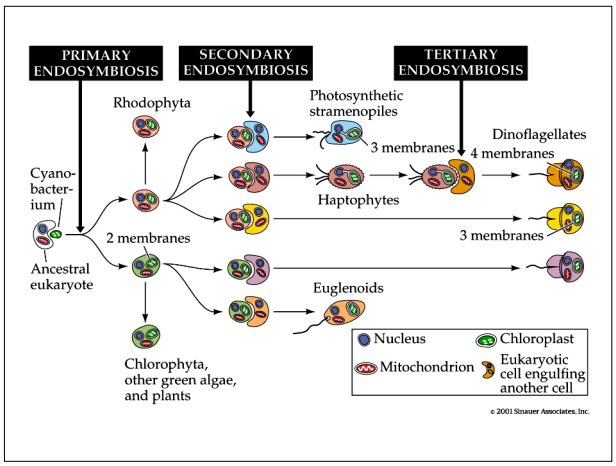
Cyanophera - 50,000 -1 million years -

still have peptidoglycan

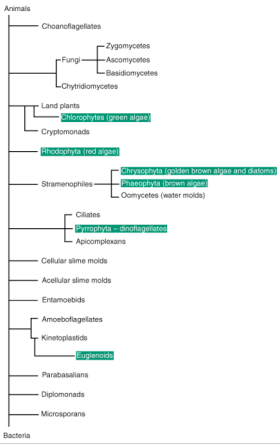
15% DNA compare to 5%

Testing the Hypothesis -

- ✓ Coral bleaching
  - ✒ Symbionic relationship with dinoflagellates
- ✓ Treatment with chloramphenical
  - ✒ Kills chloroplasts



Phylogeny of algae



Structure of algae - *Nereocystis luekeana*

Phaeophyta
Brown algae

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Brown Algae

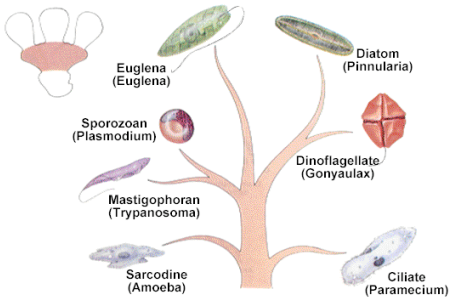
Fig. 35.16a

Green Alga – *Ulva*

Chlorophyta

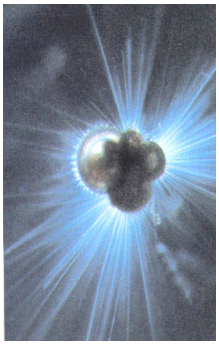
Red algae - Rhodophyta

Protista



Protista

- ✓ Eukaryotic
- ✓ Unicellular or grouped
- ✓ Nutrition by ingestion, absorption or photosynthesis
- ✓ Asexual and sexual reproduction



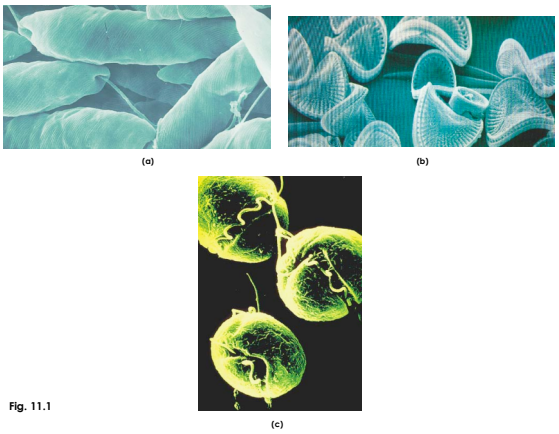
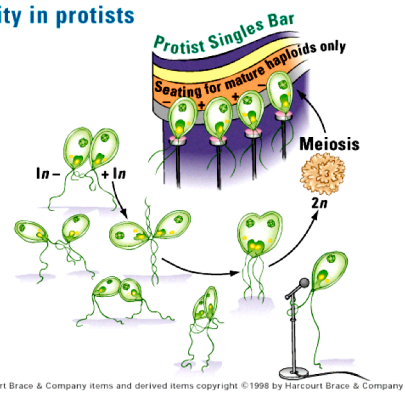


Fig. 11.1

Sexuality in protists



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Protista

- ✓ Plantlike protists
  - ✒ Have chloroplasts; live in moist, sunny environments, unicellular
- ✓ Funguslike protists
  - ✒ Saprophytes; may be uni- or multicellular
- ✓ Animal-like protists
  - ✒ Heterotrophic; unicellular, free-living, commensals or parasites

Plantlike protists

- ✓ Euglenids (*Euglenophyta*)
  - ✒ Single flagellum; pigmented eyespot; lacks a cell wall, but has protein pellicle; divide by binary fission.
- ✓ Diatoms (*Chrysophyta*)
  - ✒ Two flagella; yellow and brown pigments; contain silica or $CaCO_3$ in cell wall
- ✓ Dinoflagellates (*Pyrrophyta*)
  - ✒ Two flagella; may or may not have cellulose cell wall(not very common in protists); some bioluminesce.

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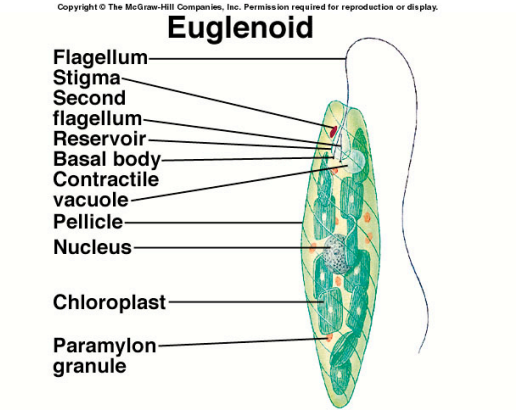

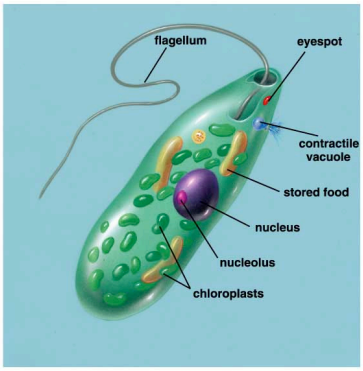

Diatoms

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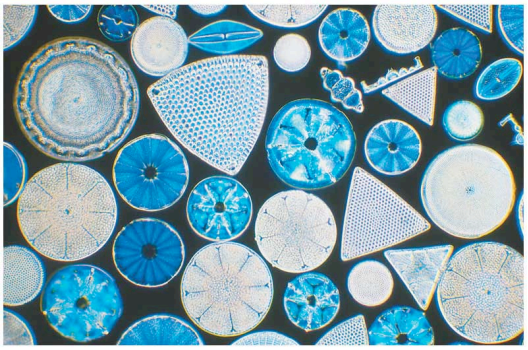
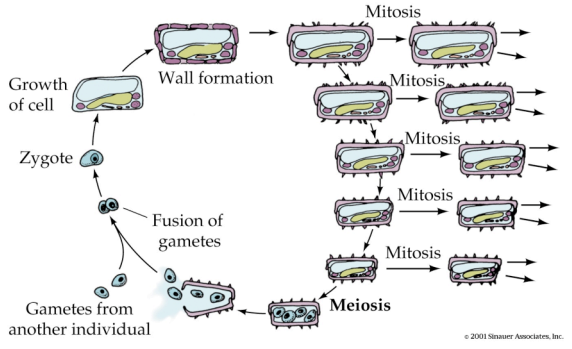


Diatom reproduction



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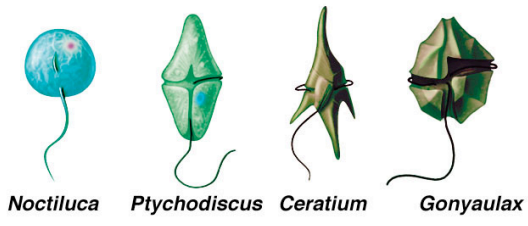
Dinoflagellates



Dinoflagellate (*Gymnodinium*)

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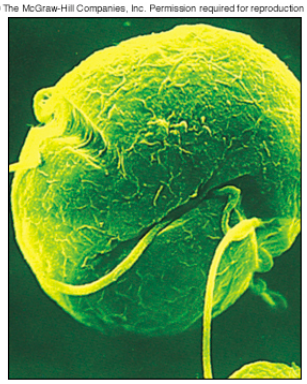
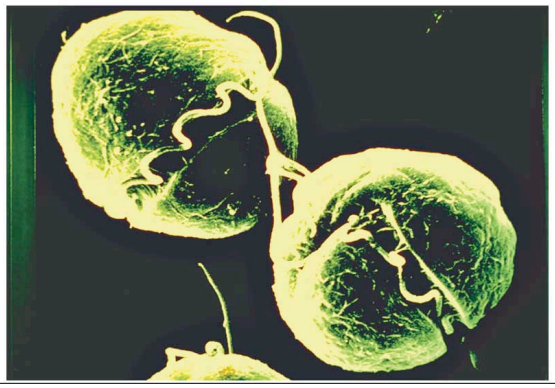


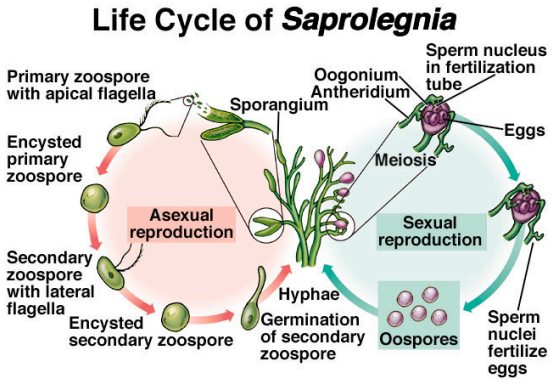
Dinoflagelate (*Gymnodinium*)



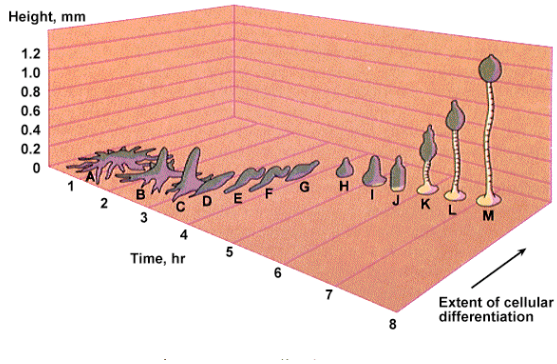
Funguslike protists

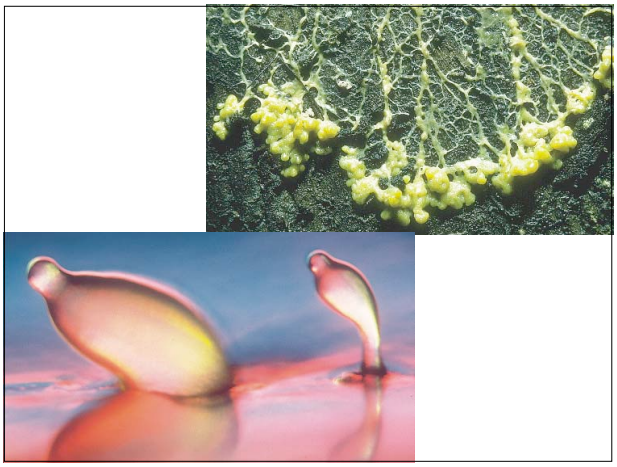
- ✓Water molds (*Oomycota*)
  - ✒Cellulose cell wall; form egg-like spores; have motile zoospores.
  - ✒Diseases on plants, mildews, and fish diseases
- ✓Slime molds
  - ✒Plasmodial (multinucleate, amoeboid mass) lack cell wall; pair of flagella, fruiting bodies
  - ✒cellular psuedoplasmodia (slightly motile aggregation of cells), fruiting body, cellulose cell wall; amoeboid

Oomycota

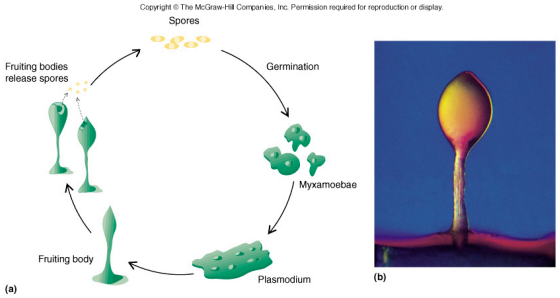


Development of a slime mold





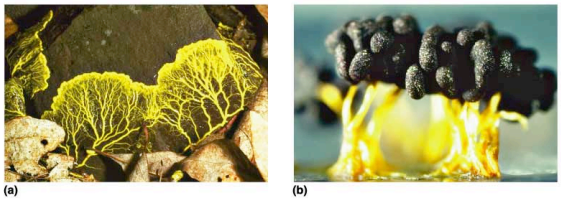
Slime molds



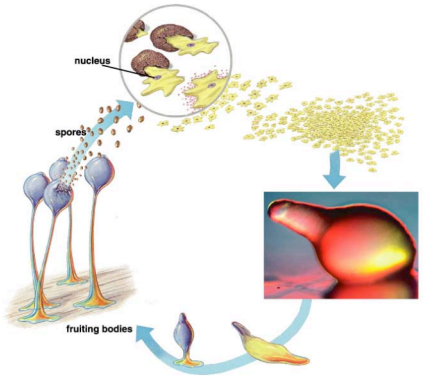
Acellular slime mold

Cellular slime mold

Plasmodial slime mold



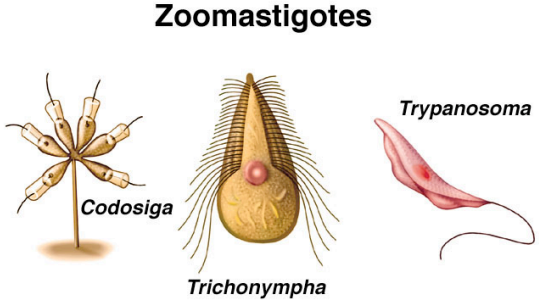
Cellular slime mold

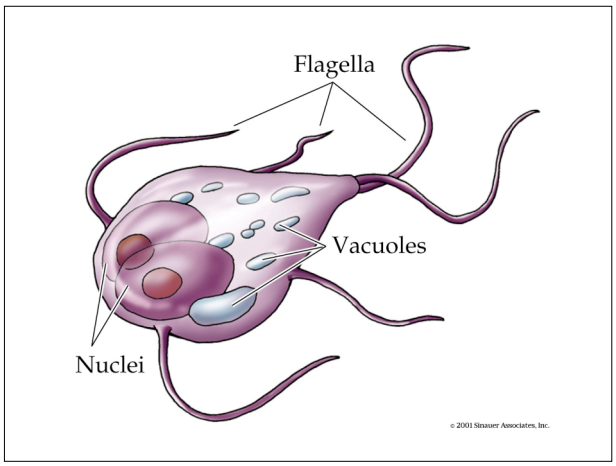


Animal-like protists (protozoa)

- ✓ Mastigophorans (Flagellates)
  - ✒ Flagellated - *Trichonympha* lives in termite guts and digests cellulose, *Trypanosoma*, *Leishmania*, *Giardia*, *Trichomonas*
- ✓ Sarcodines (*Sarcodina*)
  - ✒ Amoeboid, some have shells - *Entomoeba*, *Dientamoeba*, *Endolimax*, & *Iodamoeba*
- ✓ Apicomplexans (sporozoans)
  - ✒ Immobile, parasitic, complex life cycles- *Plasmodium*, *Toxoplasma gondii*
- ✓ Ciliates (Ciliophora)
  - ✒ Ciliated, 2 or more nuclei, vacuole, pellicle- *Paramecium*

Flagellates





Giardia lamblia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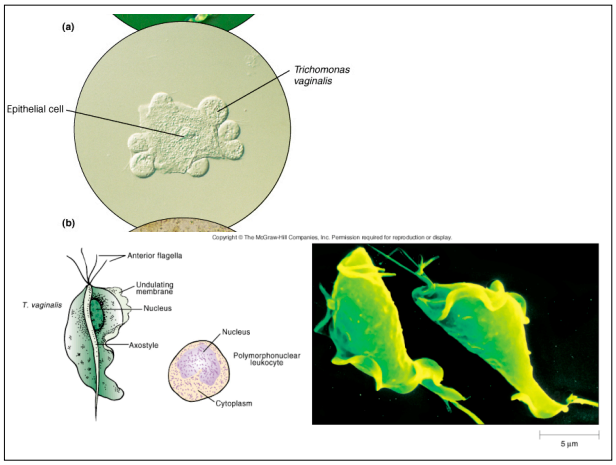
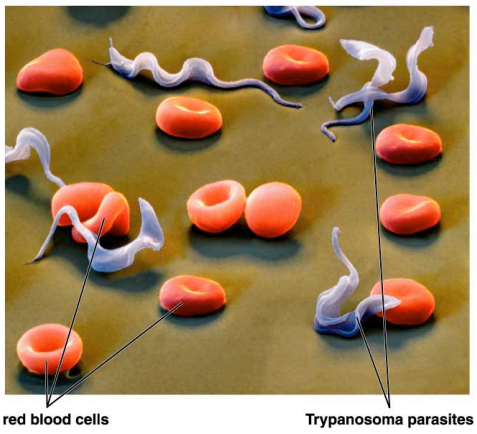
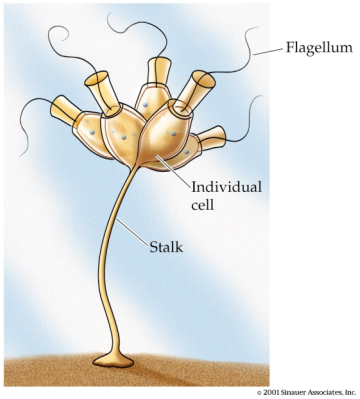
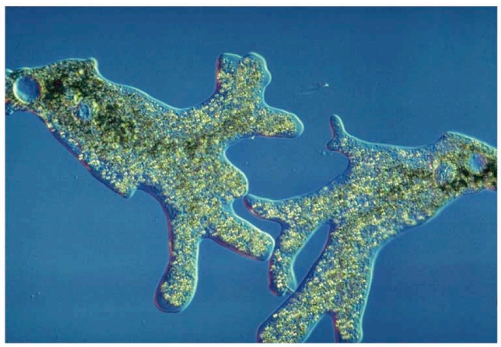
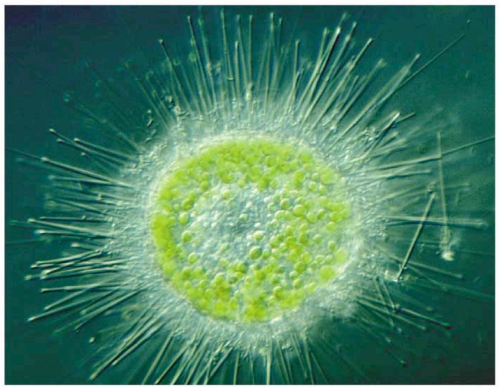


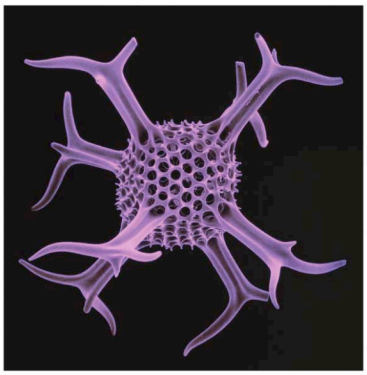




Amoeba







Foraminifera (hard silica shells)

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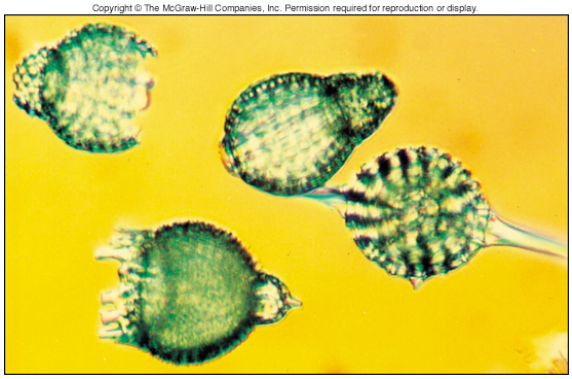
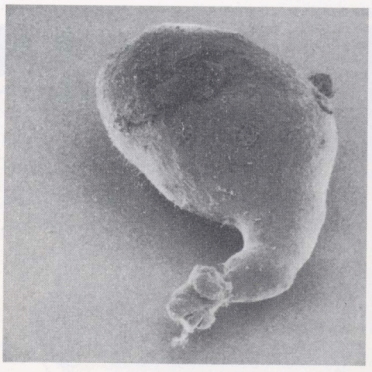


FIGURE 31.8
White cliffs of Dover. The limestone that forms these cliffs is composed almost entirely of fossil shells of protists, including coccolithophores (a type of algae) and foraminifera.

FIGURE 31.6
Pelomyxa palustris. This unique, amoeba-like protist lacks mitochondria and does not undergo mitosis. *Pelomyxa* may represent a very early stage in the evolution of eukaryotic cells. This species is the only member of the phylum Caryoblastea.



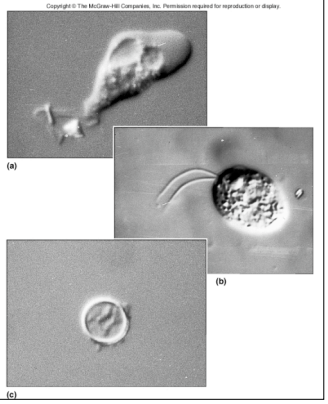
Plasticity (polymorphism)

Naegleria has many forms

Human tissue - ameba

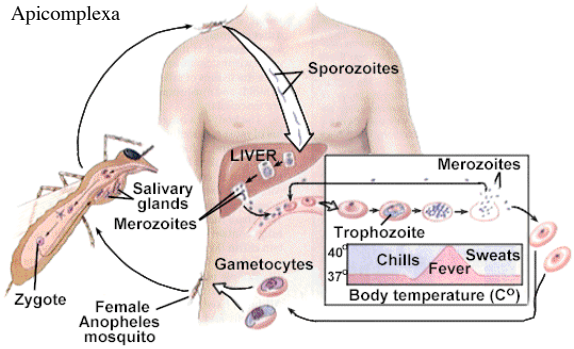
Water - flagella

Adverse conditions - cyst

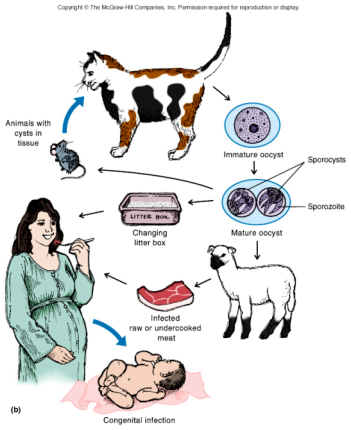


Life cycle of *Plasmodium* (malaria)

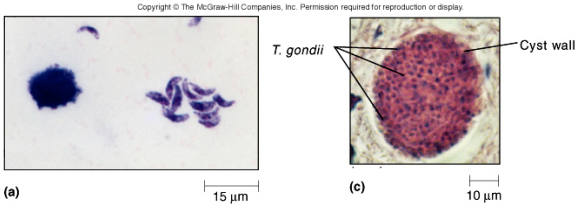
Apicomplexa



Toxoplasma gondii



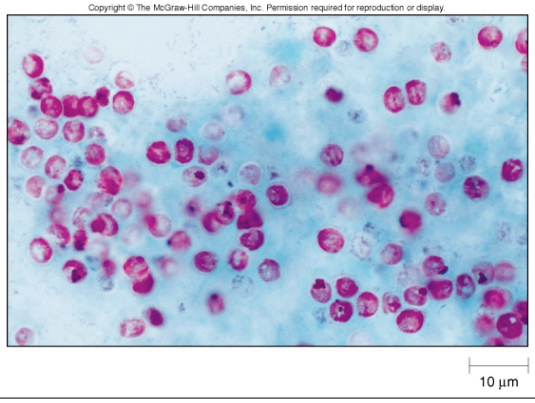
Toxoplasma gondii

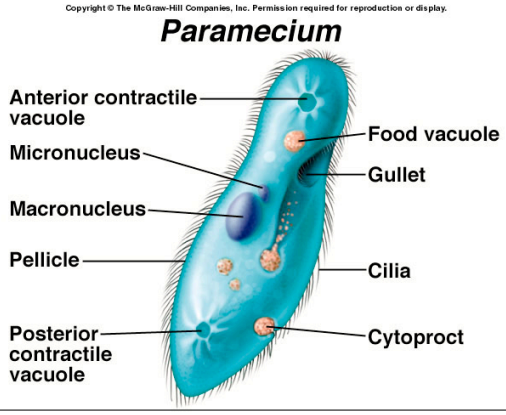


Invasive forms

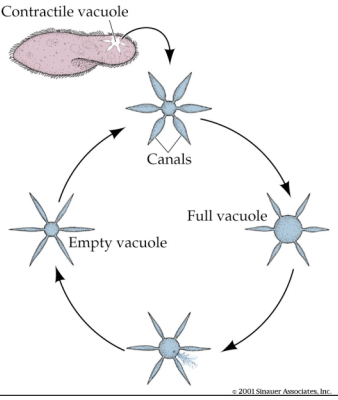
Cyst in meat

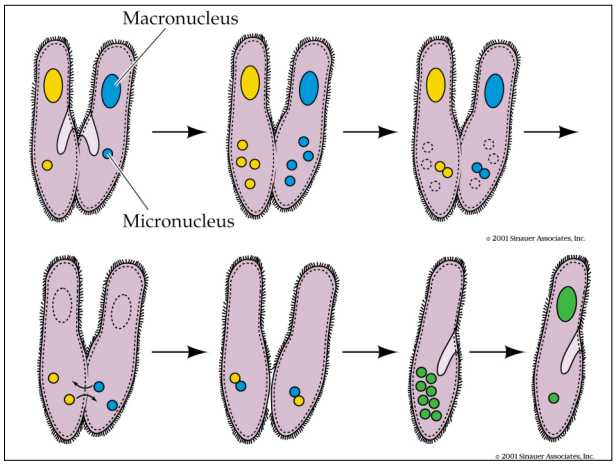
Cryptosporidium parvum

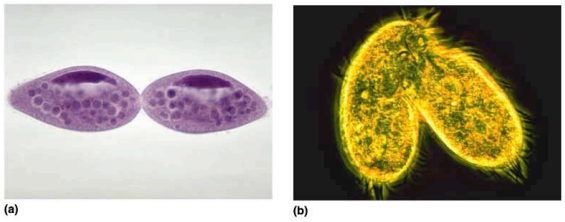




Contractile vacuole







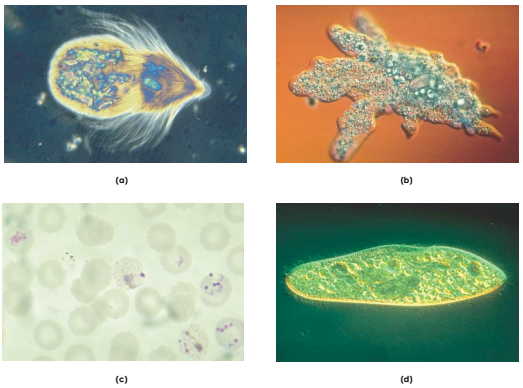


Fig. 11.3