

CHAPTER 28: PROTISTS

AP Biology 2013

1

Protists

- * Single-celled (mostly - some colonial or multicellular)
- * Eukaryotes
- * Extremely diverse (more diverse than any other classification of eukaryotes)
- * Contain: photoautotrophs, heterotrophs, mixotrophs (both heterotrophic and autotrophic)
- * Diverse habitats (freshwater and marine species)
- * Both sexual and asexual life cycles

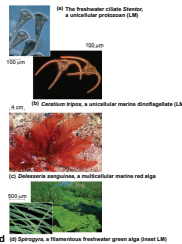


Figure 28.2a-c

Major Clade	Key Characteristics	Examples from Chapter
Diplomonada (diplomonads)	Two equal-sized nuclei; modified mitochondria	Giardia
Phaeophyta (brown algae)	Uniflagellate zoospores; modified mitochondria	Trichomonas
Euglenozoa (euglenozoans)	Spiral or crystalline rod inside flagella	Trypanosoma
Kinetoplastida (kinetoplastids)	Kinetoplast (DNA in mitochondrion)	Euglenas
Euglenozoa (euglenozoans)	Parasitism or orange rodlike	Flagellates
Alveolates (alveolates)	Alveoli beneath plasma membrane	Ciliates, Dinoflagellates
Dinoflagellata (dinoflagellates)	Arms of cellulose plates	Plankton
Amoebozoa (amoebozoans)	Apical complex of organelles	Paramecium, Entamoeba
Ciliophora (ciliates)	Gills used to move water and feeding	Paramecium, Stentor
Stramenopiles (stramenopiles)	Hairy and smooth flagella	Water molds, white rust, downy mildew
Chlorophyta (green algae)	Regular flagella	Chlorella, Scenedesmus
Charophyta (charophytes)	Glucose, wax, lignin	Chara, Lemnaca, Spirogyra, Volvox
Chlorophyta (green algae)	Flagella attached near one end of cell	Diatoms
Phaeophyta (brown algae)	All multicellular, some with alternation of generations	Laminaria, Macrocystis, Postelsia
Ceratium (ceratium) and other rhizaria	Association with terrestrial periphyton	Giardia
Forams (forams)	Process shell	Forams
Rhizaria (rhizaria)	Pseudopods radiating from central body	Amoeba, Paramecium
Amoebozoa (amoebozoans)	Amoebae with thin-layered pseudopodia	Amoeba
Opisthokonta (opisthokonts)	Soil-dwelling, freshwater, or marine	Opisthokonta
Opisthokonta (opisthokonts)	Parasites	Plasmodium
Mycetozoa (mycetozoa)	Multicellular plasmodium, feeding bodies that function as sexual sporangia	Slime molds
Desmidiaceae (desmidiaceae)	Multicellular aggregate that forms sexual resting spores	Chlamydomonas
Rhodophyta (red algae)	Phycocyanin (accessory pigment); no flagellated stages	Brown algae, Charophytes, Embryophytes
Chlorophyta (one group of green algae)	Plano-type chloroplasts	Chlorella, Chlamydomonas, Spirogyra, Volvox

Table 28.1

2

Secondary Endosymbiosis

- * Causes much of the diversity
- * Plastid-bearing lineages evolved into red algae and green algae

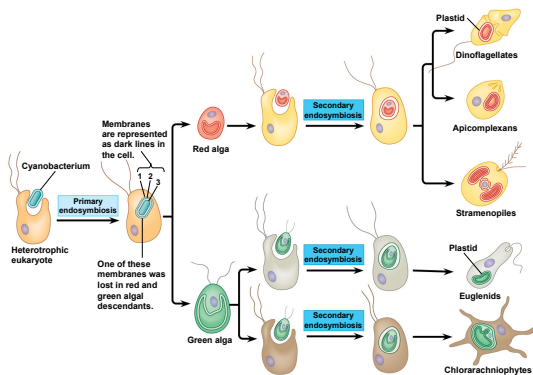


Fig. 28.2

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3

Eukaryotic Clades

- * Understanding of protists continues to change rapidly
- * One hypothesis divides all eukaryotes into five supergroups

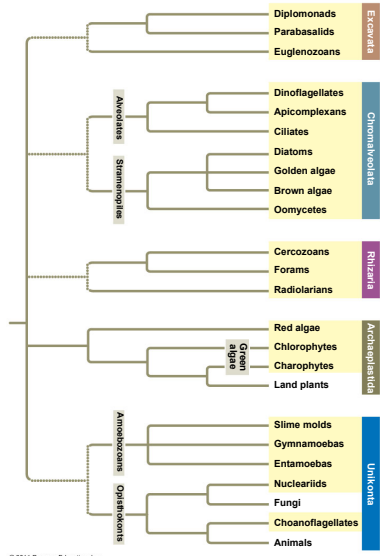
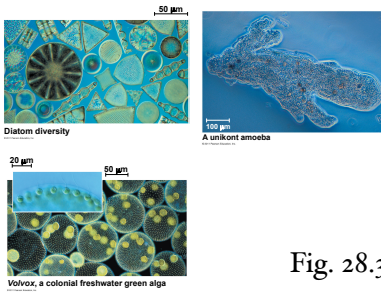


Fig. 28.3

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4

Excavata

- * Characterized by its cytoskeleton
- * Have modified mitochondria that lack DNA, electron transport chain, and citric acid cycle enzymes
- * Adapted to anaerobic environments
- * Lack plastids
- * Diplomonads - two nuclei and multiple flagella
- * Parabasalids - move by means of flagella and undulating plasma membrane

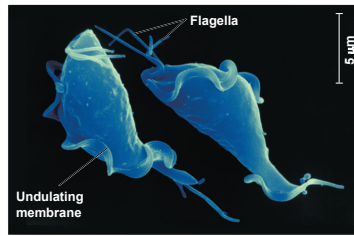


Fig. 28.4

5

Euglenozoans

- * Include predatory heterotrophs, photosynthetic autotrophs, and pathogenic parasites
- * Main distinguishing characteristic is a spiral or crystalline rod of unknown function inside the flagella
- * Kinetoplastids - single large mitochondrion (kinetoplast) (ex. *Trypanosoma* - parasitic causes sleeping sickness in humans)
- * Euglenids - have one or two flagella

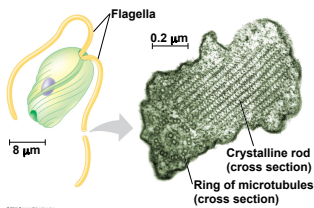


Fig. 28.5

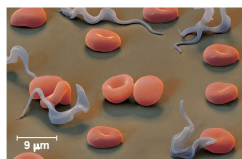


Fig. 28.6

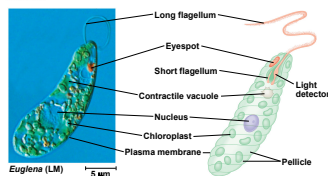


Fig. 28.7

6

Chromalveolates

- * May be monophyletic and originated by a secondary endosymbiosis event
- * Like many protist clades, it is controversial.
- * Alveolates - membrane bound sacs (alveoli) under the plasma membrane
- * Dinoflagellates - aquatic photoautotrophs and heterotrophs that have a characteristic shape (reinforced by internal plates of cellulose), two flagella that make them spin as they move, and rapid growth causes "red tides" (can be toxic to humans)
- * Ciliates - use cilia to move and have macronuclei and micronuclei (use conjugation to exchange micronuclei)

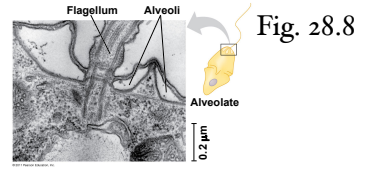


Fig. 28.8

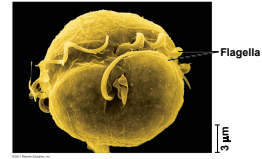


Fig. 28.9

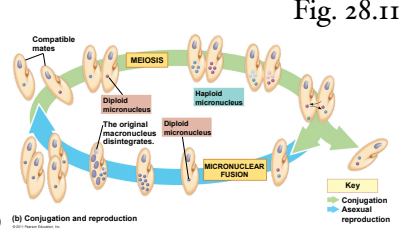


Fig. 28.II

Chromalveolates

- * Apicomplexans - parasites of animals
- * Ex. Plasmodium is the parasite that causes malaria
- * Requires both mosquitos and humans to complete life cycle
- * 900,000 people die each year from malaria

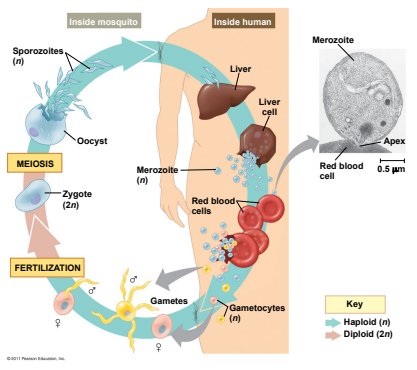


Fig. 28.I0

Chromalveolates

- * Stramenopila - photoautotrophs and heterotrophs
- * Most have "hairy" flagellum paired with a "smooth" flagellum
- * Diatoms - glass-like wall of hydrated silica, reproduce both sexually and asexually (major component of phytoplankton)
- * Golden Algae - some unicellular some colonial
- * Oomycetes - water molds, downy mildews, and white rusts

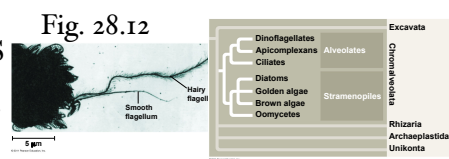


Fig. 28.I2



Fig. 28.I3

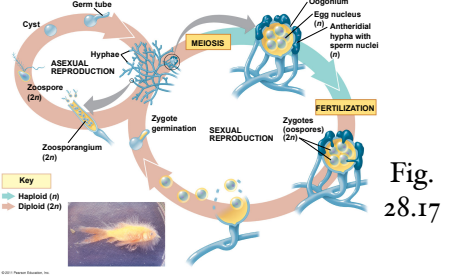
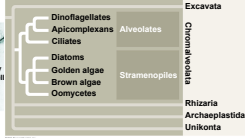


Fig. 28.I7

Chromalveolates

- * Brown Algae - largest and most complex algae
- * Multicellular and mostly marine (commonly referred to as seaweeds)
- * Algal body is plant-like but lack true roots, stems, and leaves
- * Has a holdfast (rootlike), stipe (stemlike), and blades (leaflike)
- * Alteration of generations



Fig. 28.15

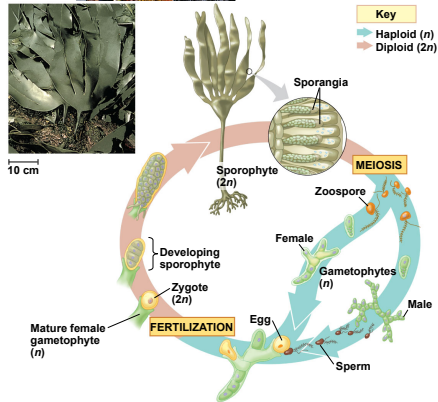


Fig. 28.16

10

Rhizarians

- * DNA evidence supports this as a monophyletic clade
- * Amoebas - move and feed by pseudopodia
- * Radiolarians - pseudopodia radiate from central body
- * Foraminiferans - multichambered shells
- * Cercozoans - most are heterotrophic parasites and predators

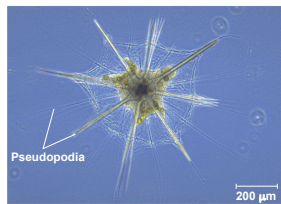
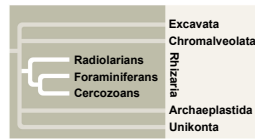


Fig. 28.18

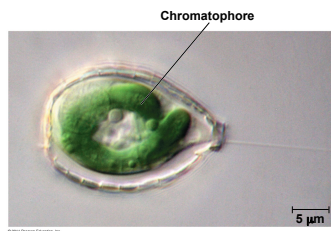


Fig. 28.19

11

Archaeplastida

- * Land plants are descended from the green algae
- * Includes red algae, green algae, and land plants
- * Red algae - most abundant large algae in tropics
- * Green algae - paraphyletic group that gave rise to land plants

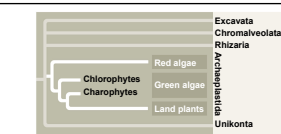
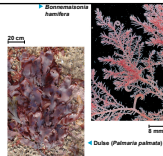


Fig. 28.20 Fig. 28.21

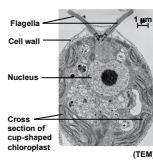
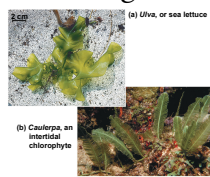
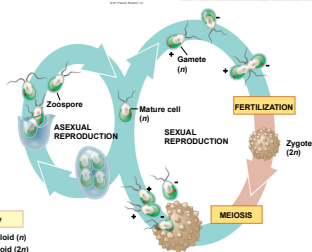


Fig. 28.22



12

Cercozoans and Radiolarians

- * Cercozoans (type of amoebas) - move by thread-like pseudopodia
- * Foraminiferans - named for porous, multichambered shells called tests (pseudopods extend through pores in tests)
- * Radiolarians (marine protists)
 - * Tests fused into one delicate piece made of silica
 - * Pseudopodia known as axopodia

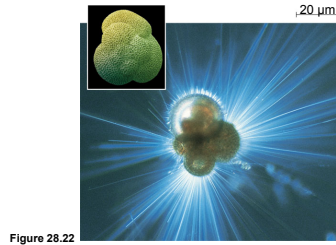


Figure 28.22

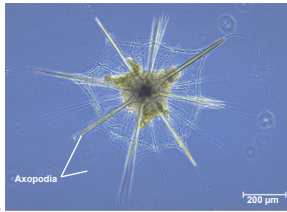
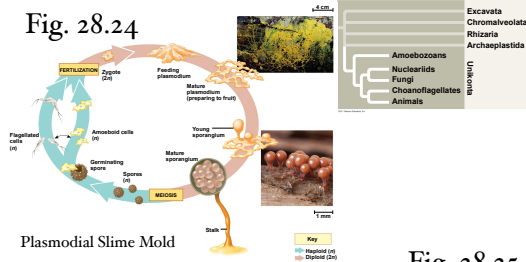


Figure 28.23

13

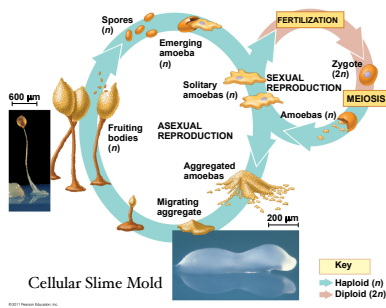
Unikonts

Fig. 28.24



- * Group that contains animals, fungi, and some protists
- * Amoebozoans - amoeba that include slime molds

Fig. 28.25



14

Role in Environment

- * Symbiotic protists
 - * Dinoflagellates nourish coral polyps that build reefs, wood-digesting protists digest cellulose in the gut of termites
- * Parasites
 - * *Plasmodium* causes malaria, *Phytophthora ramorum* causes sudden oak death
- * Producers
 - * Photosynthetic protists and prokaryotes are the main producers in aquatic environments
 - * Populations will explode when limiting nutrients are added
 - * Biomass has declined as sea surface temperature increases

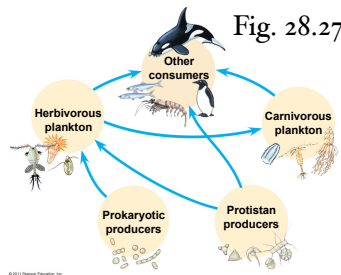
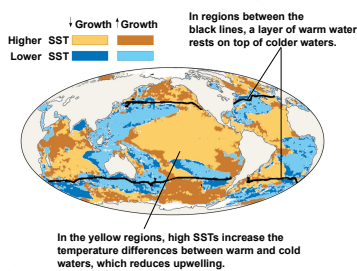


Fig. 28.28



15