

Protista Alliances and Candidate Kingdoms

Excavates

"Archaezoa"

Lack mitochondria (Origins predate endosymbionts?)

Diplomonadida

Flagellates

Includes *Giardia*

Parabasala (Trichomonada)

Parasitic

Excavates

Euglenozoa

Photosynthetic Flagellates (Euglenophyta)

Photosynthetic

Flexible pellicle for wall

Motility by flagella

Non-Photosynthetic Flagellates (Kinetoplastida)

Non-photosynthetic

Motility by flagella

Variety of ingestion and digestion forms

Trypanosomes

Heterolobosea

Nonpigmented

Alternate between amoeboid, flagellated and cyst stages

Chromalveolates

Alveolata

Dinoflagellates (Dinoflagellata or Pyrrophyta)

Most forms with cellulose "armored" plates

Most marine

2 flagella; one in groove

Photosynthetic, "blooms" with nutrient changes

Source of red tides

Many form toxins

Paralytic shellfish poisoning

Many tropical fish poisonings

Reproduction mostly fission

Some symbionts, eg., zooxanthellae

Apicomplexa (Non-Motile Protists or Sporozoa)

Parasites with multiple hosts

Example: *Plasmodium vivax*

Ciliates (Ciliophora)

Locomotion by cilia

Heterotrophic, many feeding modes

Elaboration of organelles

Examples

Paramecium

Stentor

Haptophytes (Haptophyta)

Often with calcium carbonate scales

Stramenopila

Diatoms (Bacillariophyta)

Freshwater and marine

Abundant fossils (diatomaceous earth)

Cell walls overlapping halves with silica

Reproduction mostly fission

Photosynthetic

Oömycota (Oomycetes)

Non-septate vegetative hyphae

Water molds and parasitic fungi

Sexual reproductive structures, oogonium and antheridium

Form oöspores

Examples

Downy mildews

Potato blight

Plus:

Cryptomonads (Cryptophyta)

Chrysophytes (Chrysophyta)

Golden algae

Brown Algae or Kelps (Phaeophyta)

Marine tidal zone to 75 feet deep in temperate waters

Sizes to 100 feet

Color -- brown to olive brown

All multicellular

Pigments -- Chlorophyll a and fucoxanthin

Food reserve -- laminarin and mannose

Body Form has a Holdfast, Stipe, Lamina (Blade) and

Air bladders for buoyancy

Well defined alternation of diploid and haploid generations

Sporophyte (diploid stage) dominant

Reproductive cells flagellated

Vegetative Reproduction by Fragmentation, Propagules, or Zoospores

Rhizarians

- Locomotion by pseudopodia
- Feeding by phagocytosis
- Many secrete shells
- Heterotrophic

Ameobozoa

Loboseans

- Locomotion by pseudopodia
- Common *Ameoba*

Myxogastriada (Plasmodial Slime Molds)

- Naked protoplasm or multinucleate plasmodium stage
- Nuclei are generally diploid
- Heterotrophic (Phagotrophic)
- Produce sclerotia for resistance
- Produce sporangia for sexual reproduction. Meiotic cells are swarm cells and myxamoebae. Fusion produces plasmodium

Dictyostelida (Cellular Slime Molds)

- Alternate between amoeboid cells, flagellated cells and plasmodium stage (called a slug) which is multicellular not multinucleate
- Nuclei are generally haploid
- Myxamoebae common but not swarm cells
- Produce asexual fruiting bodies

Plus

- Gymnamoeba (Gymnamoebas)
- Entamoeba (Entamoebas)

Cercozoa

- Threadlike pseudopods

Foraminifera

- Long, branching pseudopods, calcium carbonate shells

Radiolaria

- Thin, stiff pseudopods, silica exoskeleton

Choanoflagellida

- Locomotion by flagellum
- Colonial
- Closely related to sponges
 - Each cell has a single flagellum and funnel-shaped collar, similar to choanocytes of sponges
- Heterotrophic

Protists Now Frequently Included with Plants

Red Algae (Rhodophyta)

97% marine

Size to 3 feet, depths to 300 feet

Colors -- red, purple, black

Shapes

Unicells, Branching filaments, Sheetlike

No flagellated cells

Pigments

Phycobiliproteins (Phycocyanin, Phycoerythrin)

Chlorophyll a

Reproduction

Gametophyte

Forms gametes

Gametes fuse to form Sporophyte

Sporophyte may make many types of sporangia and spores

Carospores

Tetraspores

Meiospores which develop in gametophyte

Green Algae (Chlorophyta)

7000 species

Mostly freshwater

Shapes

Unicellular

Colonial

Filaments

Sheet-like (thallus)

Color -- Mostly "grass-green"

Cell walls have cellulose and pectin

Food reserve is starch (stored in pyrenoids)

Pigments -- chlorophyll a and b, carotenoids -- like higher plants

Reproduction

Vegetative - Fission, Fragmentation

Sexual: Isogamy, Anisogamy, Oogamy, Conjugation

Life cycle

Dominant generation usually haploid

Now separated into several alliances in most classification systems, typically including the following:

Chlorophyceae

Ulvophyceae

Charophyceae

Coleochaetaceae

Glaucophyceae