

Big Picture

Protists belong to the protist kingdom under domain Eukarya. Protists are some of the most basic eukaryotes and are believed to be the ancestors of modern day animals, plants, and fungi. Many protists inhabit aquatic environments or moist terrestrial ones. Protists reproduce using a combination of asexual and sexual reproduction, having complex life cycles. The three main classifications of protists are: protozoa, algae, and molds.

Key Terms

Endosymbiotic Theory: Theory that eukaryotic organelles such as mitochondria evolved from ancient, free-living prokaryotes that invaded primitive eukaryotic cells.

Motility: The ability to move.

Pseudopod: A temporary protrusion from the cell membrane.

Flagella: Whip-like projections.

Cilia: Short, whip-like projections.

Protozoa: Animal-like protist.

Algae: Plant-like protist.

Mold: Fungus-like protist.

General Characteristics

Protists, believed to be the oldest eukaryotic organisms, may have evolved by endosymbiosis. The **endosymbiotic theory** postulates that a smaller prokaryotic cell, such as a photosynthetic one, was engulfed by a larger one, forming a symbiotic relationship from which both cells benefited.

- Eventually, the smaller prokaryotic cell(s) became the organelles, such as the mitochondria and the chloroplast, of the larger cell.
- Evidence for this theory includes independent mitochondrial and chloroplast DNA, and the plasma membrane surrounding the two organelles resembles that of prokaryotes.

Image Credit: Urutseg, CC-BY 3.0

Motility

Protists have various appendages that give them **motility**, the ability to move. They include cilia, pseudopodia, and flagella.

- **Pseudopods** look like feet walking. The extension and retraction of pseudopods help move the cell forward.
- **Flagella** are typically significantly longer than cilia. Protists may possess one or more flagellum.
- The swaying of **cilia** determines the direction of movement of the protist.

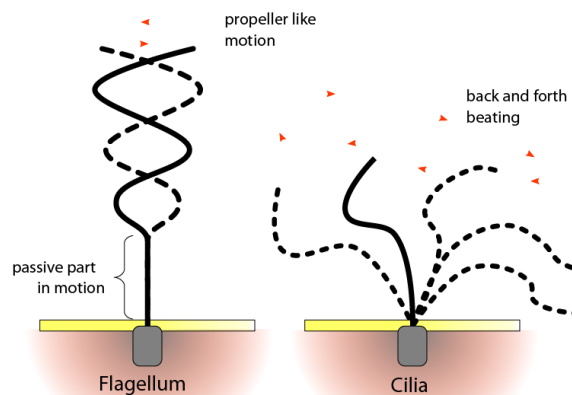


Figure: Flagellum and cilia movement.

Reproduction

Protists can reproduce both asexually or sexually.

- Asexual reproduction: binary fission
- Sexual reproduction: produce reproductive cells called spores that can fuse together to form a diploid zygote

Nutrition

- **Ingestive protists:** These protists eat by endocytosis. They surround their food particle and then engulf it, forming a food vacuole. Enzymes within the cell digest the food.



Ingestive protists take food inside.

- **Absorptive protists:** In these protists, food particles simply diffuse across the plasma membrane.



Absorptive protists absorb food.

- **Photosynthetic protists:** These protists undergo photosynthesis, harnessing light energy to convert inorganic molecules into sugar.

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Protozoa

Protozoa are motile heterotrophs and many are unicellular. Protozoa are believed to be the ancestor of animals.

Protozoan movement or lack thereof determines their classification:

- Amoeboid: Moves using pseudopodia.
- Ciliate: Moves using cilia.
- Flagellate: Moves using flagella.
- Sporozoan: Not motile (stationary).

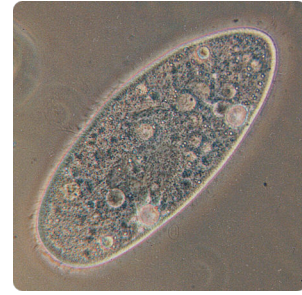


Image Credit: Barfooz, CC-BY-SA 3.0

Algae



red
alga



green
alga

Image Credit: Peter Halasz, CC-BY-SA 3.0

Algae are photoautotrophs. Some are unicellular and others are multi-cellular. Some are also motile. They are believed to be the ancestors of plants.

- Kelp: Multi-cellular seaweed. Forms the base of many ocean ecosystem food chains.

Algae are classified by the origin of their chloroplasts. The four main categorizations are below.

- Red algae
- Green algae
- Euglenids
- Dinoflagellates

Red and green algae are believed to have evolved before euglenids and dinoflagellates.

Molds

Molds are decomposers that directly absorb food or material from their environment. Molds are believed to be the ancestors of fungi. Examples:

- Slime mold: Motile decomposer that engulfs its decaying matter. Individual cells will aggregate when there isn't a lot of food.
- Water mold: Typically found in aqueous environments. Directly absorbs food from its environment.



Image Credit: Dr. Jonatha Gott and Center for RNA Molecular Biology, Case Western Reserve University, Public Domain

Role in the World

- Parasitic protozoa lay at the heart of many protist diseases. For example, sleeping sickness is caused by a flagellate protozoa. Another protozoa spread by mosquitoes causes malaria.
- Certain species of algae can be made into biofuels as an alternative to fossil fuels. Biofuels help address the growing energy crisis.
- Certain species of algae, informally known as seaweed, can also be eaten and serve as a source of vitamins.

Notes
