

Protists Guided Notes: 2025

Protists are the simplest eukaryotes

Classifying protists is difficult – they are a _____ group. Originally, protists were defined as eukaryotes that are not plants, fungi or animals.

Protists are extremely diverse

Each protist phylum is so different from the others that they may actually be different kingdoms. Evolutionary relationships among protists are being clarified by molecular sequence data.

Protists are organized into three groups

Biologists traditionally classify protists in terms of the kingdom they most closely resemble:

Algae—resemble _____ cells

Slime molds/water molds—resemble fungal cells

Protozoa—resemble animal cells

Protists are ecologically important

Algae carry out photosynthesis, producing much of the O₂ in Earth's atmosphere and supporting food webs in oceans, lakes, rivers, and ponds.

Algae produce enough energy that scientists are producing algae-powered cars and power plants.

Protists are medically important

Disease-causing protists include Cryptosporidium, which is carried in feces and contaminates swimming water. Swimmers who ingest this protist become ill with vomiting, diarrhea, cramps, and dehydration.

Protists are the most ancient eukaryotes

Protists are helpful in piecing together the development of modern-day eukaryotic cells.

Protists help trace endosymbiosis events

Endosymbiosis explains the origin of mitochondria and chloroplasts, which developed from free-living _____.

Protists show primary endosymbiosis

Chloroplasts in red algae, green algae, and plant cells have two membranes, indicating they developed from a single endosymbiosis event.

Protists show secondary endosymbiosis

Chloroplasts in brown algae and euglena have three membranes, indicating they developed from two successive endosymbiosis events.

Volvox colonies show clues to multicellularity

This Volvox _____ is somewhere between a group of individuals and a multicellular organism.

Single-celled protists show clues to multicellularity

Single-celled Chlamydomonas protists closely resemble certain Volvox cells.

Single-celled Choanoflagellate protists closely resemble cells of the simplest multicellular animals, sponges.

Many protists are photosynthetic

Algae are aquatic, photosynthetic protists.

Common types include euglenoids, dinoflagellates, diatoms, golden algae, brown algae, red algae, and green algae.

Euglenoids are both autotrophic and heterotrophic

These protists use their _____ to swim around their fresh water habitats.

Euglenoids have triple-membrane, green chloroplasts for photosynthesis when there is light, and in the dark feed on organic matter.

Dinoflagellates are crucial in ocean food webs

Dinoflagellates are characterized by _____ flagella. They use them to whirl around in the ocean.

Some are photosynthetic, some live inside animals such as jellyfish, and some are bioluminescent.

They can overgrow and produce toxins, causing red tides.

Brown and golden algae contain yellowish pigments for photosynthesis

Golden algae are unicellular or colonial autotrophs in light and heterotrophs in the dark.

Brown algae are the largest and most complex protists. They form giant underwater kelp forests.

Diatoms have _____ cell walls

Diatoms have yellowish pigments for photosynthesis and are abundant in all moist habitats.

Their cell walls are very intricate and give them unique shapes.

Red algae can live in deep water

Red algae have photosynthetic pigments that absorb red and blue wavelengths of light. These wavelengths do not dissipate in deep water.

People eat red algae and use the agar they produce as a thickening agent in many things.

Green algae are close relatives of plants

Green algae are a diverse group – some are microscopic, others are large and multicellular

They share many features with plants, including using chlorophyll a and b for photosynthesis and producing _____.

Green algae reproduce like plants

In alternation of generations, haploid gametes and diploid zygotes can both grow into adult organisms.

This life cycle, alternating between haploid and diploid forms, is only found in green algae and plants.

- 1) Sporophyte produces male and female spores by meiosis.
- 2) Spores divide mitotically, producing gametophytes.
- 3) Gametophytes produce gametes.
- 4) Gametes fuse
- 5) Zygote develops into sporophyte

Some heterotrophic protists resemble fungi

Slime molds and water molds are heterotrophic protists that have filamentous feeding structures.

However, they are only distantly related to fungi in terms of DNA _____.

Slime molds are unicellular and multicellular protists

Slime molds can exist as single cells or as large masses that behave like a multicellular organism.

- 1) When food is lacking, cells secrete biochemicals that stimulate them to aggregate.
- 2) Cells aggregate into slug.
- 3) Slug travels toward light.
- 4) Slug halts, forming a stalk with a fruiting body containing spores.
- 5) Stalk cells perish.
- 6) Spores germinate in new habitats.
- 7) Cells feed and divide.

Cellular slime molds keep their individual cells

Cellular slime molds, like those shown here, live as haploid cells until resources become limited. They then aggregate into a mobile “_____” and then a fruiting body, which produces spores.

- 1) When food is lacking, cells secrete biochemicals that stimulate them to aggregate.
- 2) Cells aggregate into slug.
- 3) Slug travels toward light.
- 4) Slug halts, forming a stalk with a fruiting body containing spores.
- 5) Stalk cells perish.
- 6) Spores germinate in new habitats.
- 7) Cells feed and divide.

Plasmodial slime molds are one huge cell

During their feeding stage, plasmodial slime molds form a plasmodium, which is a large cell containing thousands of diploid nuclei.

Water molds are decomposers and parasites

Water molds are decomposers and parasites.

They secrete digestive _____ into their surroundings and absorb the nutrients.

Water molds feed on plants and animals

Some water molds ruin food crops, including potatoes, grapes and lettuce. Others grow on weak, dead, or dying aquatic organisms like fish.

Protozoa are diverse heterotrophs

Most protozoa are _____-celled, heterotrophic, and motile. They are grouped together based on morphology and locomotion but are only distantly related to each other.

Flagellated protozoa can cause disease

Flagellated protozoa have one or _____ flagella, which they use to move around. They live in soil, oceans, and fresh water. Some are parasites that live in our bodies.

Termites rely on flagellated protozoa

Trichonympha lives in the _____ of termites. Bacteria that break down wood live in each of these unicellular protists. It is because of these bacteria within a protist that termites are able to digest wood.

Amoeboid protozoa produce pseudopodia

Amoeboid protozoa produce extensions known as pseudopodia, which are important in locomotion and capturing food. The amoeba shown here is consuming a ciliate

Some amoeboid protozoa cause disease

Entamoeba species invade the human digestive tract and cause fever and severe diarrhea in humans. Infection often occurs through lake water.

Forams are marine amoeboid protozoa

Foraminiferans (Forams) have calcium carbonate shells, which are used to date layers of rock. Huge populations of forams live at the bottom of oceans.

Radiolarians are close relatives of forams

Radiolarians are among the oldest protozoans. They have intricate shells made of silica.

Ciliates are complex protozoa

Ciliates are mostly unicellular protozoa characterized by abundant hairlike cilia, which propel the organism and sweep food into the cell. They have specialized cell structures such as food vacuoles, contractile vacuoles, and an anal pore. Some have 2 types of nuclei.

Ciliates are diverse protozoa

Some are symbionts that live in cattle or marine animals and help them digest food. Some are parasites, such as the species that causes white spots on fish. Others, such as Paramecium and Stentor, are free-living.

Apicomplexans are nonmotile parasites

The apicomplexans have a special cell structure that helps them attach to and invade host cells. Cryptosporidium, the species shown here, causes waterborne diseases.

Malaria is caused by an apicomplexan protist

Plasmodium is a protist carried by mosquitoes. When transmitted to humans it infects the red blood cells.

- 1) Mosquito infects human by injecting saliva containing sporozoites.
- 2) Injected sporozoites migrate to liver.
- 3) Sporozoites enter liver cells, multiply, and emerge as merozoites.
- 4) Merozoites enter red blood cells.
- 5) Some merozoites become gametocytes.
- 6) Mosquito ingests gametocytes with blood meal.
- 7) Gametocytes produce gametes that fuse, forming a zygote that divides by meiosis to form sporozoites.
- 8) Sporozoites are released and migrate to salivary glands.

Protist classification is changing

New research based on genetic sequences is helping to assign each protist species into a lineage with its closest relatives.