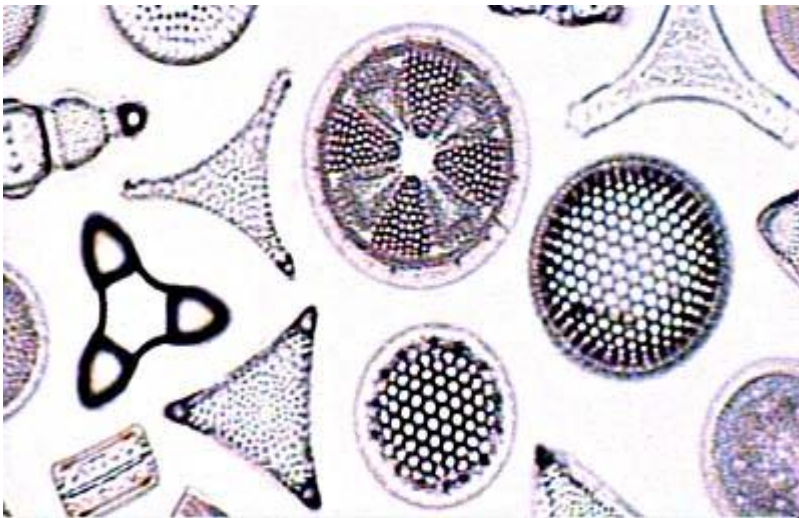


Station 1: Protists



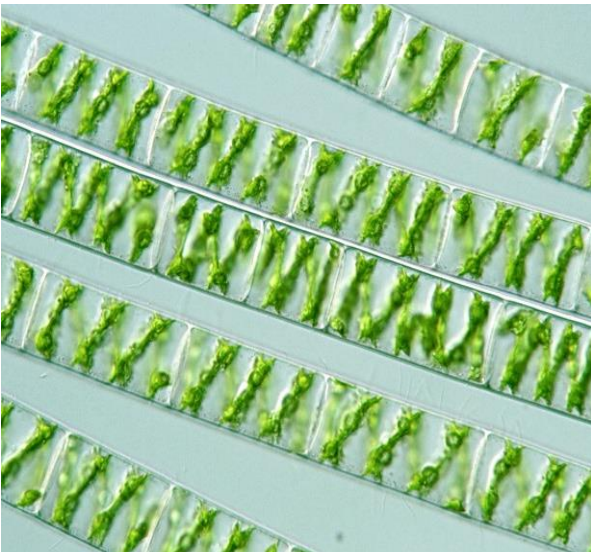
Paramecium:

Genus of free-living protozoans of the holotrichous order Hymenostomatida. There are at least eight well-defined species; all can be cultivated easily in the laboratory. Although they vary in size, most Paramecium species are about the size of the period at the end of this sentence. The basic shape varies, depending on the species: *P. caudatum* is elongated and gracefully streamlined and *P. bursaria* resembles a footprint. The term paramecium is also used to refer to individual organisms in a Paramecium species. Found in aquatic environments. Paramecium are heterotrophic protists that are animal-like.



Diatoms

Any member of the algal class Bacillariophyceae (division Chromophyta), with about 16,000 species found in sediments or attached to solid substances in all the waters of the Earth. Diatoms may be either unicellular or colonial. The silicified cell wall (made of silica) forms a pillbox-like shell (frustule) composed of overlapping halves (epitheca and hypotheca) perforated by intricate and delicate patterns useful in testing the resolving power of microscope lenses. Found in aquatic environments. Diatoms are heterotrophic protists that are animal-like.



Spirogyra:

Alternate name: mermaid's tresses; pond scum; water-silk

Spirogyra, genus of green algae, found only in fresh water and usually free-floating. The slippery unbranched filaments are composed of cylindrical cells containing one or more beautiful spiral green chloroplasts, from which the genus gets its name. The nucleus is suspended in the central vacuole by fine cytoplasmic filaments.

On bright spring or fall days, there might be masses of *Spirogyra* floating near the surface of streams and ponds, buoyed by oxygen bubbles released during photosynthesis. During the night, when photosynthesis decreases, the masses tend to sink.

Station 2: What's In Your Pond Water?

A Laboratory Exercise in Using Microscopy to Identify Protists

Introduction:

The Kingdom Protista includes unicellular organisms that contain a nucleus, along with some forms of multi-cellular algae. Although all of the protists have a few common characteristics, they are probably the most diverse kingdom and have many differences among one another.

Regarding how they obtain energy, some protists act like plants, some like fungi, and some like animals. Plant-like protists obtain energy from the sun (**autotrophs**), fungi-like protists obtain energy by absorbing it from other organisms (**heterotrophs**), and animal-like protists obtain energy by eating other organisms (**heterotrophs**). Protists also show a great variety in the manner in which they move. Some protists use a large **flagella** (tail) to whip themselves around. Others use many small hair-like **cilia** to beat around. Finally, some protists can even extend large **pseudopods**, which are jelly-like arms, from themselves and follow it to the next location.

In this laboratory, we will observe protists under a microscope, diagram them, and finally note their similarities and differences.

Purpose: The purpose of this lab is to use microscopy to identify protists by name and characteristics.

Materials:

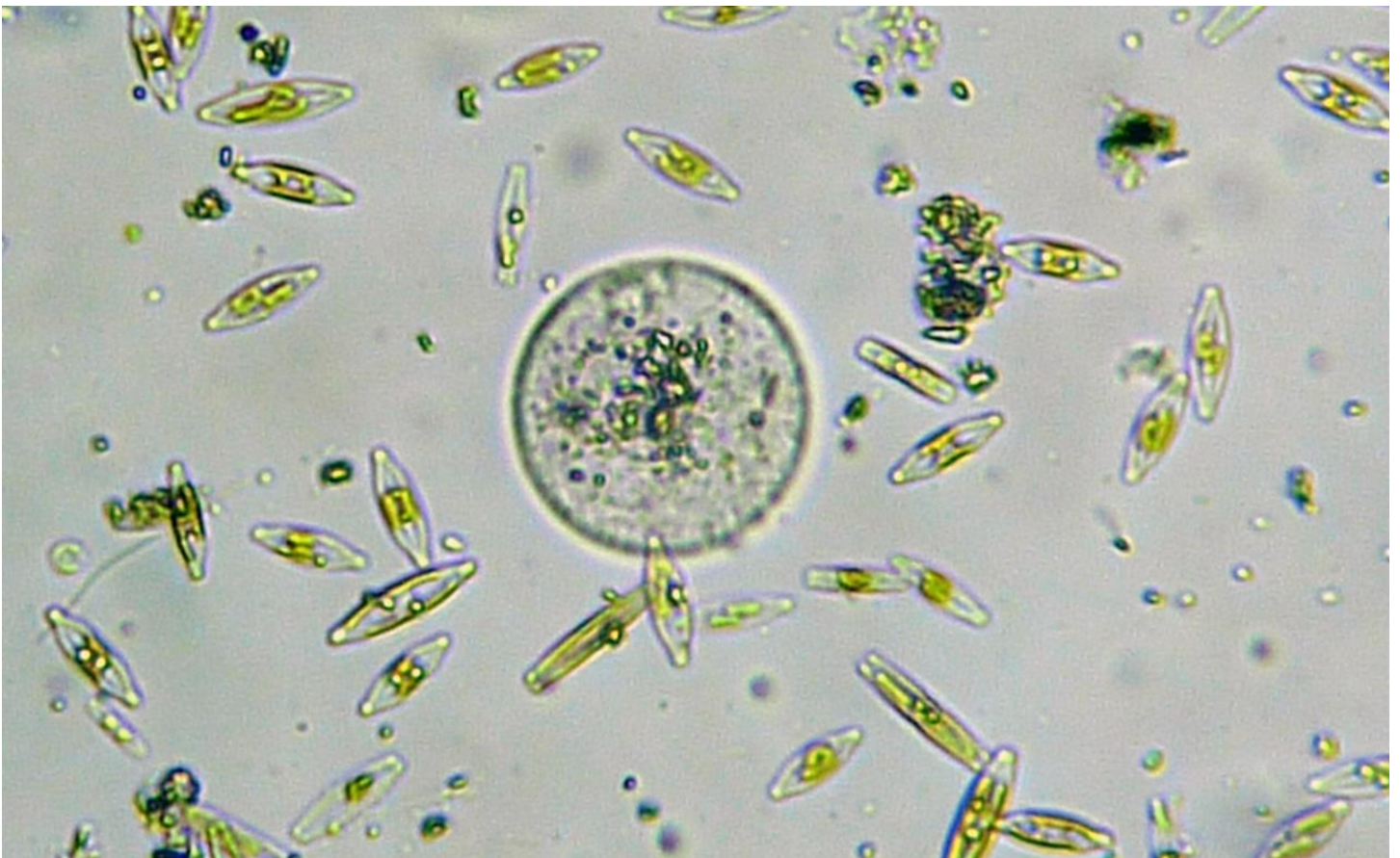
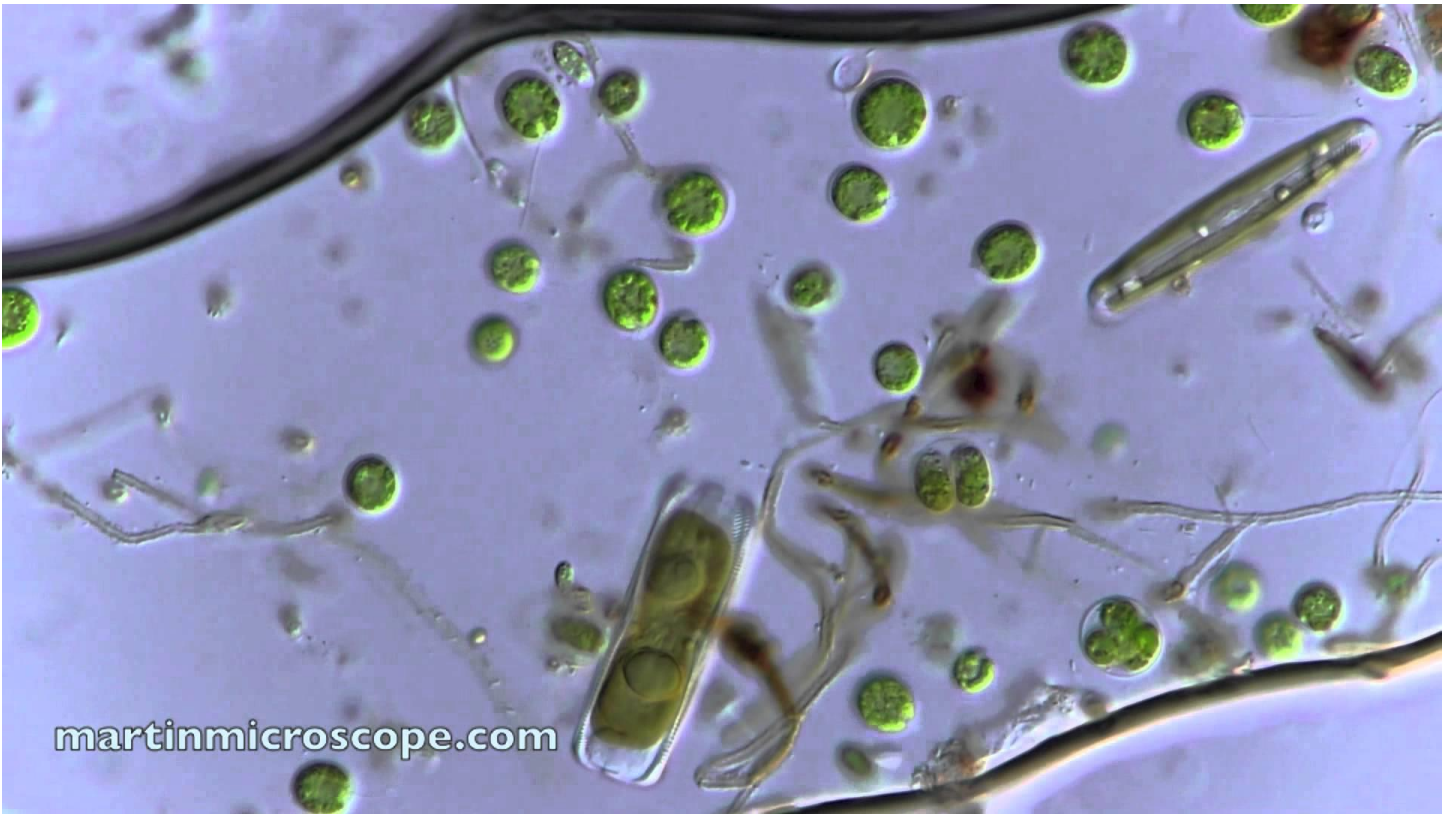
Depression Slide and Cover Slip
Pipet
Live Mixed Protist Culture (Pond Water)
Boreal Quieting Solution (or ProtoSlow)
Compound Microscope/Dissecting Microscope

Procedure: Preparing Wet Mounts













1. Place a drop of Boreal quieting solution into a depression slide.
2. Place 2 or 3 drops of the mixed protist culture into the quieting solution in the depression slide and cover with a cover slip.
3. Place the depression slide under the low objective on the stage of the microscope. Focus using the microscope coarse and fine focuses knobs. If necessary, use a higher power objective but be careful not to touch the microscope slide with the objective lens!
4. Sketch at least **two different** protists and identify them by using the key provided by your instructor.



Station 2: Pond Water



Station 2: Protists – Some Common Freshwater Types

Group		Key features	Examples
Animal-Like or Plant- Like (Flagellates)		one or more flagella <0.4 mm	Euglena
Animal-Like (Amoeba)		move with pseudopods 0.02 - 5 mm	Amoeba
Animal-Like (Heliozoans)		immobile, spherical with radiating hair- like pseudopods 0.01 - 1 mm	Heliozoans, Actinosphaerium
Animal-Like (Ciliates)	 <i>Coleps</i>  <i>Lacrymaria</i>  <i>Paramecium</i>  <i>Stentor</i>  <i>Spirostomum</i>	various, mostly free living forms cell usually of a fixed shape but can be contractile, or extending neck, cilia of various forms, fixed mouth 0.01 - 4 mm	See labeled sketches.
Plant-Like (Green algae)	 	green, don't move, no flagella, not attached to a surface spherical colonies, cells with 2 flagella Volvox: 0.5 - 2mm	Pediastrum; Asterococcus Volvox
Plant-Like (Blue- green algae)		blue-green, often slow locomotion cells<0.05 mm colonies can be many mm	Cyanobacteria
Plant-Like (Diatoms)		usually brownish, silica cell wall in two parts, solitary or colonial, some have a slow gliding motion <0.5 mm	Diatoms

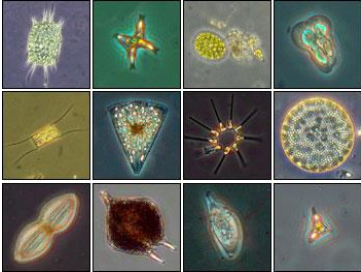
Station 3: HELPFUL Protists

Members of the kingdom Protista can be very beneficial to life on Earth. Many species of red algae are edible and are popular foods in certain parts of the world. **Red algae** are rich in vitamins and **minerals**. Carageenan, a polysaccharide extracted from red algae, is used as a thickening agent in ice cream and other foods.



Giant kelp forests are rich ecosystems, providing food and shelter for many organisms. Trichonymphs are flagellates that live in the intestines of **termites**. These protozoans break down cellulose found in **wood** into carbohydrates the termites can digest.

In addition, protists form the foundation for food chains, especially **phytoplankton** (small, photosynthetic organisms found near surface of ocean). About 1/2 of photosynthesis is carried out by phytoplankton, which provide a direct source of nutrition to marine organisms and produce the oxygen we breathe. Without protists, the ocean's food chain would collapse, and in turn the food chain as a whole would crumble, and at the same time oxygen would be reduced drastically.

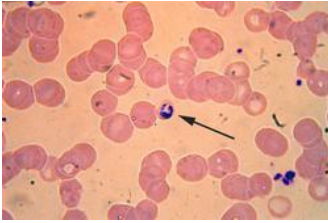


Fungus-Like protists such as **slime molds** and **water molds** play a vital role in recycling sewage and other wastes. They are a major component of nutrient recycling within ecosystems.



Station 3: HARMFUL Protists

Malaria is a disease caused by the protist Plasmodium. It results in 1.5-2.7 million deaths per year with most cases occurring in Africa and South America. Its symptoms include fever, headache, vomiting and other flu-like symptoms. The protist lives inside the bloodstream, eventually clogging capillaries and destroying blood cells, which will lead to death if not treated.

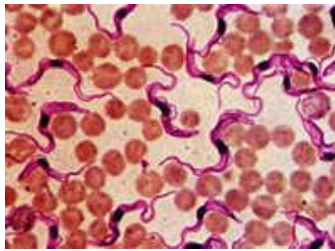


The arrow points to the purplish colored protist (*Plasmodium*), the pinkish spheres are blood cells



Anopheles moquisto taking a blood meal, this is how a human becomes infected with plasmodium and contracts Malaria

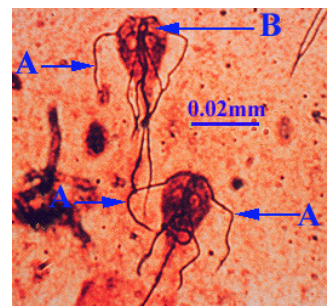
African Sleeping Sickness is caused by the protist called Trypanosoma. It is transmitted by the Tse Tse Fly and occurs mostly in sub-Saharan Africa. Symptoms include fever, headaches, pain in joints -followed by a phase when the parasite infects the central nervous system, causing confusion, lack of coordination, and uncontrolled sleepiness. Without treatment, the host will die.



This slide shows a blood smear of a person infected with trypanosoma. The protist is the purplish colored string-like things. They appear string-like due to a flagella. The reddish circles are blood cells.

Giardiasis is caused by the protist called Giardia and is transmitted through drinking contaminated water (usually outdoor streams and other untreated water). Symptoms include severe diarrhea and vomiting, because the protist takes up residence in the digestive tract.

B = Protist, Giardia
A = flagella



Other Protist Parasites

Cryptosporidium - this protist was responsible for a major health crisis in Detroit when the city's drinking water became contaminated

Amebic Dysentery - also known as Montezuma's Revenge, travelers often contract this in other countries (causes diarrhea)

Station 3: Helpful and Harmful FUNGI

The fungus *tinea* is responsible for athlete's foot, jock itch, and ringworm. Athlete's foot can be found in locker rooms, around public swimming pools and other moist places that people walk around barefoot.



Alternaria (*Hyphomycetes*) is found on decaying wood, decaying plants, food, soil, and outdoor air. Some species are plant pathogens. Indoors, it can be found in dust, carpet, damp areas around showers and window frames, and anywhere condensation occurs. *Alternaria* is recognized as one of the main fungal allergens.

Brewer's yeast (*Saccharomyces cerevisiae*) is used to brew beer and make wine. It is also known as baker's yeast and is used in almost all baking products to help bread rise. In fact, it can kill bacteria, promote production of certain white blood cells, and help fight appetite loss, bronchitis, colds, eczema, boils, acne, indigestion, and sore throat.



Mushrooms are a type of fungus called *basidiomycetes*. Mushrooms can be found growing in the wild, but some types are grown commercially for public consumption. Even though some types of mushrooms are edible, others can be very poisonous.

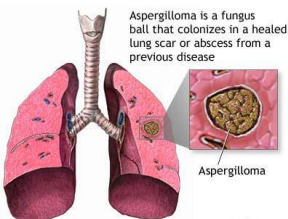


The cigar beetle is found around decaying wood and plant material, which means it can be found in parks, forests, and even cigar shops. The beetles are especially fond of cigars, which is where they get their name. Yeast-like *ascomycete* lives in the gut of cigar beetles and gets rid of the toxins in the plants that the beetles eat.

Penicillium (*Hyphomycetes*) is found in soil, decaying vegetation, carpet wallpaper and the air. Some species are used for commercial production, such as antibiotics penicillin and griseofulvin, and for making bleu cheese.



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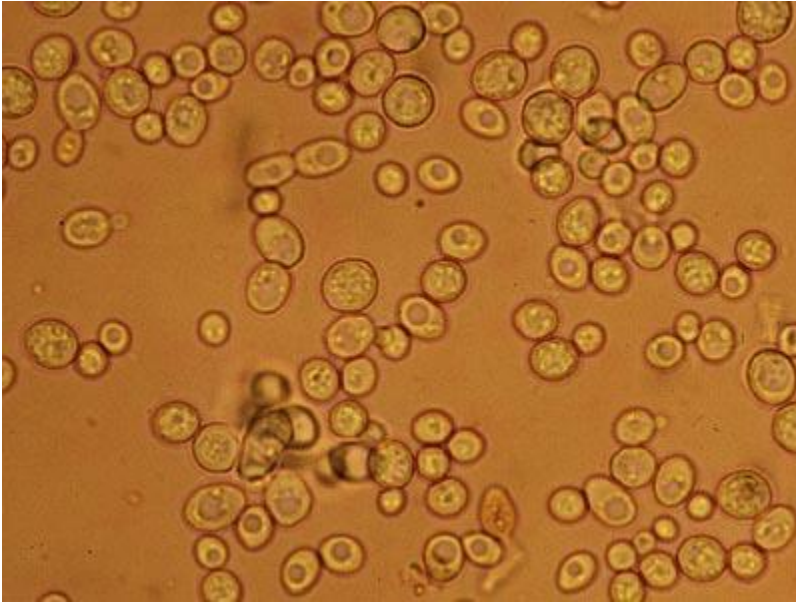


ADAM.

Aspergillus (*Hyphomycetes*) is found in soil, compost piles, decaying vegetation, stored grain, and other kinds of organic matter. It helps break down dead vegetation. A few species can cause aspergillosis in humans with compromised or defective immune systems. Most people are naturally immune to this infection of the lung. Other species are used in the manufacturing of food, such as *A. oryzae* or *A. soyae* for soy sauce.

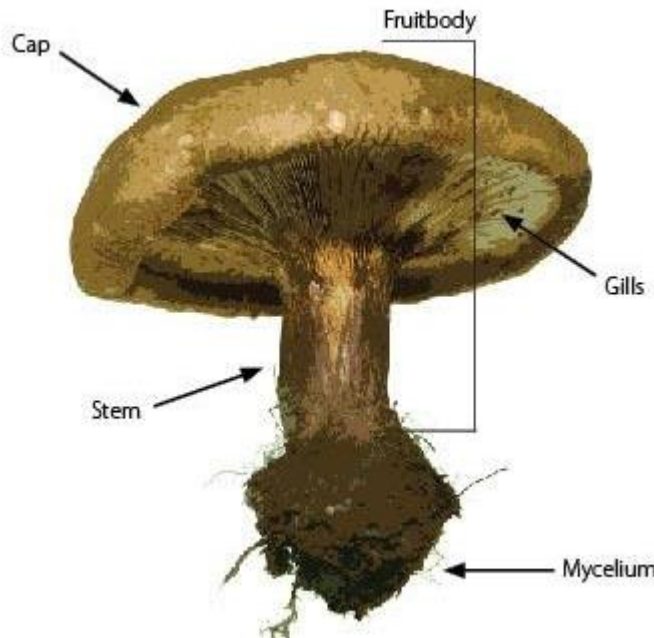
Station 4: Fungi

Yeast cells



Yeast cells are a very common kind of eukaryote cell. Yeast are one-celled creatures that eat starches and sugars. Some yeast cells are always floating around in the air, where they are too small for you to see. When they get into foods, yeast cells eat the starch or sugar and release carbon dioxide. That's what makes champagne fizzy, and it's what makes bread rise: a lot of carbon dioxide gas in it. Yeasts often get into food when we don't want them to and make it go bad, like when the cider gets fizzy, or the orange juice tastes funny. When yeasts get a chance to get inside you, they can also cause diseases known as yeast infections. When babies get thrush in their mouths, for example, that's a yeast infection.

Mushroom



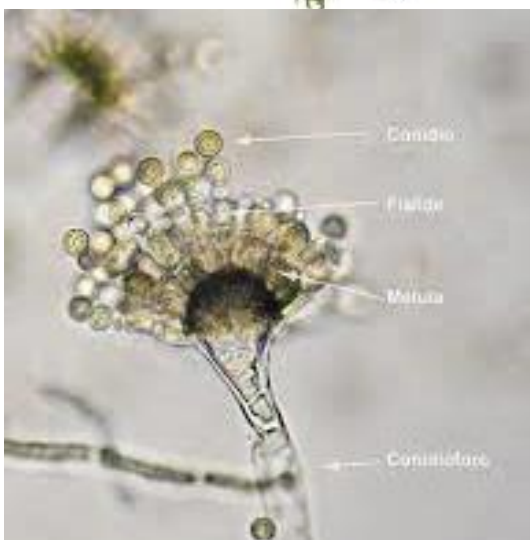
A mushroom has two parts. The part underground is called the mycelium. It gets food for the mushroom. Sometimes it dies quickly, but if it gets enough food it may live for hundreds of years.

The umbrella-shaped body of a mushroom that we can see is called the fruit or sporophore. It only lives for a few days. The fruit starts out as a small button which grows into a stalk and a cap. The stalk or stem grows quickly because it can absorb a lot of water. As the cap becomes larger it unfolds like an umbrella. Soon small plates, called gills, appear under the mushroom's cap. They have small seeds or spores on them. When these spores fall off the mushroom the wind blows them away. If they fall on a warm, wet area a new mycelium develops.

Mushrooms can have a diameter of up to 40 cm. Although some may be very colorful, most mushrooms are white, brown or yellow.

Deuteromycota

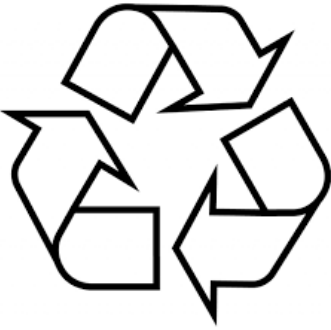
Imperfect fungi have a large impact on everyday human life. The food industry relies on them for ripening some cheeses. The blue veins in Roquefort cheese and the white crust on Camembert are the result of fungal growth. The antibiotic penicillin was originally discovered on an overgrown Petri plate on which a colony of *Penicillium* fungi killed the bacterial growth surrounding it. Many imperfect fungi cause serious diseases, either directly as parasites (which infect both plants and humans), or as producers of potent toxic compounds, as seen in the aflatoxins released by fungi of the genus *Aspergillus*.



Station 4 Continued



Yeasts are single-celled eukaryotic organisms that obtain their nutrition as heterotrophs. Yeasts have been used by man for many years in order to make bread and alcohol (beer).



Mushrooms are decomposers- their role is to maintain equilibrium in nearly every ecosystem, where they recycle nutrients by breaking down the bodies and wastes of other organisms.

Many organisms in the deuteromycota phylum are responsible for diseases like ringworm and athlete's foot.



Station #6

Psychedelic mushrooms



A handful of freshly picked *Psilocybe semilanceata*, sometimes called Liberty Caps.



Psilocybe cyanescens, referred to sometimes as *Wavy Caps*.

Psychedelic mushrooms are fungi that contain psychedelic substances, such as psilocybin, psilocin, or muscimol. The most common colloquial terms for psychedelic mushrooms are magic mushrooms, boomers, or just 'shrooms

History

Various cultures throughout the ages have used psychedelic fungi for shamanistic and other purposes; rock paintings in the **Sahara** of mushroom effigies date back to **7000 BC**. Psilocybin mushrooms were a revered tradition in native Central American cultures at the time of the European invasion, and have been in continuous use up to the present. Named **teonanácatl** (literally "god mushroom") they may have been employed for healing, divination and for intercession with **spirits**. Since the beginning of the Latin American colonial era, their use has been hidden due to persecution by the **Christian** church, which branded all native religious practices, especially those employing entheogenic sacraments, as "pagan".

Station #6 (con't)

Psychedelic mushrooms

A mushroom of the *Amanita muscaria* variety, colloquially known as *Fly Agaric*. A quizzical strain, it has been known to cause delirious effects when taken in high doses. In 1957, amateur mycologist R. Gordon Wasson published an article for *Life* describing his experiences with psilocybin mushrooms while a guest in the rituals of the Mazatec shaman Maria Sabina in a mountain village in Mexico. His account triggered a wave of experimentation with these mushrooms which resulted in their eventual classification in the United States as a Schedule I drug under the Controlled Substances Act.



Effects

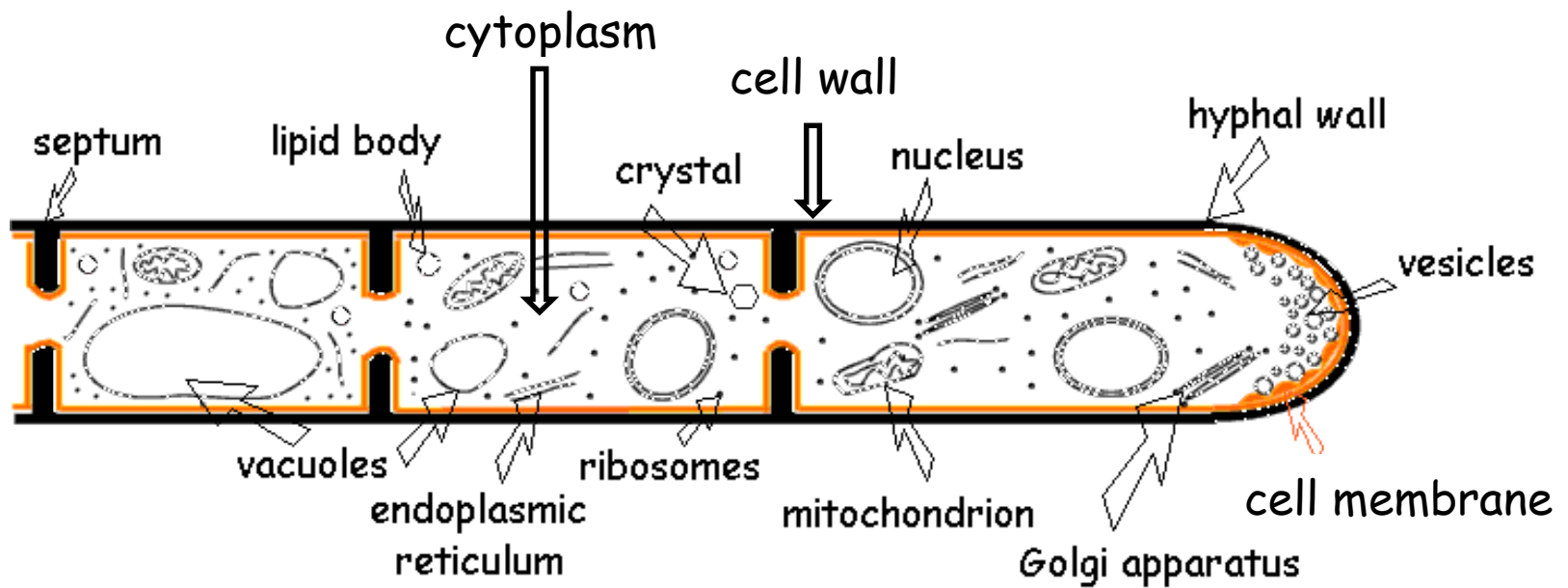
As with many psychoactive substances, the effects of psychedelic mushrooms are subjective and unpredictable. The intoxicating effects of psilocybin containing mushrooms typically last anywhere from 4 to 7 hours. There are a wide range of effects such as feelings of coldness, numbness of the mouth, nausea, weakness in the limbs, excessive yawning, pupil dilation, and stiffness in the body. Effects such as a noticeable feeling of heaviness, relaxation, enhancement and contrasting of colors, strange light phenomena, surfaces that seem to ripple, shimmer, or breathe, and other such visual hallucinations. Higher doses cause a variety of intensified and distinct perceptual changes: objects that warp, morph, or change solid colors, a sense of melting into the environment, trails behind moving objects, and auditory hallucinations. Natural and artificial sounds seem to be heard with increased clarity; music, for example, can often take on a profound sense of cadence and depth. Feelings of bliss, relaxation, wonder, anxiety, sadness, or fear have all been reported.

Identification

Such mushrooms can be found in places like farms, parks, and stables. *Amanita muscaria* can be easily confused by the layperson with *Amanita pantherina* as well as other toxic Amanitas. Misidentified Amanitas are the cause of 95% of fatal mushroom poisonings. For this reason, extreme caution should be used when attempting to identify an *Amanita muscaria* for ingestion.

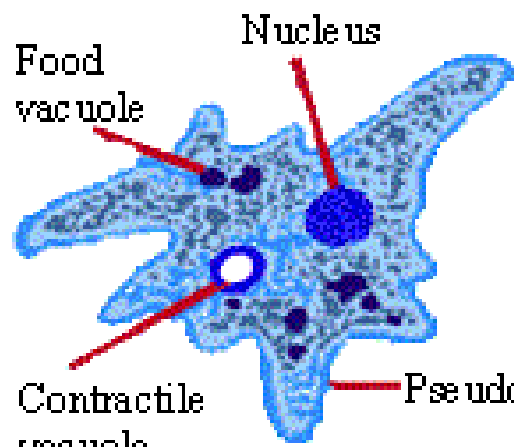
STATION #5

FUNGUS

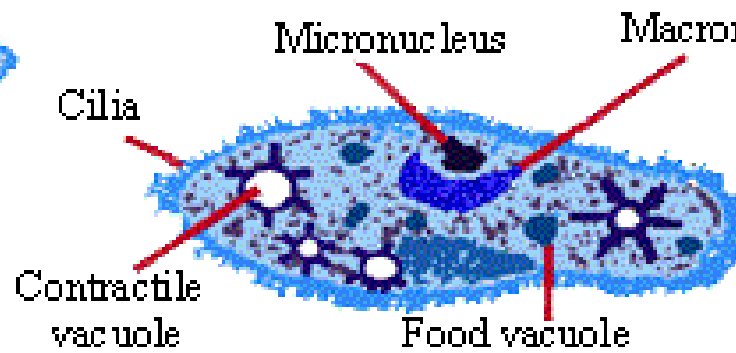


STATION #5

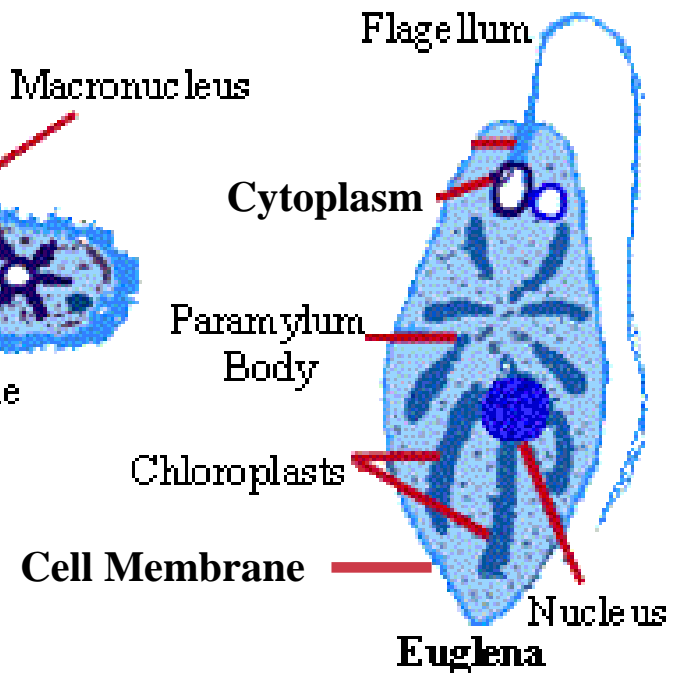
PROTIST



Amoeba



Paramecium



Euglena