The Fungi

The fungi are nonphotosynthetic (for the most part) eukaryotic organisms often with chitin, a nitrogenous polysaccharide forming their cell walls. Many are saphrophytic and some are parasitic.

There are many beneficial fungi, including *Penicillium* from which the wonder drug penicillin is derived. Bread and alcoholic beverages are made from yeasts and many cheeses are made with fungi.

Fungi are also very destructive. Mold, mildew and dry rot plague humankind. More directly, many fungal infections affect humans as aspergillosis, ring worm, athlete's foot, and tinea capitis. Modern medicine is concerned with treatment of systemic fungal infections. Since these fungal cells are eukaryotic, like human cells, medication that effectively treats bacterial infections often don't work on fungal infections.

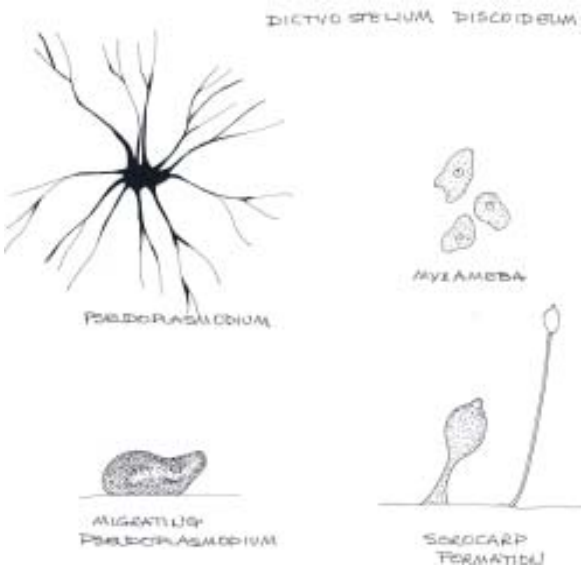
Kingdom Fungi

Division Acrasiomycota
Genus *Dictyostelium*
Division Myxomycota
Genus *Physarum*
Division Oömycota*
Genus *Achlya*
Division Ascomycota
Genera *Sacchromyces*
Peziza
Division Basidiomycota
Genus *Coprinus*
Others Bird's Nest Fungus
Earthstars
Division Imperfecti
Genera *Penicillium*
Aspergillus
Lichens
*included by some as Kingdom Protista

Acrasiomycota - The Cellular Slime Molds

This division is often discussed with the fungi, but technically, they are not fungi. It's just biologists don't quite know where to place them. They have characteristics of protists and plants. For a portion of their life cycle, they exist as uninucleate, eukaryotic ameba that wander around and feed on bacteria. They contain cellulose in their cell walls, not chitin.

Figure 1. A cellular slime mold, Dictyostelium discoideum, *from Alexopoulos CJ. 1962. Pages 51-52* in *Introductory mycology, 2nd ed.. New York: John Wiley & Sons.*



After a period of wandering as individual ameba, they begin to aggregate into clusters of amebas called a **pseudoplasmodium.** The pseudoplasmodium is rather interesting in that it behaves as a group yet the individual ameba retain their identity.

What causes them to aggregate seems to be the chemical called **acrasin**, which is really cyclic AMP, a chemical messenger. After a period of existence as a pseudoplasmodium, the structure launches itself into the air to form a "fruiting" structure called the **sorocarp.** The sorocarp produces spores which, when released, germinate to form individual ameba. It is unclear as to whether or not these creatures undergo sexual reproduction, so the spores produced in the sorocarp comes from mitotic processes.

☐ Observe the culture provided of *Dictyostelium discoideum* showing sorocarps on an agar plate. The plate has been inoculated with the bacterium *Escherichia coli* to provide the ameba with a food source.

Myxomycota - the Cellular Slime Molds

This division is often included when discussing the Acrasiomycota since they don't seem to fit in anywhere either. The main difference between these and the cellular slime molds is the Myxomycota are multinucleate. They form a huge, multinucleated ameboid mass called the **plasmodium**. This wanders around, much like the individual ameba of the cellular slime molds, and feeds on small protozoans and bacteria. When conditions are favorable, the plasmodium begins to form the "fruiting" structures that produce haploid spores. (Favorable is perhaps misleading. They often form these structures when environmental conditions are harsh.) The spores germinate and form either flagellated amebae (called **swarm cells**) or individual amebae which fuse to from a diploid plasmodium.

Meiosis thus occurs in the fruiting structure called the **sclerotium**. Spores are discharged from the sclerotium by **hygroscopic** filaments in the sclerotium called the **capitulum**.

☐ Observe the plasmodial stage of the acellular slime mold *Physarum polycephalum*. Not the mass of protoplasm which has moved out in all directions. You may wish to place the Petri dish with the plasmodium under a dissecting scope to see if you can see any flowing of protoplasm in the plasmodium.

☐ Observer the various sclerotial types of various slime molds on display.

Figure 2. An acellular slime mold, Physarum polycephalum*, from Alexopoulos CJ. 1962, Pages 72, 81* in *Introductory mycology, 2nd ed.. New York: John Wiley & Sons.*

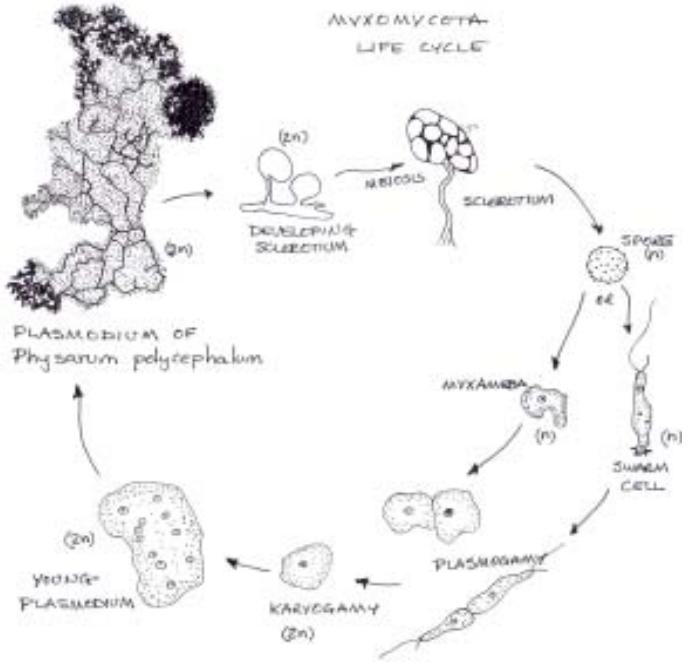
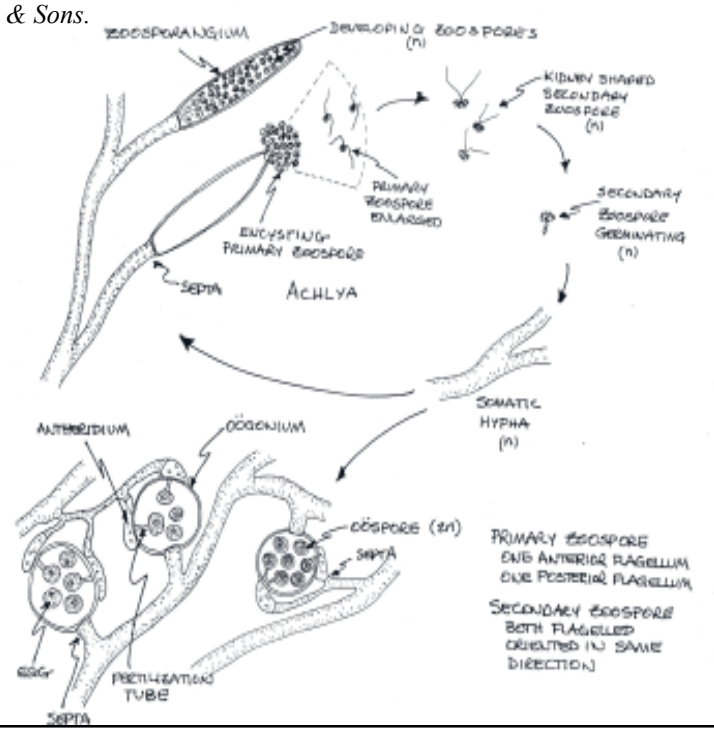


Figure 3. Saprolegnia *(*Achlya *zoöspores congregate at mouth of zoösporangium.) From Alexopoulos CJ. 1962. Page 147* in *Introductory mycology, 2nd ed.. New York: John Wiley & Sons.*



Oömycota - the Water Molds

Some biologists place this group in the Kingdom Protista and, indeed, we covered this in the previous lab. The common name "water mold" gives you an idea as to where they may be found and how they may be cultured.

The members of this group are considered to be either unicellular or coenocytic (tubular). The cell walls are composed of chitin and since the cells are coenocytic, they are considered to be multicellular. In this lab, we will concentrate on the coenocytic forms, in particular, the genus *Achlya*.

Achlya is often responsible for a fungal infection found on pet fish called ick. You see this on aquarium fish as a patch of whitish filaments growing out of the side of the fish.

By now, you should have cultured your specimen of *Achlya* on sterile hemp seeds. You should have completed at least two changes of water to stimulate the production of asexual and sexual structures.

☐ Remove the top of your Petri dish and look at your culture with a dissection scope. Describe what you see.

_____

_____

☐ Look for any long, swollen filaments which look denser or darker than others. These are the asexual reproductive structures called **zoösporangia.** Inside will develop motile, biflagellated asexual spores called **zoöspores**. These zoöspores will then swim around and find a suitable location (perhaps your goldfish) and germinate to form new filaments.

☐ Look for globe-like structures in your culture. These are sexual reproductive structures called **oögonia**. Inside will develop 4 to 8 egg cells. They will be fertilized by male reproductive structures called **antheridia**. These are simple filaments which lay across the top of the oögonium and deposit their nuclei into the oögonium, fertilizing the eggs.

The result of fertilization is a diploid single cell called the **oöspore**. These develop rather thick walls that will protect the spore during poor environmental conditions. When conditions improve, the oöspore undergoes meiosis to produce four meiospores which will then germinate to produce new vegetative filaments.

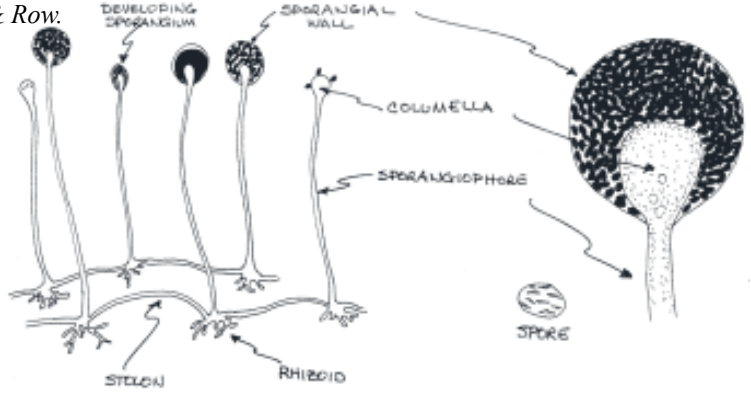
☐ Tear some of the filaments from your culture and place them in a drop of water from the culture on a clean, blank slide and cover with a coverslip. Observe the filaments under the microscope. Look for both zoosporangia and oögonia and antheridia.

Where do you find cross walls (septa)? _____

_____

☐ If you don't have asexual and sexual structures, continue to periodically wash the filaments over the next week and review in the next lab. Compare this to the prepared slide.

Figure 4. Rhizopus *asexual reproduction. From Bold HC. 1973. Pages 179-180* in *Morphology of plants, 3rd ed. . New York: Harper & Row.*



Zygomycota - the Black Molds and Bread Molds

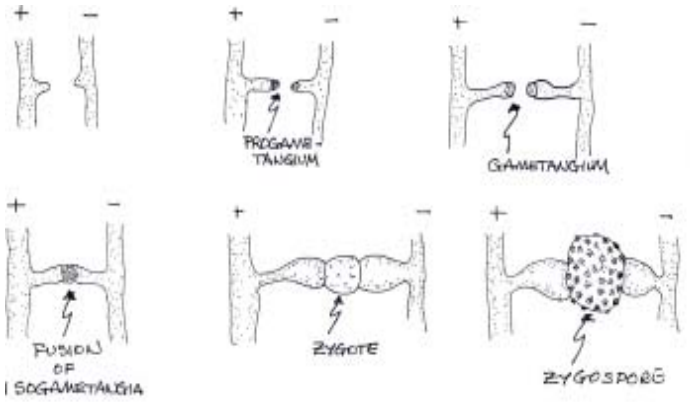
This group includes the fungi

commonly called the bread molds because they often infest old bread. The most common is *Rhizopus*, often appearing as black specks on stale bread. It has a cottony white mass of **hyphae** (fungal filaments) topped by a dark, spherical structure.

Rhizopus stolonifera

☐ Observe the provided culture of *Rhizopus* under the dissection scope. Do not remove the top of the dish or spores will be released throughout the lab. Look for small "root-like" structures attaching the fungus to the Petri dish. These are called **rhizoids** and they anchor the fungus to the substrate. Look carefully and observe the structure holding a "spherical" structure aloft. This is the **sporangiophore** and it holds up the swollen tip, the **sporangium** which is often full of spores.

Figure 5. Rhizopus *sexual stages. From Bold HC. 1973. Pages* 179-180 in *Morphology of plants, 3rd ed. New York: Harper & Row.*



Also look for sporangiophores connected to one another by another filament, the **stolon**. Sporangia with sporangiospores represent asexual reproduction in *Rhizopus.*

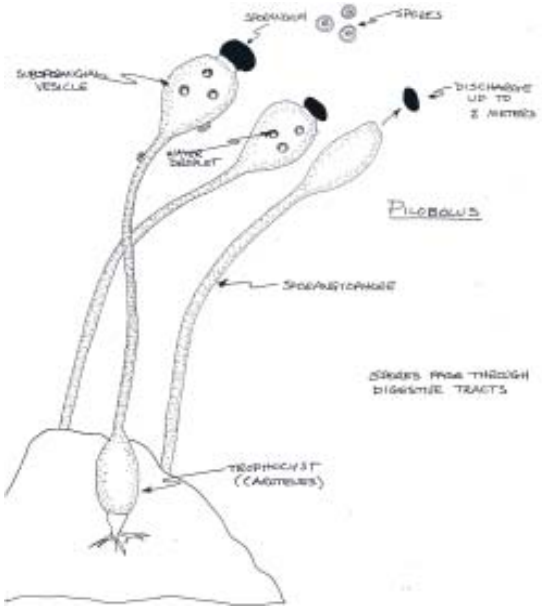
Sexual reproduction in *Rhizopus* involves two different strains (+) and (-) coming together to form **isogametangia**. The **gametangia** fuse and form a diploid structure called the **zygospore**. This undergoes meiosis and produces four new filaments that grow vegetatively.

☐ Observe the culture of *Rhizopus* that has both (+) and (-) strains together on the same Petri dish. Look where they meet and see if you can see any zygospores.

☐ Obtain a prepared slide of *Rhizopus* asexual stage and compare that to the living. Try to locate as many of the detailed features as possible.

☐ Obtain a prepared slide of *Rhizopus* sexual stages and compare to the living. Try to locate as many of the detailed structures as possible.

Figure 6. Pilobolus *or shotgun fungus. From Pritchard HN, Bradt PT. 1984. Page 311* in *Biology of nonvascular plants. St. Louis: Times Mirror/Mosby.*



***Philobolus* (Gr. *pilos*, hat + *bole* lump) - Shotgun Fungus**

This is called shotgun fungus because of the way it forcibly discharges its sporangia. The sporangia are ejected entirely due to excessive turgor pressure building up in the sporangiophore during early morning hours. The fungus is positively phototrophic and thus sporangia with their spores are discharged toward the light. Some have been recorded to hit at distances of 6 feet away and with a velocity of 16 m/s.

☐ Note the **sporangiophores, sporangia**, and vegetative body of this fungus. Yes, you read correctly, it grows best on dung of various types.

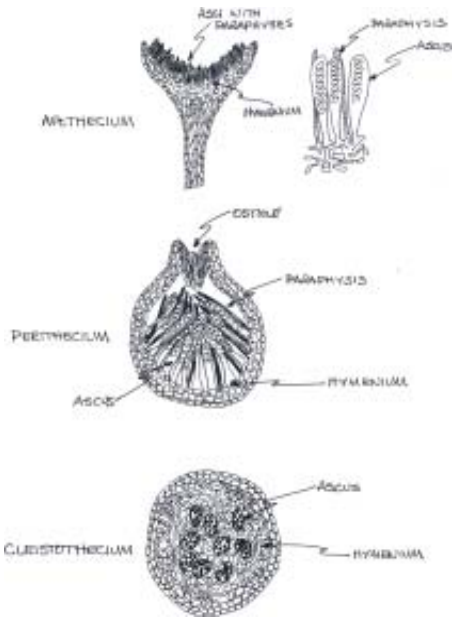
Ascomycota - the Sac Fungi

The Ascomycota are called the sac fungi because they produce sexual spores in a sac-like structure called the **ascus**. Typically, each ascus contains eight sexual spores, the result of (+) and (-) strains growing together. The asci are surrounded by additional fungal material. The degree of protection of the ascus is a basis for classification: apothecium, perithecium, and cleistothecium.

The **apothecium** is simply where the asci are free and exposed to the environment much like coffee is exposed in a cup. The **perithecium** is where the asci are almost totally enclosed by fungal hyphae except for a single, small opening in the perithecium called the **ostiole**. The **cleistothecium** totally encloses the asci.

The members of this division are dikaryotic and eukaryotic. Dikaryotic meets there is a plus and minus strain of nucleus in each "cell." The cell walls are composed of chitin. Many members of this group are beneficial, as yeast for baking and brewing, and morels which are considered delicacies when sautéed in butter. Unfortunately, there are many that are considered harmful.

Figure 7. Thecial types. From Alexopoulos CJ. 1962. Page 235 in *Introductory mycology, 2nd ed. New York: John Wiley & Sons.*

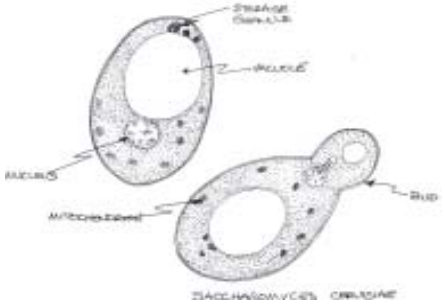


Yeasts

Yeasts are one of the more important members of the fungal kingdom. From yeasts, we make bread, wine, and beer. Common baker's yeast makes dough rise and is the genus *Saccharomyces.*

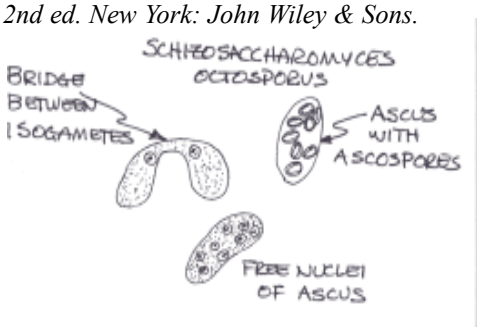
Take a drop of yeast culture provided and place on a microscope slide with a coverslip. Observe the oval shape yeast cells. Do you notice an asexual process called **budding** taking place? You may need to go to oil immersion to view cellular detail. **Call your instructor over for instructions on how to use oil immersion.** Look for the nucleus and the very large central vacuole.

Figure 8. Saccharomyces *or baker's yeast. From Alexopoulos CJ. 1962. Page 249* in *Introductory mycology, 2nd ed. New York: John Wiley & Sons.*



☐ Obtain a prepared slide of *Schizosacchromyces octosporus* and look for sexual reproduction. Look for two yeast cells with a "bridge" between the two and look for ascospores in one of the yeast cells. One cell serves as the donor and the other serves as the recipient.

Figure 9. Schizosaccharomyces *sexual reproduction. From Alexopoulos CJ. 1962. Page 249* in *Introductory mycology, 2nd ed. New York: John Wiley & Sons.*



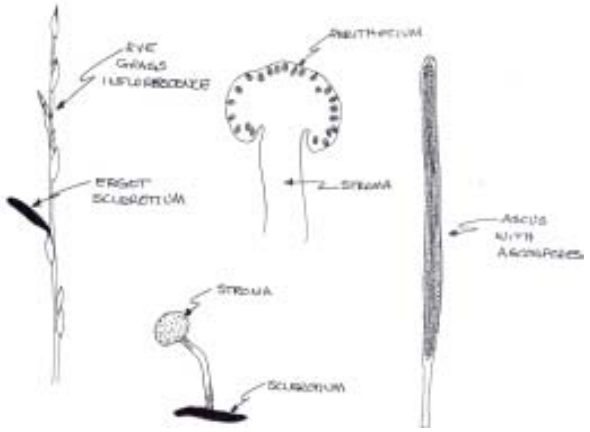
Peziza

Observe the preserved material of the cup fungus *Peziza*. It's often found attached to rotting logs. The cup shape of the fungus is actually the "fruiting" body called an apothecium. Each apothecium is filled with thousands of asci which contain 8 ascospores.

Look at the prepared slide showing a section of the fungus *Peziza* through the apothecium. You should be able

to see individual asci with ascospores and sterile hairs in between each called **paraphyses.** Spores are discharged when drops of rain water hit the cut shaped structure and releases the spores. The next raindrop to hit then splatters the spores outward.

Figure 10. Claviceps purpurea *or ergot. From Webster J. 1970. Pages 238-239* in *Introduction to fungi. Cambridge: Cambridge University.*



Ergot (*Claviceps purpurea*)

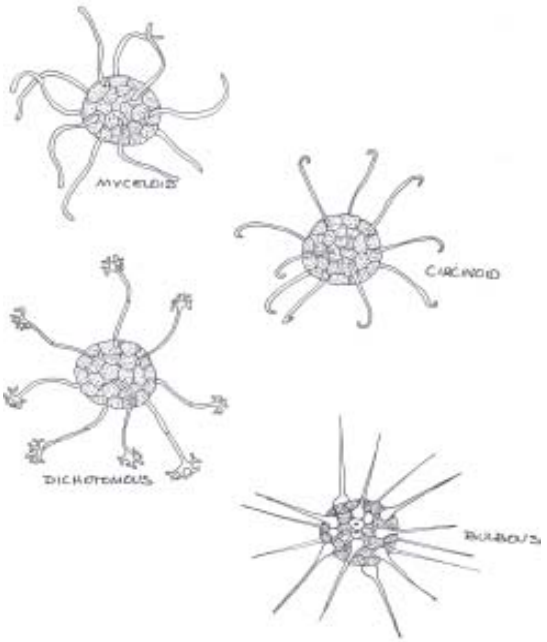
Claviceps is responsible for ergot of rye. The fungus infects the ovaries of rye flowers. As it grows, it produces a mycelial mat that eventually forms a hard **sclerotium** which overgrows the rye seed. It falls to the ground and later germinates to produce a **stroma**. Inside the stroma may be found numerous perithecia containing needle-like ascospores.

☐ Obtain a prepared slide of *Claviceps purpurea*. Your slide is a section through the sclerotium. Inside the sclerotium you should see numerous perithecia.

Claviceps or ergot is famous for the sclerotial stage which contains a number of poisonous alkaloids. Ergot poisoning of animals as cattle and even people is quite common through history. Rye bread has been a mainstay of Europe for centuries and massive outbreaks of ergotism have been know to occur as late as 1951. Ergotism may result in a variety of conditions and even result in death. It has been suggested that so-called witches and warlocks during the periods of the Inquisition were actually individuals under the influence of ergot poisoning.

One alkaloid derived and later synthesized from the sclerotia is **lysergic acid diethylamide,** better known as LSD, so it is possible those people put to death for being possessed were really tripping out.

Figure 11. Cleistothecial types. From Alexopoulos CJ. 1962. Page 299 in *Introductory mycology, 2nd ed. New York: John Wiley & Sons.*



Powdery Mildew of Lilac (*Microsphaera alni*)

Powdery mildews are a broad group of Ascomycetes in the family Erysiphaceae. The term "powdery" refers to the vast number of **conidiospores** produced to give a white, powdery coating to the host plant that is visible to the naked eye.

Some species have a wide range of hosts, as *Erysiphe polygoni* which has been reported to be found growing on 352 different hosts. Others are most host specific.

The plant diseases of this family can be some of the most destructive known; however, powdery mildew of lilac seems to do no harm to the lilac bush.

Obtain a prepared slide of *Microsphaera alni*, Powdery Mildew of Lilac. This slide demonstrates **cleistothecia**. Each cleistothecium is attached to the surface of a lilac leaf by appendages. The shape and

sculpturing of appendages is often diagnostic of the genus. Observe the ends and bases of the appendages and note their patterns.

Appendage tips fall into one of four classes:

1. myceloid - like flaccid hyphae;
2. rigid - with spear-like tips;
3. hook shaped; and
4. dichotomously branched.

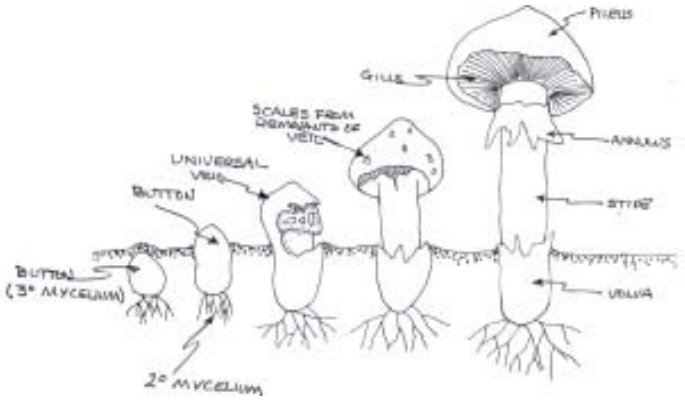
How would you describe the tips of *Microsphaera*? _____

What would you expect to find inside the cleisotothecium? _____

Basidiomycota - the Club Fungi

This group of fungi is commonly called the club fungi from the shape of the sexual reproductive structure. You know this group as mushrooms, toadstools, smuts and rusts. The typical mushroom you see growing in fields is an example of this type of fungus.

Figure 12. Gill fungus development. From Pritchard HN, Bradt PD. 1984. Page 362 in *Biology of nonvascular plants. St. Louis: Times Mirror/Mosby.*



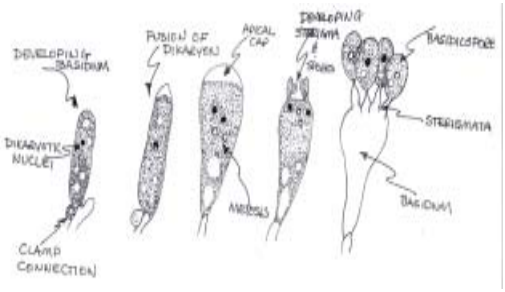
When you see a mushroom, you are seeing only a fraction of a fungus. The mushroom is simply the reproductive structure of the fungus found growing in the soil. The soil is packed with fungal filaments called hyphae that may extend outward from the mushroom for many feet in all directions, including downward. Some botanists insist the largest plant in the world is a mushroom found in the Midwest where fungal hyphae from this extend over several counties.

☐ Observe the mushrooms provided. Try to identify as many of the below structures as possible.

1. cap
2. stalk or stipe
3. gills
4. volva
5. annulus.

Most mushrooms start out as a button stage underground. Inside each "button" is the makings of a complete mushroom. As the mushroom develops, it pushes above the ground. The top of the "button" tears off as the cap of the mushroom continues to grow and expand. Remnants of the button found on the cap often produce scales or flakes useful in identification.

Figure 13. Basidium with basidiospores.



The delicate gill structure is protected by a veil of tissue, the **velum**. It rips away as the cap continues to expand to expose the gills. Remnant of the velum may remain around the stipe and form the circle of tissue called the annulus. The bottom of the button remains in the ground and often persists to from the volva.

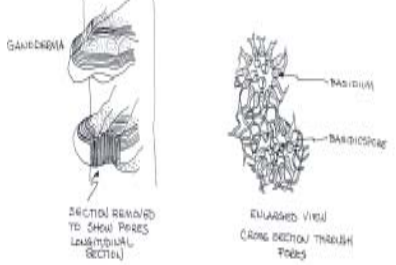
☐ Look at the prepared slide of the gills of the mushroom *Coprinus*. Note the arrangement of gills around the stipe and also their delicate nature. On high power you should be able to see the **basidia** with sexual spores called **basidiospores.**

Shelf or Bracket Fungi

Another type of fungus is the pore fungus. Instead of producing gills, these fungi produce basidiospores via pores or tubes, much like soda straws in a bundle. These will often grow attached to tree trunks, sides of houses, and other wooden structures and are thus called shelf or bracket fungi. They produce the same type of spores as the gill fungus, only inside pores.

☐ Observe examples of shelf fungi provided. Note how their growth from is significantly different from gill fungi.

Figure 14. Shelf or bracket fungus. From Alexopoulos CJ. 1962. Page 502 in *Introductory mycology, 2nd ed. New York: John Wiley & Sons.*

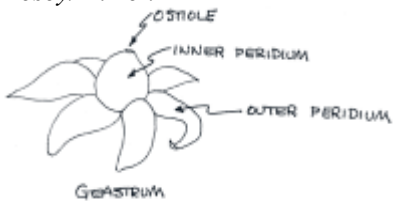


Earthstars

Earthstars are another type of pore fungus. The outer coat of the fungus, the outer **peridium** peels away to form a star-shaped structure. The inner layer is the fertile layer with the basidiospores. They are ejected from the tiny opening in the top and discharge when rain drops hit the membranous fertile layer.

☐ Observe the earthstars on display and tap the membranous fertile layer and see if you see any spores discharge. Many earthstars belong to the genus *Geastrum.*

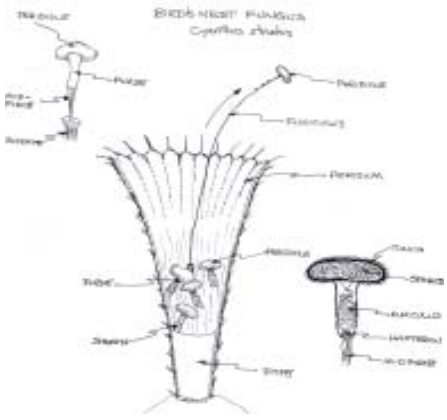
Figure 15. Earthstar Geastrum.. *From Pritchard HN, Bradt PD. 1984. Page 381* in *Biology of nonvascular plants. St.Louis: Times Mosby/Mirror.*



Bird's Nest Fungus

A very interesting fungus is called bird's nest fungus. This tiny fungus is often found growing in mulch of flower beds. When you look at it, it looks very much like a miniature bird's nest complete with eggs. The "eggs" inside are actually spore containing structures. The "nest" is the design of the fungus to trap rain drops for spore dispersal. Once a rain drop slashes in the "nest", the "egg" is then splattered out of the nest and twines around a branch of an overhanging bush or shrub. The spores are later released.

Figure 16. Bird's Nest Fungus, Cyanthus striatus. *From Alexopoulos CJ. 1962. Page 529* in *Introductory mycology, 2nd ed. New York: John Wiley & Sons.*



Black Wheat Stem Rust (*Puccinia graminis*)

Black Wheat Stem Rust is a basidiomycete that infects wheat worldwide. Losses to wheat stem rust can be as much as 50 to 70% of the yield and in some cases, loss of the entire crop (ARS 2006) . It has a very complex life cycle with five types of spores and an alternate host, therefore, it is difficult to control. Scientists have placed their emphasis more on producing resistant strains of wheat but there are other species of rusts that affect wheat and it is difficult to produce resistance to all species of wheat rusts (INAR 2005). At one time, the Japanese barberry played a significant role is dispersal of the **aeciospores** but that effect has lessened over the years. (INAR 2005).

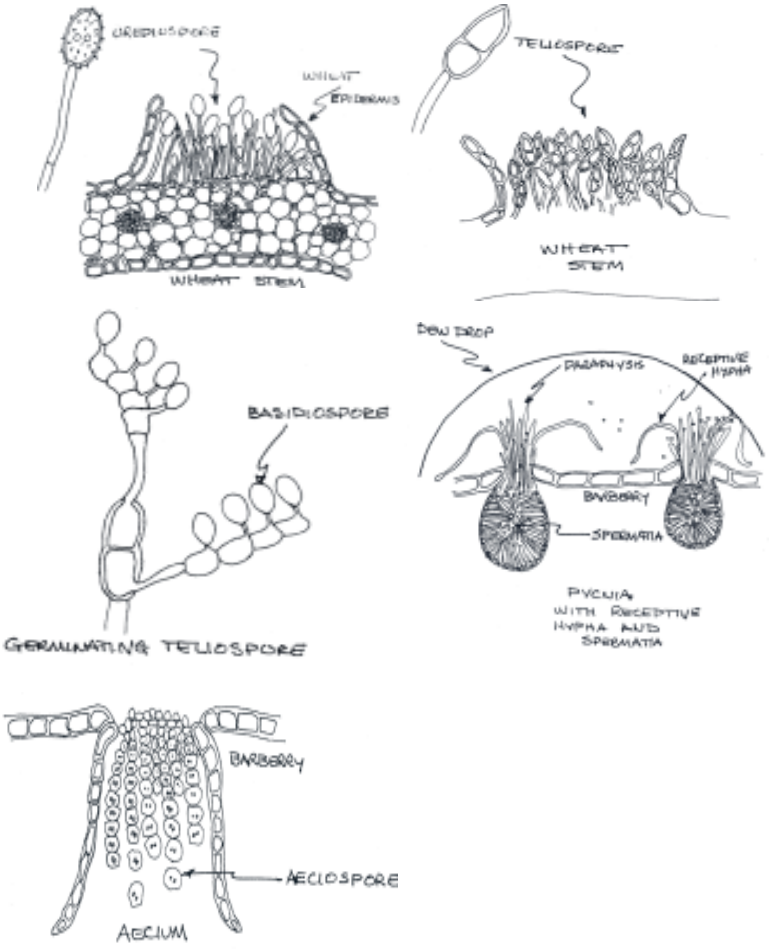
The five spore stages of the black wheat stem rust and the host is provided for you in table 1.

Urediospores from infected wheat escape and re-infect other wheat stems when pustules on the wheat stem erupt. These urediospores undergo a change into **teliospores** which can re-infect wheat or be released, again through eruptions of the epidermis of the wheat stem. Teliospores typically overwinter in the ground once the wheat has been harvested. In the spring, teliospores germinate to produce **basidiospores** which the Japanese barberry. Barberries were planted as wind breaks in the West to prevent wind erosion of wheat fields and served as the natural secondary host to the fungus. Once the basidiospores infect the barberry, the + and - strains of the spores form either spermatia or pycnia on the surface of barberry leaves. Spermatia are carried from one pycnium to another in dew on the surface of barberry leaves. The spermatia fertilize the pycnia and form aeciospores which erupt from the lower epidermis of barberries. The aeciospores then infect the wheat and turn into urediospores and start the cycle again.

Table 1: Spore types of Puccinia graminis *and hosts.*

SPORE	HOST	NUCLEUS
urediospore	wheat	n + n
teliospore	wheat	n + n/2n
basidiospore	wheat/barberry	n (+) n (-)
aeciospore	barberrry	n + n
pycnia/spermatia	barberry	n

Figure 17. Spore types of Puccinia graminis *on wheat stem and barberry. From Pritchard HN, Bradt PD. 1984. Pages 268, 270* in



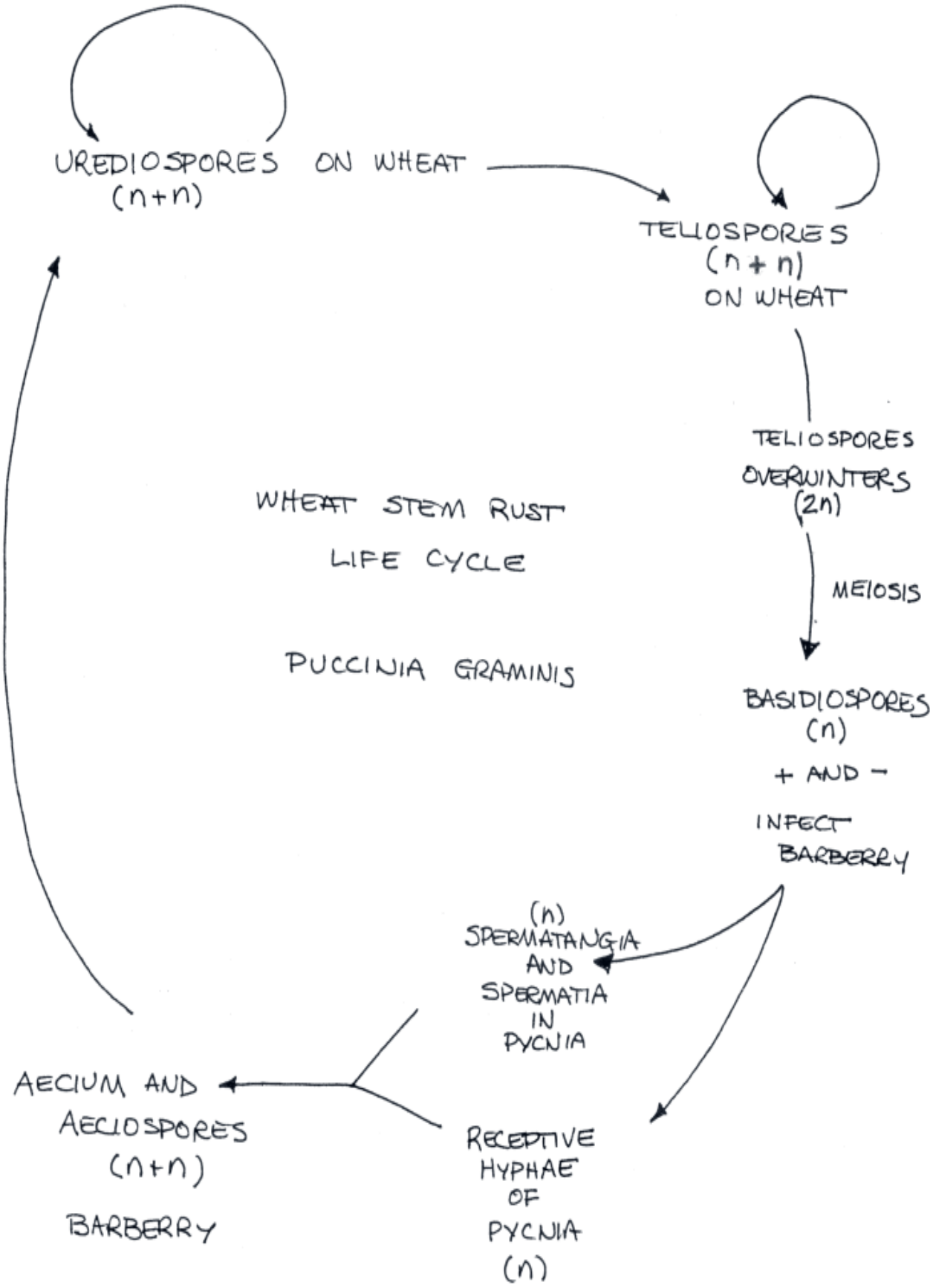
☐ Observe the prepared slides of the various stages of black wheat stem rust and identify all the various spore types.

☐ When available, obtain samples of wheat stem and barberry leaves. Make wet mounts of any eruptions of the epidermis of each to study the spore stages. Simply moisten a sharp probe and scrape the surface where you find an eruption. Place that in a drop of distilled water and cover with a coverslip.

Corn Smut

Corn smut is another basidiomycete, and as the name implies, infects corn (*Zea mays*) and its ancestor *Teosinte*. Corn smut (*Ustilago maydis*) is considered a pest in the United States and Europe and most fields with infections are destroyed. In essence, the fungus infects the plant but most often affects the ovaries of the corn "ear" and produces fungal growths in place of the corn seed. Some cultures consider the fungus (called huitlacoche in Mexico) edible and a

Figure 18. Life cycle of Puccinia graminis.



delicacy and you pay a higher price for corn ears infected with the fungus (Wikipedia 2006).

☐ Make a wet mount of corn smut. Moisten the tip of a sharp probe and scrape some spores (**teliospores)** from the pustule. Mount in a drop of distilled water and cover with a coverslip. Corn smut only has two spore stages: teliospores and basidiospores. You will see only teliospores in your slide.

Lichens

Lichens are a symbiotic relationship between fungi and algae. The fungal component is either an Ascomycete or a Basidiomycete. The algal component is usually a green or blue-green alga. They live in a parasitic relationship where the fungus sends a filament, the **haustorium** into the algal cell to feed off it. The algal cell is seldom destroyed and the fungus perhaps offers some degree of protection.

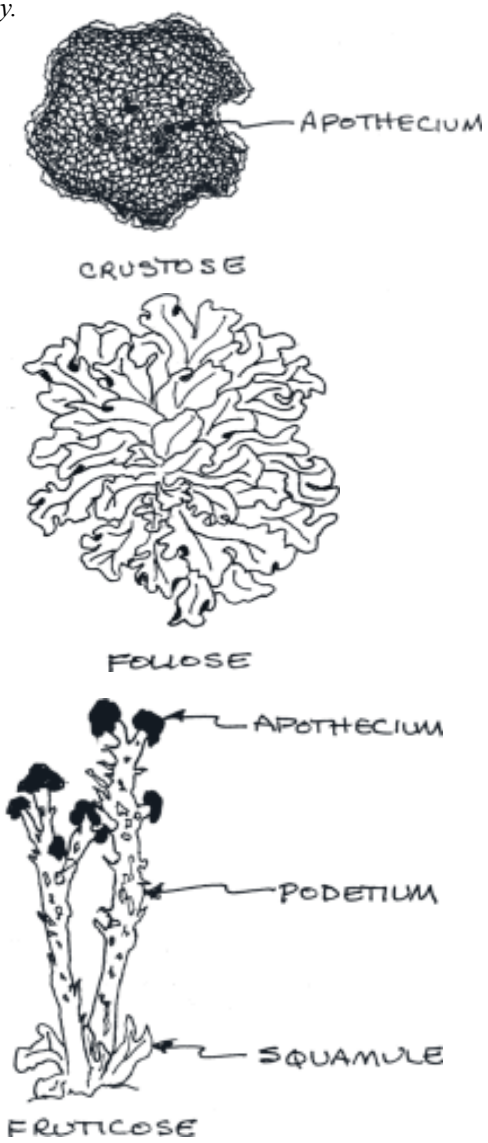
There are three basic types of lichens depending upon their pattern of growth: crustose, foliose, and fruticose. If the lichen grows "crustlike" to its substrate, to the point of almost appearing painted upon the substrate, it is said to be crustose. If the lichen looks "leafy", it is said to be foliose. If the lichen looks "shrublike" it is said to be fruticose. Often, fruitcose lichens are used as shrubs and trees in models scenes. One common one used is reindeer moss which is not a moss, but a fruticose lichen.

Lichens are considered primary soil formers. They often grow attached to bare rock and chemically decompose the rock over a period of time. There are numerous acids associated with lichens. Lichens are also able to withstand severe drought. They also have the ability to literally pull water vapor from the air for the moisture.

☐ Look at the three types of lichens provided. Be able to distinguish between crustose, foliose, and fruticose types.

☐ Observe the prepared slide of a lichen under the microscope. Look for the fungal and algal components of the lichen.

Figure 19. Three types of lichens. From Pritchard HN, Bradt PT. 1984. Pages 421, 424 in *Biology of nonvascular plants. St. Louis: Times Mirror/ Mosby.*



Fungi Imperfecti

This group technically belongs to the Division Ascomycota, but since they generally do not reproduce sexually, they are called the Fungi Imperfecti (imperfect because of no known sexual reproduction). Two common genera are found in this group: *Aspergillus* and *Penicillium.*

Aspergillus

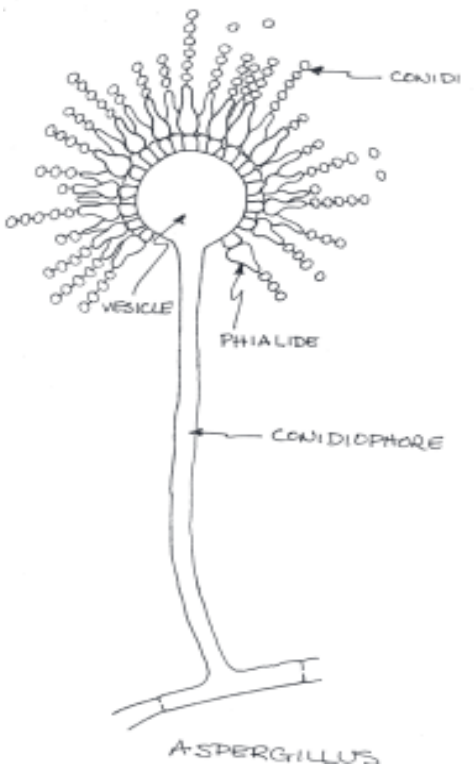
Aspergillus is a fungus often found growing on stale bread and is confused with *Rhizopus* be-

cause of the similarity of growth and substrate. *Aspergillus*, however, is quite different from *Rhizopus*. This fungus has both beneficial and detrimental effects. Some species may be used to produce some food products such as cheeses, soy sauce, and tofu. Other species may cause diseases in humans and other animals as **aspergilloses.**

☐ Look at the culture of *Aspergillus* with a dissection scope. Try to observe its growth form and notice the color. **Do not remove the lid of the Petri dish!** Note how the spores are attached to a special spore bearing structure called the **conidiophore.**

☐ Now look at a prepared slide of *Aspergillus*. Observer the details of asexual reproduction and compare them with the illustration in the lab exercise and with a slide of *Rhizopus.*

Figure 20. Aspergillis. *From Webster J. 1970. Page 204* in *Introduction to fungi. Cambridge: Cambridge University.*



Penicillium

Penicillium is another member of the Fungi Imperfecti and most of your probably realize Sir Alexander Fleming discovered the antibiotic properties of this fungus. Not to take away the importance of Fleming's discovery, it was Norman Heatley that discovered the way to purify the antibiotic penicillin found in *Penicillium* so it could be used as the wonder drug it is. Even today, penicillin is the most widely prescribed drug in the world, the safest (except to those who are allergic), and overall the most effective.

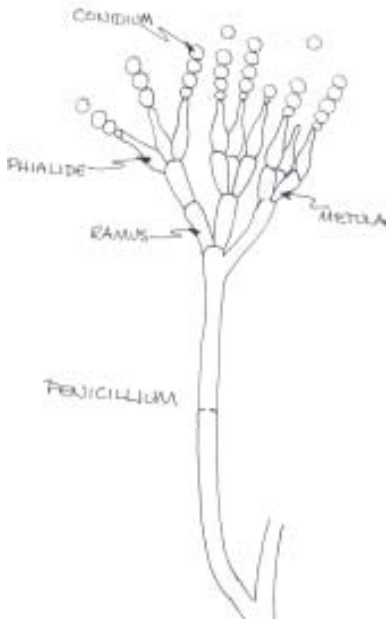
It is, again, a member of the Ascomycota; however, it generally does not exhibit sexual reproduction. It was the discovery of a sexually reproducing strain found on an orange at a fruit stand in Chicago that allowed us to produce various strains for attack against bacteria.

Penicillium is not only used for the production of the drug; it is also used in many preparations of food stuffs, especially cheeses. You can also find the fungus growing right along side *Rhizopus* and *Aspergillus* on bread and moldy cheese.

Note the growth form in the Petri dish. *Penicillium* often has a distinctive growth pattern. Particularly notice the blue-green color.

Obtain a prepared slide of *Penicillium*. Look for the finger-like projections with the **conidiospores** produced on the ends. Also, note your magnification.

Figure 21. Penicillium. From Webster J. 1970. Page 205 in *Introduction to fungi. Cambridge: Cambridge University.*



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