Fungi

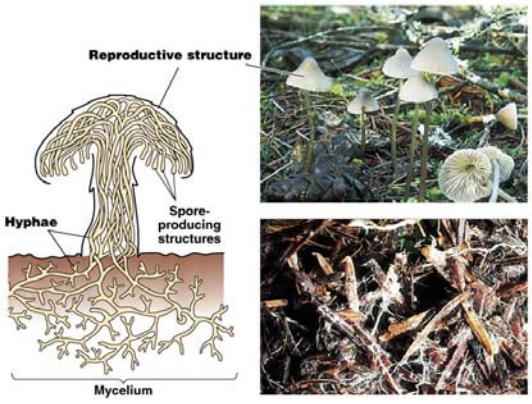
Fungi and plants moved onto land together

- Fungi are heterotrophic and require external sources of food molecules. They likely evolved to terrestrial habitats from aquatic ancestors, joining their food supply, which was early plants, on land.
- Fungi are found in both terrestrial and aquatic environments.
- Many fungi are parasites of plants.
- A few fungi have unique adaptations that enable them to trap animals for food.

- A major role of fungi is decomposition of dead organisms, particularly plants and their organic remains. Some fungi can break down other organic materials, including residues of pesticides and cancer-causing chemicals.

Fungi absorb food after digesting it outside their bodies

- Kingdom Fungi includes **heterotrophic eukaryotes** that **digest their food externally** and absorb the resulting small molecules as nutrients. Other characteristics include: cell **walls of chitin**, **spore production**, and the **absence of motile stages**.
- Fungi are grouped in their own kingdom. They differ from plants, with which they were once classified, because they cannot make food by photosynthesis, and in the details of their cellular and molecular structure.
- Fungi are usually multicellular, but their bodies (**mycelia**) are composed of extensive networks of **hyphae** (filamentous cell-like units). Hyphae may be branched, may be syncytium, or may be divided into cell-like components.



- The hyphae of the mycelium extend rapidly into the food source, developing a huge surface area from which digestive enzymes are secreted and through which the digestive food is absorbed. A large mycelium can add as much as a kilometer of hyphae each day.
- Some fungi produce mushrooms, external reproductive bodies composed of packed hyphae.

Many fungi have three distinct phases in their life cycle

•The phases of mushroom-producing fungi and their relatives are characterized by a nuclear condition.

•Fertilization of one nucleus in a dikaryotic pair with another in the mushroom (fruiting body) produces diploid zygotes. These are held in terminal cells of the hyphae in the mushroom. Meiosis of the zygote produces the haploid nuclei that form spores.

•Haploid spores are shed from the fruiting body, are wind-dispersed (or dispersed by water or animals), and develop into haploid mycelia. Two compatible, haploid mycelia can fuse to form a dikaryotic mycelium.

•The dikaryotic mycelium maintains the compatible (and genetically different) nuclei, paired but separate. This phase is dominant in the life of the fungus, often lasting for many years as it continues to grow into its food source. Dikaryotic hyphae also make up the tissues of the mushrooms produced by this mycelium periodically.

•Some fungi are simple. Yeasts are single-celled and mostly reproduce by mitotic cell division.

Lichens consist of fungi living mutualistically with photosynthetic organisms

•Lichens are associations of millions of green algae or cyanobactyeria held in a tangled network of fungal hyphae.

•The fungus received food from the photosynthesis of its partner.

•The alga or cyanobacterium receives housing, water, and the minerals trapped by the hyphal network.

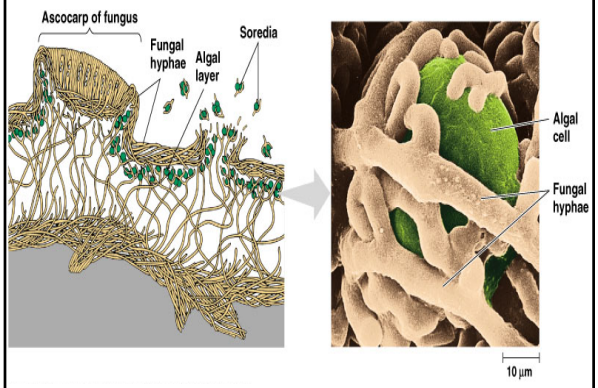
•All lichen fungi and most lichen algae and cyanobacteria cannot grow independently.

•Asexual reproduction of the fungus and alga together is advantageous; dispersal of both partners occurs, and they can immediately reestablish the lichen.

•Lichens are able to survive in habitats where neither partner (nor any other multicellular organism) could grow alone. However, they are highly susceptible to airborne pollutants.

•Lichens play important ecological roles in soil formation on rock surfaces and as food for animals.

•Some lichens are thousands of years old.



Parasitic fungi harm plants and animals

•Of the 100,000 species, about one-third are mutualistic in mycorrhizae and lichens, one-third are decomposers, and one-third are parasites.

•Parasitic fungi are the most serious plant pests. Particularly dangerous are nonnative parasites, such as the fungus that caused the Dutch elm disease.

•Some parasitic fungi attack developing seeds and fruits of grains.

•Fungi cause a few diseases in humans. Flour made from grain infested with ergots can cause gangrene and nervous system disorders.

• **LSD** is one of the toxins that has been isolated from ergots.

•Some infections of lung tissue can be fatal, particularly people weakened by other diseases.

•Less serious are the fungal infections of the outer layers of the skin known as **ringworm** and **athlete's foot**. Fortunately, most of these fungal parasites can be controlled by fungicidal ointments.

Fungi have enormous ecological and practical impacts

•Mushroom and other fungi are eaten.

•Certain molds lend distinctive flavors and textures to food such as Roquefort and blue cheese, and underground truffles.

•Different strains of one kind of yeast are used in baking, brewing, and winemaking.

•Some fungi are commercial sources of antibiotics.

•There is evidence that fungi evolved from the same protistan line that gave rise to animals.