

Fungal basics - all fungi we will deal with are made up of microscopic thread-like cells call **hyphae** (hypha=singular). Collectively all of the hyphae of a single individual are called its **mycelium**. The mycelium is the vegetative body of the fungus and it obtains nutrients for the fungus via absorption.

The **fruiting body (sporocarp, basidiocarp, ascocarp)** is the reproductive stage. Meiotic (recombinant) spores are produced in it and dispersed in various ways.

Spores are usually haploid and germinate to form a haploid mycelium. In Basidiomycetes the haploid mycelium fuse (with compatible mating types) to form a heterokaryotic mycelium (one that contains two different types of haploid nuclei).

Different gross morphologies -useful for identification, but non-phylogenetic categories (pages 52-55 in Arora).

Basidiomycetes:

- agarics (=mushrooms)
- chanterelles (mushrooms that are vase-shaped with very shallow gills)
- boletes (= mushrooms with tubes rather than gills)
- Tooth fungi (teeth instead of gills or tubes)
- Polypores and bracket fungi (hard or leathery, and usually tubed, often on wood)
- Resupinate fungi (Arora calls them crust and parchment fungi)
- Jelly fungi (rubbery in texture, often with blob-like in shape)
- club and coral fungi
- Gastromycetes (gastroid agarics, puffballs, earth stars, birds nest fungi, stink horns and false truffles)

Ascomycetes:

- true truffles
- cup fungi
- Earth tongues
- Perithecial fungi (flask fungi)

Parts of an agaric (i.e., a mushroom): **stipe** (stem), **pileus** (cap), **pileus context** (or trama), **pileipellis** (cuticle or skin of cap), **lamellae** (gills), **lamellulae** (short gills, that don't reach the stipe - a space filling strategy), **veils** – universal and partial: these can produce structures such as a **volva** (a cup of sac at base of stipe), **warts or scales** on the pileus surfaces, and an **annulus** or ring on the stipe, or **veil fragments** on the pileus margin.

Microscopic features:

spore characteristics: color via spore prints (color of gill, or spore deposition on cap, may be indicator); size, shape, ornamentation, staining in Meltzer's (amyloid reaction), presence of germ pores, truncate apex, thickness of wall layers.

Pileipellis characteristics (see pp 55-59 In How to ID Mushrooms III, Microscopic features)

Derms (upright cells): epithelium (Swollen circular cells, *Cystoderma*, *Psathyrella*), hymeniform (club-shaped upright cells, *Agrocybe*, *Conocybe*), trichoderm (upright unswollen hyphae) *Paxillus* and may others, ixotrichoderm (gelatinized hyphae, *Suillus*)

Dense layer or *parallelocutis* - common in many

Pileocystidia - cystidial like cells in the pileipellis. broom cells in *Marasmius*.

Gill cross-section

gill trama types: **interwoven** (irregular), **parallel** (regular), **divergent** (bilateral) found in *Amanita* and a few others, **convergent** found in *Pluteus* and *Volvariella*

Hymenium (organized layer of spore-producing cells) -

Basidia - shape, size, number of spores/basidium

cystidia (p 71-80 in D Mushrooms III, Microscopic features) non-spore producing, usually odd shaped cells in hymenium or elsewhere.

Described by location: **Cheilocystidia** (on gill or tube edge), **Pleurocystidia** found on gill or tube face, **Caulocystidia** (on stipe surface), *pileocystidia* (found on pileipellis).

Described by shape, structure, or contents (many terms, only a few examples listed): **Metuloids** (thick-walled), **setae** (metuloids that are dark, only in Hymenchaetales), **gloeocystidida** (oily contents); *chrysocystidia* (*gloeocystidia* with golden contents in KOH); **suhovanilla positive** (dark blue in Sulfuric acid and vanillin - only in the Russulales), **capitulate** (a rounded head), **macronate** (tapering to a point), **encrusted** (with crystals at apex).

Function of cystidia?

Pileus trama - usually filamentous, sometime **heteromerous** (containing nests of rounded cells called heterocysts, found only in Russulaceae).

Hyphae may be clamped or not (i.e., **clamp connections** found at septa).

In polypores hyphae may be thick-walled (**Skeletal or binding hyphae**) - more on this later.

Hyphae can also be distinctive by **staining reactions** (some stain reddish brown in Meltzer's and are called dextrinoid), or they may be **incrusted** with crystals, or roughen on the surface, or swollen or inflated in various ways.

Suggested Readings: In Arora read Identification and Terminology pp 14-23, and look at pp 52-55.

In How to ID Mushrooms III, Microscopic features scan the plates in the center, and turn to the glossary in the back and look through some of the terms you have now been exposed to.