

GUIDE TO THE MAJOR GENERA OF GILLED MUSHROOMS

The Light Spored Mushrooms I:

Pluteaceae, Entolomataceae, Pleurotaceae, Lepiota, Laccaria, Cystoderma, Marasmiaceae (52.5 minutes)

Slide 1. In this program I have included representative species from half of the major genera of gilled mushrooms with white to pastel to pink spore prints. I have included all of the most poisonous species and the best edible species from these genera. I have attempted in this short space to give the viewer a sense of the range of diversity within each major genus as well as the diversity of the pale-spored mushroom species. My aim is to help you develop a feel for the look of each genus so that even when you do not know the exact species of a mushroom that you find in the fields or woods, you will recognize the genus and will have a much easier time in figuring out what species you have because you will be able to go to the right part of your field guide or to the proper monograph to solve the puzzle of what you have found.

Slide 2. I am Michael Beug, a member of the Education Committee of the North American Mycological Association and Professor Emeritus of The Evergreen State College. Elsewhere on this CD you can read my fungal biography, learn more about NAMA and learn how to customize this program for your specific needs.

Slide 3. *Amanita* is the first genus that someone wishing to pick mushrooms should learn. The genus is divided into subgenera, and the subgenus *Lepidella* section *Phalloideae* contains the most dangerous poisonous mushrooms. The North American members of this deadly group include *Amanita phalloides*, *Amanita bisporigera*, *Amanita verna* and *Amanita ocreata*. *Amanita phalloides* is deadly poisonous and accounts for 40- 50% of all mushroom fatalities. Add *Amanita ocreata*, *Amanita bisporigera* and *Amanita verna* and to the toll from *Amanita phalloides* and you account for about 90% of mushroom fatalities in North America. These mushrooms are large, meaty and tempting with excellent flavor, but cause an excruciating poisoning that slowly destroys the liver, can cause kidney damage and can cause blood thinning so extreme that you literally bleed to death internally. These four species have white, free or nearly free gills, a white spore print, a membranous ring (that may rub off in age), and a sac-like volva at the base of the stem (that may be buried beneath the surface of the ground and missed by careless collectors). The cap is typically greenish-yellow but can be tan or almost white in *Amanita phalloides* and is basically white in the other three species. *Amanita phalloides* appears to have been accidentally imported from Europe associated with the roots of nursery trees. Its range in the U.S. is steadily expanding. It is found most abundantly in California but has now extended its reach up into British Columbia. It is also present and spreading in eastern North America. *Amanita ocreata* is a western species. *Amanita bisporigera* and *Amanita verna* are widespread but are most common in eastern North America.

Slide 4. The second most dangerous group of mushrooms in the genus *Amanita* are all in section *Lepidella* of subgenus *Lepidella*, a group where several members contain a toxin

that causes kidney failure. Members include *Amanita smithiana*, *Amanita magniverrucata*, *Amanita cokeri*, and *Amanita daucipes*.

Amanita smithiana has caused several severe poisonings. *Amanita smithiana* is found in western North America and its range extends down into Mexico. It has chlorine-like odor.

Amanita magniverrucata is found in Southern California and Baja.

Amanita daucipes grows under oak and pine and is found from Pennsylvania down into Mexico. It has a strong meat-like odor of old ham bones or soap.

Amanita cokeri has a mild odor and is found under pines or pine/hardwood stands in southeastern and southern North America and parts of California. All of these species should be considered dangerously poisonous. Do not even taste them. They all have white free gills, a white spore print, a powdery partial veil that does not leave a distinct ring, a bulbous base and a universal veil that breaks up into small granular patches and does not form a sac-like volva

Slide 5. *Amanita muscaria* may well be the most famous of all mushrooms. It is in subgenus *muscaria*, section *muscaria*. As an inebriant, *Amanita muscaria* was used by Siberian tribesmen before the introduction of alcohol and its effects were reflected on by Lewis Carroll in Alice in Wonderland: one bite makes you too big, another makes you too small, and a third makes you just right. In 15 minutes to one hour after ingestion *Amanita muscaria* can cause changes in the perception of time and in the perception of size but it can also easily cause violent reactions, muscular spasms, and deep coma-like sleep. While the toxins in *Amanita muscaria* are not lethal per se, a very few people have died after consuming a quantity of this mushroom. One person froze to death while winter camping after falling into the characteristic deep coma-like sleep that typically lasts 6-8 hours but can last much longer. One or two others have died over the past 2 centuries due to other unexplained consequences following consumption of this mushroom.

Amanita muscaria is the classical Toadstool and frequently appears in multi-colored versions in children's books as well as in lawn and kitchen ornaments. The real mushroom has cap colors of white, brown, yellow, orange or red. *Amanita pantherina* contains the same toxins but causes even more violent poisonings. Both have white free gills, a white spore print, a ring on the stipe and a universal veil that breaks up to leave warts on the cap that easily rub off or wash off in the rain. The *Amanita muscaria* volva consists of three bands of tissue at the top of the somewhat swollen base while *Amanita pantherina* as we know it in North America has a single rolled collar of tissue just above the slightly swollen base. Every year there are numerous accidental and intentional ingestions of these two species. Young specimens are sometimes mistaken for puffballs – but remember, edible stage puffballs look and feel just like a marshmallow with no traces of a developing cap, gills or stipe inside. *Amanita muscaria* and *Amanita pantherina* both have a delicious flavor and actually can be eaten without ill effect if you cut them up, boil them in water and throw away the water. Their toxins are water soluble, which is not the case with the toxins in the previous *Amanita* species.

Slide 6. For brave individuals expert at their taxonomy, there are some edible *Amanita* species in subgenus *Amanita* section *Vaginatae*. *Amanita vaginata*, Grisette, shares the cup-like volva of the deadly *Amanita* species but does not have a partial veil. It comes in many variations ranging from white to yellowish-brown to brown or dark gray. Sometimes these variants are raised to species rank (e.g. *Amanita fulva*). The mushroom is found throughout North America and is said to be edible, though I recommend against trying it. It is too easy to mistake one of the deadly *Amanita* species that have lost their partial veils for a member of the *Amanita vaginata* complex. This happened to a mushroomer in Oregon in about 2004 who loves to eat *Amanita vaginata* but got *Amanita phalloides* by mistake. Fortunately he realized his error as soon as he began to feel ill and rushed to the hospital in time to avoid serious consequences.

Amanita calyprata has both a cup volva and a ring on the stipe and has been mistaken for *Amanita phalloides* with deadly results.

Amanita jacksonii is sufficiently distinctive that a mistake is unlikely but it is not all that good to eat, so why bother.

Slide 7. In most sources this mushroom is listed as *Volvariella speciosa* but *Index fungorum* lists *Volvariella gloiocephala* as the approved name. It looks very much like a white Grisette except that it yields a pink spore print, marking it as a *Volvariella* and not an *Amanita*. *Volvariella gloiocephala* is a widespread and beautiful, though soft-fleshed mushroom that quickly becomes rather flaccid. It fruits spring, summer and fall in mulch, rich soil, wood chips, cultivated fields and sometimes in the woods. It is a mediocre edible but if you choose to eat it, make certain to actually make a spore print. It is just too similar to the deadly white-spored “Destroying Angel” mushrooms, *Amanita bisporigera*, *A. verna* and *A. ocreata*. These species also have a partial veil which *Volvariella gloiocephala* lacks. *Volvariella volvaceae* grows in similar habitats in the Deep South or in greenhouses farther north and has a dry gray-brown to blackish brown pileus. In Asia, *Volvariella volvacea* is grown commercially and is known as the “Paddy Straw Mushroom”. In North America on several occasions Asian immigrants have picked and eaten *Amanita phalloides* with tragic results thinking that they had *Volvariella volvacea*.

Slide 8. *Pluteus atromarginatus* is a distinctive and good-sized *Pluteus* easily recognized by an examination of the gill edges which are fringed with black and thus the scientific epithet *atromarginatus*, otherwise it looks very much like the Deer Mushroom, *Pluteus cervinus*.

Pluteus pellitus is distinguished by an almost all white cap. *Pluteus* species have free gills, a pink spore print, and grow on wood, in this species rotten conifer wood. The cap will break from the stipe in a ball and socket fashion as in the genus *Agaricus* and *Lepiota*, broadly defined. *Pluteus* species can be abundant in old sawdust and wood-chip piles. *Pluteus cervinus*, *Pluteus pellitus* and *Pluteus atromarginatus* are edible mushrooms, though they tend to be soft fleshed and not to my liking. They are widespread in North America. They are frequently encountered growing singly to several. Just be sure that you do not mistakenly pick a bunch of pink-spored *Entoloma* species. *Entoloma* species have attached gills, but the gills can tear away from the stem making inexperienced collectors think that they have a mushroom with free gills. Several

nastily toxic *Entoloma* species are similar in size and general appearance, though they do not grow on wood and *Pluteus* does grow on wood.

Pluteus aurantiorugosus is a small, widespread but uncommon and strikingly beautiful *Pluteus* characterized by a bright red to orange-red cap that turns to a bright yellow in age. The stem can be white or yellow or orange-yellow. It grows on decaying hardwoods. There are a number of small beautiful *Pluteus* species recognized by their free gills, pink spore print, absence of a ring or volva and growth on wood.

Slide 9. *Entoloma* species have bluntly attached to notched gills, no partial veils, and a pink spore print. The species illustrated all have the stature of a *Tricholoma*, but smaller members of the genus can have the stature of a *Mycena* or an *Omphalina* or *Collybia* in the broad sense.

Entoloma lividoalbum is in the *Entoloma* subgenus of *Entoloma*. This mushroom grows west of the Great Plains and prefers hardwoods. There are two varieties, one that has little odor and one that smells farinaceous. *Entoloma lividoalbum* is found in North Africa and in Europe in addition to western North America. Mushrooms that look virtually identical in Europe cause 10% of all European mushroom poisonings. This species should be considered quite poisonous. It also is a dead ringer for *Lyophyllum decastes*, a choice edible species. *Lyophyllum decastes* has a white, rather than a pink, spore print.

Many variants of *Entoloma rhodopolium* are found in North America, Europe, Asia and North Africa. The *Entoloma rhodopolium* group is the most common of the large poisonous *Entoloma* species. It fruits on soil or in leaf litter late summer to fall and is a hardwood forest inhabitant.

Entoloma bloxamii of Europe is edible but our species may not be the same thing so I would avoid this species.

Entoloma luridum is an American species from eastern North America where it is occasionally found in mixed woods, especially with oak. It is called the yellow-gilled *Entoloma*. The NAMA database has one 2002 report of 4 people with very serious gastro-intestinal distress after consuming this species.

Slide 10. *Entoloma abortivum* is a very interesting dual organism. The aborted form is an *Armillaria* growing with *Entoloma abortivum* and it is edible. When non-aborted, *Entoloma abortivum* might well be confused with a poisonous *Entoloma*. However, it has bluntly attached to distinctly decurrent gills while the poisonous species we have just covered have gills notched at the point of attachment and not decurrent. *Entoloma abortivum* has a farinaceous odor and taste, which is the odor and taste of meal and is not pleasant. It is found in eastern North America in the fall mushroom season around stumps or on rotten limbs. It has also been called *Clitopilus abortivus*.

Slide 11. There are several subgenera of the genus *Entoloma* that are considered separate genera by some authors. These subgenera are *Nolanea*, *Leptonia* and *Alboleptonia*. There are over 100 of these small *Entoloma* species. They include *Nolanea holoconiata* which is a very common western spring species that outwardly looks very similar to *Entoloma verna* of eastern North America. The *Nolanea* species tend to be drab.

Leptonia species have interesting nonamyloid angular spores and are small to medium-sized saprophytic mushrooms. Many have beautiful blue or black colors. The gills are typically attached but can appear free. They have a stature that is omphaloid to mycenoid.

Alboleptonia species are a beautiful luminescent white and are widespread. The bright yellow to orange to red *Entoloma* species, of which there are several appear confined to areas east of the Rocky Mountains.

Slide 12. The genus *Lepiota* in the broad sense includes species with white to greenish spore prints, distinctly free gills, a partial veil but no universal veil or volva and a cap that breaks from the stipe in a ball and socket fashion as in *Agaricus* species, to which these are closely related. The Parasol Mushroom, *Macrolepiota procera*, formerly known as *Lepiota procera*, is a tall stately eastern North American species distinguished by a cap that starts brown and egg-shaped and then expands to almost flat with a central bump and can be as large as a dinner plate. As it expands the surface breaks into distinctive scales. The ring is membranous and moveable. The stem is striped with bands of small brownish scales. *Lepiota procera* is a choice edible for those who can distinguish it from *Chlorophyllum molybdites*, The Green-Spored Lepiota. *Chlorophyllum molybdites* is much stockier, without the tall slender stipe and in age the spores develop an olive-green coloration.

At some point in time, the name *Macrolepiota procera* will be reserved for European material and we will get new names for the at least two species of look-alikes that we have in North America. That is why I have used “*procera*” in quotes and have not provided an author citation. Another approach would be to call this *Macrolepiota procera sensu auct. Amer.* which means in the American sense.

Chlorophyllum rachodes, formerly known as *Macrolepiota rachodes* and *Lepiota rachodes* is somewhat similar to *Macrolepiota procera* and is distinguished by the thicker stipe, the absence of the bands of scales on the stipe and by an orange-yellow to red-brown bruising reaction of the flesh. The upper stipe is hollow. It does not tend to grow densely clustered as does the somewhat similar *Leucoagaricus americanus*. *Chlorophyllum rachodes* is a widely distributed choice edible species that closely resembles the poisonous green-spored, *Chlorophyllum molybdites*, especially since in young material the spores of *Chlorophyllum molybdites* are white and have not yet turned greenish. *Chlorophyllum rachodes* grows in small to large groups on rich ground in grass, humus, wood chip piles, needle duff and especially compost piles and ant hills. It is more common in southerly than in northerly regions. It should be noted that some people, me included, suffer gastrointestinal distress when they consume any *Chlorophyllum*, *Macrolepiota*, or *Leucoagaricus* species – even the ones generally considered to be choice edibles.

Leucoagaricus americanus, formerly *Lepiota americana* is distinguished by often growing in dense clusters with the stipes almost fused at the base. The stipe is fat in the middle. The bruising reaction that is immediately yellow and then quickly turns reddish. Some collections bruise reddish directly without a yellow phase. Specimens turn deep red when dried. This eastern species is considered to be a good edible. I once discovered some misplaced specimens of *Leucoagaricus americanus* growing in a nursery in

Olympia, Washington, and their taste was positively awful. Picking mushrooms in a nursery where pesticide use is going to be significant was not a smart move on my part.

Slide 13. *Leucogaricus naucinus*, formerly known as *Lepiota naucina*, is a white, sometimes grayish, lawn mushroom with white free gills and a smooth stem with a movable ring. *Leucoagaricus leucothites* is the other accepted name for this species. It is widely distributed, frequently showing up in lawns and gardens and sometimes in the woods and is considered to be a good edible species, though I know of several people who are made ill by it, sometimes with violent flu-like symptoms that can last several days. *Leucogaricus naucinus* is not on my list of mushrooms to try and if it makes yours, make certain that you haven't picked one of the deadly white *Amanita* species and overlooked the sac-like volva. Some years ago a NAMA member assembled a collection of *Leucoagaricus naucinus* and what is probably *Amanita verna*. If you miss the volva at the base of the stipe of the *Amanita* it looks indistinguishable. All similar white *Amanita* species with a ring and a sack-like volva are deadly poisonous. I do not eat all-white mushrooms as a matter of personal safety.

The smaller *Lepiota* species should all be excluded from consideration as edibles. Several are deadly poisonous. *Lepiota castanea* is one of the potentially deadly species. It contains modest amounts of α -amanitin, the deadly toxin of the “Destroying Angel” mushrooms in the genus *Amanita*. The partial veil is white and wooly, occasionally leaving an annulus. *Lepiota castanea* is widely distributed and can be found in both hardwood forests and in mixed woods where it grows in rich loam or humus.

Lepiota subincarnata is known to contain α -amanitin and is deadly poisonous. From the reports that I have gathered it is probably the single most poisonous species in existence, though it is not large enough to frequently attract attention as an edible.

Slide 14. There are many small species of *Lepiota* in the broad sense. Many are quite beautiful but none should be sampled for the table. The mushroom commonly known as *Lepiota clypeolaria* has a ragged look with yellowish wooly scales on the stipe below the ring zone and a white cottony partial veil, which often leaves pieces hanging from the edge of the cap. It is normally found under conifers and is widely distributed.

Lepiota cristata is considered possibly poisonous and in view of its close resemblance to *Lepiota subincarnata*, it should not be tested. It is found widely distributed in needle litter or on various kinds of humus, sometimes singly, but often in large troops. A distinguishing feature of *Lepiota cristata* is its strong, foul fishy or spicy odor. The spores are distinctively wedge-shaped with a spurred corner. There are a number of closely related species that are hard to distinguish.

Lepiota rubrotincta is a very pretty smallish *Lepiota* distinguished by a cap with predominant pinkish to red tones. It is fairly common.

Leucocoprinus cepistipes, long known as *Lepiota cepistipes* is found widespread but infrequently, on rich decomposing organic matter, on sawdust and wood chips in warm, moist weather. *Leucocoprinus cepistipes* is distinguished by its mealy white cap with a striate margin and by its scallion-shaped stem.

Slide 15. *Cystoderma* species are small mushrooms with a granular to minutely scaly cap and a partial veil of large round cells. There are 14 species reported from North America. Some evidence points to a close relationship to *Lepiota*.

Cystoderma fallax is a personal favorite of mine because of its beautiful rich brown color, contrasting white gills and a unique sheathing partial veil that leaves a stocking-like ring on the stem. *Cystoderma fallax* is primarily found in western North America.

The “Vermilion *Cystoderma*”, *Cystoderma terreii*, has previously been called *Cystoderma cinnabarinum*, *Lepiota cinnabarinum* and *Armillaria cinnabarinum*. The cap varies from cinnabar red to orange brown. The presence of cheilocystidia give the gill edges a fringed look that helps distinguish this species from the overlapping color forms of *Cystoderma amianthinum* and *Cystoderma granulosum*. *Cystoderma terreii* is widely distributed and is found under conifers and hardwoods late summer through fall.

Cystoderma amianthinum is an interesting little *Cystoderma* characterized by a yellowish-orange-brown cap and an evanescent ring. In *Cystoderma amianthinum* var. *rugosoreticulatum*, the cap is deeply wrinkled and the odor is very pungent, often reminiscent of green corn (due to the presence of the compound geosmin, a sesquiterpene). Var. *amianthinum* lacks the deeply wrinkled cap and lacks the pungent odor. *Cystoderma amianthinum* is found in much of North America and Europe. The cap color can range from almost white to yellow-orange to reddish-brown. The partial veil does not leave a prominent ring on the stipe.

Slide 16. The complex of species known as Oyster Mushrooms are very widespread and fruit spring through late fall. They have fleshy white to gray or brown caps with whitish or yellow-tinged gills, and a stub-like stalk. Oyster Mushrooms grow from deciduous trees, rarely conifers. If you are in western North America and find an oyster mushroom growing on a conifer, you have *Pleurotus pulmonarius*, which can only be told from *Pleurotus ostreatus* by its habitat. The spore prints range from white to lilac with *Pleurotus ostreatus* characterized by white spores and *Pleurotus sapidus* by lilac spores, though not all authors recognize *Pleurotus sapidus* as a separate species. *Pleurotus populinus* grows on cottonwood and aspen in northern North America and can sometimes be distinguished by its somewhat larger spores. These Oyster Mushrooms are all choice edibles that can be easily cultivated at home on straw, old newspapers or magazines. They are distinctive and are good bets for the relative novice mushroom collector. But stick to the large meaty mushrooms. There are similar small species, about the diameter of a quarter that have brown spore prints and should be avoided.

Ecologically, Oysters Mushrooms have an interesting trick. Their habitat on dead and dying trees is a rich source of carbon but is rather deficient in nitrogen. The hyphae that form the mycelium produce sticky knobs that attach to nematodes that come along trying to eat the hyphae. As the nematode thrashes around, it gets stuck to more and more sticky knobs. The hyphae then grow into the nematode, digesting it and thus absorbing nitrogen and other useful compounds from the nematodes they kill. Had you ever thought of mushrooms as a carnivore? This one is.

Slide 17. *Hypsizygus tessulatus* is tempting for the table. It tends to grow in clusters and has a smooth cap. *Hypsizygus tessulatus* is a prized edible mushroom and is known in Japan as *hon shimeji*. A synonym is *Hypsizygus marmoreus* and I first learned it as *Pleurotus elongatipes*. Fungi perfecti and others sell mushroom growing kits if you want to give this species a try and have not found it growing wild. There are several mushrooms that look a lot like *Hypsizygus tessulatus* but no known dangerous look-alike also grows on wood.

Neolentinus lepideus, formerly *Lentinus lepideus* also has a stipe and grows on wood but it is easily distinguished by a scaly cap, a partial veil, and serrate gill edges. *Neolentinus lepideus* is widespread on conifers and occasionally hardwoods. The odor is fragrant, anise-like and the taste is good when still young and tender, but use only the caps as the stipe is tough even when young.

Slide 18. *Cheimonophyllum candidissimum* is like a miniature oyster mushroom. It was once *Pleurotus candidissimus*, the “White Oysterette”. It grows on hardwoods and sometimes conifers. It is very similar in general appearance to *Panellus mitis*, which grows on conifers and has a slimy layer in the flesh and microscopic differences. Young samples of *Crepidotus* species can also be similar but they will develop brown spores and thus develop brown gills in age.

Pleurocybella porrigens is also very similar but is larger. *Pleurocybella porrigens* has a very descriptive common name “Angel Wings”. It is a beautiful pure white and grows widely distributed on conifer logs. I typically find it on old-growth Hemlock logs. It has no noticeable stipe and a white spore print. *Pleurocybella porrigens* was once considered a *Pleurotus* species, but it is now placed in the *Tricholomataceae*. *Pleurocybella porrigens* has long been considered a good edible and I have eaten it several times. The flavor is quite unique and interesting, though not entirely to my liking. However, I now take a more cautious view of consuming this mushroom because in September and October of 2004 there was a huge fruiting of *Pleurotus porrigens* in Japan where it is a prized edible known as *Sugihiratake*. A large number of elderly citizens ate large amounts of this mushroom. In a few days after ingestion and largely confined to individuals who had compromised kidneys and needed kidney dialysis, symptoms began as tremors and weakness of extremities. Symptoms worsened to consciousness disturbances and then intractable seizures. There was over 46 cases resulting in over 14 deaths, with death occurring 13-29 days after consumption of the mushrooms. Biopsies revealed conspicuous lesions in the cerebral cortex. Even survivors had lingering difficulties. There are other edible mushrooms that cause problems when consumed in large quantities and problems are magnified in the elderly and infirm. Always consume mushrooms in moderation.

Slide 19. There are a number of small light-spored species in the *Tricholomataceae* that grow on wood and may somewhat resemble small oyster mushrooms or brown-spored *Crepidotus* species. *Phyllotopsis nidulans* is pretty but foul smelling species, sometimes reminiscent of rotting cabbage. This sessile mushroom is characterized by a densely hairy orange cap with an inrolled margin and bright yellow-orange gills. *Phyllotopsis nidulans*

has a pinkish spore print. *Phyllotopsis nidulans* has also been placed in *Pleurotus* and in *Panellus*. It is widespread, reported from North America, Europe, Asia and North Africa.

Panellus stipticus is a small pale buff to tan mushroom shaped a lot like a spatula and growing clustered on dead wood. The caps are at most 1 inch across. It is inedible with an acid-astringent taste. *Panellus stipticus* is common and wide-spread in North America, Europe, Asia, Africa and Australia, fruiting spring, summer, and fall. The gills glow greenish in the dark when fresh. It gets its species epithet from the fact that it can reportedly stop bleeding.

Panellus ringens is a similar small decay organism of dead hardwood limbs, even ones still attached to trees. The cap is light purplish or lilac when young and the gills are pinkish brown. There is a rudimentary lateral stipe with a dense white fuzzy coating. *Panellus ringens* is usually found in winter and is reported from North America and Europe.

Slide 20. *Laccaria amethysteo-occidentalis* is the largest and most colorful of three amethyst colored *Laccaria* species. It grows under conifers in western North America, turning up as far east as Michigan. The other two amethyst species are *Laccaria amethystina* which is distinguished by globose spores and grows in eastern North America and *Laccaria vinaceobrunnea* which is found in the Gulf Coast region. *Laccaria amethysteo-occidentalis* can be tricky to identify when weathering has bleached out its gorgeous color. *Laccaria amethystina* like its western look-alike *Laccaria amethysteo-occidentalis* has a gorgeous violet cap, gills, and stem, at least before the ravages of sun and rain bleach and leach much of the color. Greg Mueller lists 19 species of *Laccaria* on the Field Museum of Natural History website. All are edible. The genus is fairly easy to recognize with the twisted-fibrous stems and the relatively small caps on a tallish stem.

Laccaria ochropurpurea is a distinctive large *Laccaria* found in the deciduous and conifer forests of eastern North America. In western North America collections identified as *Laccaria ochropurpurea* have always turned out to be faded *Laccaria amethysteo-occidentalis* or faded *Laccaria nobilis*. The spore print is pale lilac. The taste of *Laccaria ochropurpurea* is slightly acid and disagreeable. It appears to be a mycorrhizal associate of oaks.

Laccaria amethystina is found in deciduous and mixed woods in Europe, eastern North America, Central America and Columbia.

Slide 21. *Laccaria laccata* var. *pallidifolia* (lower left) is typically roughly uniform flesh color, ranging from dull pink to dull orangish. The cap usually has a central depression and is not broad compared to the height of the mushroom; it is glabrous to finely scaly and may be slightly striate. The gills are broad and widely spaced and the stem is distinctively fibrous-twisted, looking much like a grape stem, the mycelium at the base of the stipe is white. *Laccaria laccata* is cosmopolitan, fruiting in the summer and fall, and seemingly always turning up if there are any mushrooms around at all. There are many variants and all are edible. These images are of material from the eastern United States. *Laccaria laccata* is not highly rated, but is a quite decent edible. Some of the mushrooms

in the *Laccaria laccata* group are *Laccaria nobilis*, *Laccaria bicolor*, and *Laccaria ohiensis*.

Laccaria nobilis is larger and more robust than *Laccaria laccata* and is mainly distinguished microscopically – it lacks obvious cheilocystidia. *Laccaria bicolor* has violaceous gills and *Laccaria nobilis* has vinaceous gill coloring but the shades of coloring can overlap. Both have violaceous mycelium while *Laccaria laccata* has white mycelium. *Laccaria nobilis* and *Laccaria bicolor* are both found in western North America plus Michigan and Ontario.

Laccaria ohiensis is in the *Laccaria laccata* complex and is hard to differentiate. It is a small species with a strongly striate cap and a short stipe. The spores are very similar to *Laccaria laccata* var. *pallidifolia* but in mating studies it is intersterile. *Laccaria ohiensis* is widespread in North America but is not common.

Slide 22. The “Honey Mushroom” *Armillaria mellea*, is good sized and a valued edible mushroom. The caps are tender, though the stipes tend to be tough. It grows on hardwoods and is quite widespread. When I was first learning mushrooms life was much less complicated and I only had to be able to recognize two species of what was then in the genus *Armillariella*. There was the one without a ring on the stipe, *Armillaria tabescens*, found in eastern North America and the one with a ring, *Armillaria mellea*, found all over North America. But it turns out that there were at least ten different species hiding under the name *Armillaria mellea*.

Armillaria ostoyae is a significant pathogen of conifers causing root disease and not a recommended edible, since it causes quite a few poisoning cases characterized by gastrointestinal distress. There are at least 6 species of *Armillaria* that have a pathogenic phase but only *Armillaria ostoyae* causes significant mortality. While it mainly kills conifers, it can also attack and kill broad-leaved trees and shrubs. It spreads by rhizomorphs, bundles of mycelium that blacken with age, which give it a common name, Shoe-string root rot. After killing a tree, the mushroom transforms from a parasitic phase to a saprophytic phase that proceeds to decompose the roots and the dead tree itself. After logging, the fungus quickly can overtake a stump and then when the forest is replanted it can surge to attack the new trees, which are most susceptible for their first 15 years. One large individual plant of *Armillaria ostoyae* has been identified in the Malheur National Forest in Eastern Oregon. It covers 2,200 acres and is estimated to be anywhere from over 2,000 to over 7,000 years old. Previously the largest known living organism was found in the Gifford Pinchot National Forest near my home in Washington – but that plant of *Armillaria ostoyae* only covered 1500 acres.

Slide 23. *Strobilurus trullisatus* is an example of a small genus of mushrooms that inhabit cones of magnolia and of various conifers. The caps of species in this genus are olive-brown to gray to pinkish-white; the stems are confluent with the cap, pliant, up to 2 mm thick, often with thick stiff short hairs at the base. *Strobilurus trullisatus* was formerly in the genus *Collybia* and Singer now places it in the *Marasmius* family. In any case, it is a neat little mushroom of no interest to mycophagists. *Strobilurus trullisatus* has a dark olive-brown cap that fades to gray and then whitish and it grows on Douglas fir cones throughout the west. *Strobilurus conigenoides* is the species on magnolia fruits

and it is found from Quebec to Florida and west to Texas. It is interesting how some mushrooms fill very specific and narrow ecological niches.

Slide 24. *Marasmius* species are small to medium in size and frequently have the ability to revive and resume growing after drying out. The stipes are typically hair-like or so pliable that you could tie the stipe in a knot. *Marasmiellus candidus*, also known as *Marasmiellus albuscorticatus* and *Marasmius magnisporus*, is a widely distributed beautiful little thing that grows on twigs and stems in the fall. The white caps are neatly pleated and the white gills are often tinged pink. There may be a complex of species and varieties closely related to *Marasmiellus candidus*.

Marasmius coplandii is a western species with a strong garlic odor that is often misidentified as *Marasmius scorodonius*. *Marasmius coplandii* has fine velvety hairs on the stipe, larger spores and grows on hardwood litter and leaves. One of the tricks to getting your identifications more accurate is to pay close attention to both habit and habitat. *Marasmius coplandii* is edible and can be used as a garlic flavoring.

One member of the genus, *Marasmius oreades* is a sought after edible species. *Marasmius oreades*, the Fairy Ring Mushroom, is edible, choice to some and just tolerable to others. It grows summer and fall in rings in grassy areas and each year as the mycelium grows outward seeking new food, the ring increases in size. Some large rings of *Marasmius oreades* are estimated to be over 600 years old. When fresh and moist, the cap is smooth, broadly knobbed, colored a dull orange-cinnamon to pale yellowish-brown, fading on drying or sun exposure to buff-white. The off-white gills are attached or free and are not closely spaced. The stem is dry, rubbery, minutely hairy. The odor is faintly of crushed apple pits as both apple pits and *Marasmius oreades* contain traces of organically bound cyanide (enough to be deadly in less than a cup of apple pits). After drying, the mushroom revives and resumes growing if it rains. Steve Saupe credits this ability to trehalose, a sugar that protects the cells from damage on drying.

Marasmius plicatulus is simply a beautiful little western example of the genus.

Slide 25. *Calocybe carnea* has pinkish tones in the cap and grows solitary or in groups in grass as well as in open places in the woods and sometimes is found on moss. The gills are white and closely spaced. I have only seen it once but it is widespread and indeed may be the same as *Calocybe persicolor*, which is not as pink and does not have the matt of short hairs on the base of the stipe. *Calocybe carnea* has been called *Lyophyllum carneum*, *Tricholoma carneum* and *Rugosomyces carneus*.

Calocybe onychina is supposed to be a species of the spruce-aspen zone of the Rocky Mountains and yet I found it near sea level on the West coast in an oak/fir forest. It makes me wonder where else this beautiful medium-small mushroom with the reddish brown cap and yellow gills may show up.

Slide 26. *Rhodotus palmatus* is an endemic northeastern species. It grows on hardwoods from June to September and is not common even in the northeast. The flesh is extremely thin and there is no distinctive odor or taste so this is just a species for wonderment and enjoyment in the woods. As far as I can determine, this is the only species in the genus.

Slide 27. Some members of the *Tricholomataceae* family are quite small and their habitat is old decomposing mushrooms. *Asterophora parasitica* is one example. It is found on rotting *Lactarius* and *Russula* fruit bodies and is found in North America, Europe and North Africa. It has chlamydospores on well-formed gills.

Asterophora lycoperdoides differs in having poorly formed gills which only produce a few normal spores. In place of a cap cuticle, one finds a powdery mass composed of chlamydospores on top of the pileus. Like *Asterophora parasitica*, it grows on old *Lactarius* and *Russula* fruit bodies in North America, Europe and North Africa.

Slide 28. *Squamanita paradoxa* is an amazing little mushroom with an intense smell according to Moser. The type collection is from very near where I live and yet I have never seen this mushroom, nor have I seen any other member of the genus. Mushrooms in the genus *Squamanita* are mycoparasites with the parasitized mushroom typically unrecognizable and making up the base of the stipe, sometimes $\pm$ evident as a bulb. The genera and species so far known to be parasitized by *Squamanita* include *Phaeolepiota aurea*, *Cystoderma*, probably two *Galerina* species, *Amanita*, and *Kuehneromyces*. Two different *Squamanita* species are suspected parasites on *Cystoderma*. They are *Squamanita pearsonii* and *Squamanita paradoxa*, which is believed to parasitize *Cystoderma amianthinum*. Since *Cystoderma amianthinum* is widespread and common, maybe some of you have seen this species. I certainly will be looking for it now. Interestingly, this mushroom was first placed in the genus *Cystoderma* as *Cystoderma paradoxum*. While most mushrooms have at most a partial veil and some mushrooms also have a universal veil, *Squamanita* species appear to have three veils. Also, while there are other mycoparasites, *Squamanita* species are unusual in that they produce Chlamydospores on their host subsumed near the base of the stipe while simultaneously producing basidiospores on their gills.

Squamanita umbonata is found in the Northeast. The sclerotium is clearly evident at the base of the stipe but what mushroom is parasitized was not mentioned in Bessette et al, Mushrooms of Northeastern North America.

Phaeolepiota aurea, the "Golden False Lepiota," is essentially a giant brown-spored *Cystoderma*. This rare and striking species is found in the Pacific Northwest and also in Europe, appearing late summer through fall. It is the only member of the genus *Phaeolepiota*. The cap, veil and lower stem are covered with a distinctive granular powder making this a very striking species. *Phaeolepiota aurea* is edible for some people but causes mild upset in many who eat it. If you do try it, discard the tough stems. I find the aromatic odor somewhat unpleasant but others liken it to bitter almonds.

Slide 29. *Floccularia albolaripes*, formerly *Armillaria albolaripes*, is a beautiful western mushroom easily distinguished by its bright to dingy yellow or yellow-orange or yellow-brown fibrillose cap; creamy to yellow gills; and soft cottony yellow-tipped scales on the stem below the fibrous-flocculent white ring. Amanitas are distinguished by their white free or almost free gills. The gills of *Floccularia* species are attached. *Floccularia albolaripes* is rated as edible but not particularly good to eat and I know of one very severe case of GI distress from consuming this species.

Floccularia luteovirens f. luteovirens which is what some authors still call *Floccularia straminea* var. *americana* and which was formerly considered part of *Armillaria* is distinguished by a paler brighter yellow cap and a paler stipe. Like *Floccularia albolanaripes* this is a western species with a mild odor and taste.

Leucopholiota decorosa is an elegant eastern species that grows in clumps or clusters on rotting wood. The margin of the cap often remains incurved even at maturity instead of unfolding or even lifting up as most pileate gilled mushrooms do in age. There is no information available to me on taste or edibility of *Leucopholiota decorosa*.

This concludes Part I of the Light Spored Mushrooms.