

MushRumors

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A mushy tale by Christine Roberts

Yesterday, I decided to take a fairly strenuous hike up the Lily and Lizard lake trail which goes up the east side of Chuckanut Mountain. I got to Lily Lake and returned to descend, when I noticed a cute little cup fungus of the *Peziza* persuasion peeking at me from a mossy log. Unprepared to make a collection I photographed it with my phone. This was a first for me on this phone, but the pic looked OK, so I left the mushroom where it was as it would have turned to mush if I'd stashed it in my backpack squashed in with my waterproofs and sweater. After trying and completely failing to download my photo to my laptop, even after spending a couple of hours fiddling with the phone and *even reading the instruction manual*, I gave up, so sorry, no photo with this report!

This episode brought back memories of other impromptu collections; while walking to work one morning, I noticed some blewits in the field I was cutting through. I had an empty plastic container with me that day, so I filled it with blewits, consulted my watch—yikes better get to work PDQ! I jogged the last mile and got to work with milliseconds to spare, and checked my collection. Mush, purple mush with the occasional very dizzy grub in it!

Next time I came across a bonanza unprepared I gave things a moment's thought. Here was a field full of *Agaricus campestris*, no bag to put them in so off came my jacket and I filled the pockets, hood, and sleeves, then took off my sweater and tying it apron fashion I filled it with more lovely firm little 'shrooms. I was now rather cold but managed to get home without further hassles and after carefully checking through my finds, had a wonderful dinner with plenty of extra mushrooms to share with friends.



Spring Wishes. Linoleum block print by Martha Dyck

Mushrooming in the time of self-isolation by Mark Johnson

In accordance with the guidelines promoted by people who understand viral epidemics, we cancelled the meetings and forays that had been planned for April. Based upon computer models of the epidemic in our area, my guess is that our meetings and outings planned for May will have a similar fate. But, the majority of the Board discussed this via email, and decided to take it month by month, rather than acting too prematurely. Once any decisions are made by our Board, I will let all the members of the club know via email.

Hopefully, as spring blossoms forth, you and your fellow housemates who you are isolating with, if any, will be out and about. In addition to logging your finds on iNaturalist, I hope you will share any especially interesting, odd, or beautiful

ones with all of us via our group email. Who knows, perhaps Erin, our newsletter editor, will pick a suite of them to feature in our next newsletter! And getting into the woods and fields is good for our mental and physical health anyway, whether or not we find any fungi blooming.

Wishing everyone a safe and well future!

—Dr. Mark D. Johnson, NMA President

** At the time of this writing, be aware that many national forest campgrounds and day use areas, and state park campgrounds are closed. Bellingham parks and trails in the Chuckanuts are open for walkers. Just please keep a safe distance from others so we can end the contagion.*



A simple recipe for a complicated time

by Linda Magee and Tom Wilmore

Even with all the stress that COVID-19 is creating around the world, we should remember that spring is a time of hope and renewal.

This year we have had to give up many of the traditional activities that shout “Spring is here!” We have to spend more time with ourselves, be more reflective, and consider what has meaning in our lives.

We could rise up in a tearful rage or fall down in despair. But, NMA

What a find!

members understand the demands and rewards of Nature. And, Nature is demanding that we live a simpler life now. So we are offering a recipe for a simple, comforting soup. If you attended the Dilly Foray in November, you may have tasted this soup that we prepared from the boletes we found in October and dried.

This soup not only nourishes the body; it is a delicious reminder of what Nature is busily preparing for the fall.

Good health to you all.

MUSHROOM BARLEY SOUP

In a soup pot cook:

- 1 large onion, chopped
- 3/4 pound mushrooms, sliced**
- 1 stick (1/2 cup) butter
- 2 tsps thyme, or to taste, optional
- 2 tsps rubbed sage, or to taste, optional

Over moderate heat until the onion is softened. Add 2 tablespoons flour, cook the mixture, stirring for 3 minutes.

Stir in:

- 8 cups hot vegetable stock (we used a combination of mushroom and veg no-chicken broth)
- 1 cup medium barley
- Sage or other herbs to taste

Bring the liquid to a boil, stirring, and simmer the mixture, covered, for 45 minutes.

Stir in:

- 2 cups milk
 - 1 cup half-and-half
 - 1 to 2 cups peeled and chopped carrots, optional
- Bring the liquid to a boil, and cook the mixture at a bare simmer, covered, for 30 minutes. Add: white pepper to taste

Ladle the soup into heated bowls. *Serves 8.*

**If using dried mushrooms, soak them as normal and use the soaking water as part of the broth. Add mushrooms with the milk and carrots.



Ready, set, clean!



What potential!

Some spring and early summer fleshy fungi in the Pacific Northwest

by Richard Morrison

While fall is the biggest season for mushrooming in the Northwest, there are many interesting species that prefer the early season. Dr. Richard Morrison takes us through a photo gallery of a few of these beautiful macrofungi. All photos by Richard Morrison.



The Early Agrocybe, *Agrocybe praecox*, is often found fruiting in large groups on woodchips and mulch in urban settings. It is regarded as edible, but be sure of your identification.



Amanita aprica, known as Jan's Yellow Friend, is an attractive spring species in mixed conifer forests. Although appealing looking, it is not friendly, but toxic, causing unpleasant reactions like nausea, cramps, diarrhea, and possibly hallucinations.

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Amanita gemmata the Gemmed Amanita, fruits in late spring to early summer in forests as well as urban areas. It may be pretty to look at, but is toxic.

© Richard Morrison



Boletus rex-veris is the Spring King Bolete, a tasty, sought after spring porcini relative found at higher elevations under pine and fir in mountainous regions like the Cascades.

© Richard Morrison



The Snow Bank Orange Peel Fungus, *Caloscypha fulgens*, is a cheery colored cup fungus that fruits in early spring under conifers following snow melt. Claimed by some to have medicinal properties, it is not considered a safe edible.

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The Mica Cap, *Coprinellus micaceous*, is one of the “inky cap” mushrooms, whose gills and cap tissue deliquesce into a black inky goo as spores mature. It is frequently found in abundance on or near the base of rotting hardwood stumps. Often overlooked, it is edible and makes a tasty sauce or gravy.



© Richard Morrison

Pig's Ears, *Gyromitra ancilis*, is also known as *Discina perlata*. It fruits on wet soil and decaying wood in early spring. It is not a recommended edible.



© Richard Morrison

Gyromitra esculenta, the False Morel or Brain Mushroom, can vary quite a bit in coloration and form. It fruits in early spring in habitats from lowlands to the mountains. Regarded as edible, it likely contains potentially deadly volatile toxins which can be removed by parboiling followed by thorough cooking.



Gyromitra montana goes by names such as Snowbank False Morel, Walnut and Bull Nose. Edible and popular it should always be thoroughly cooked. Look for it in mountainous areas with conifers during or just after snowmelt.



Helvella maculata, the Fluted Brown Elfin Saddle, is found under conifers and in mixed woods from early spring into summer, but also in fall. Edibility is unknown, but it likely contains toxins.



The Golden Waxy Cap, *Hygrocybe flavescens*, fruits in woodsy areas in late winter to early spring, and is a welcome and colorful harbinger of the coming spring season. Although edible, it is tasteless.



© Richard Morrison

Inocybe praecox is a rather stout late winter to early spring mushroom found under conifers. Early *Inocybe* is the English translation of the scientific name. Like other *Inocybe* species it is most likely poisonous, containing muscarine and possibly other toxins.



© Richard Morrison

Lichenomphalia umbellifera is a small, delicate looking mushroom that fruits in cold weather in late winter into spring. Given the common name Lichen Agaric, it is a basidiomycete fungus symbiotic with a single celled green alga in the genus *Coccomyxa*. The two symbionts form the lichen which colonizes the surface of rotting conifer logs and stumps on which the mushroom fruit bodies are produced.



© Richard Morrison

Marasmius oreades is the renowned Fairy Ring Mushroom of grassy areas where it fruits in arcs, rings or clusters. The pliable caps are very tasty, with a nutty flavor when fried. Be certain the grassy spot where you find them has not had pesticides or fertilizers applied. Also, be aware there could be other ring forming look-alikes, so be sure of the identification.



© Richard Morrison

Morchella eximia is one of three Pacific Northwest burn site morel species that fruit in abundance in the spring a year or two following a forest fire. Avid mushroomers study their maps of forest fires from the prior year and are known to head in droves to vie for these tasty mushrooms.



© Richard Morrison

Morchella importuna is the Landscape Morel, an urban species found fruiting in newly laid wood chips and mulch in landscapes and gardens. When taking a neighborhood stroll remember to keep an eye out for these morels in newer mulch and wood chip patches. Your biggest challenge just might be how to harvest the prospective bounty without getting caught. You might try convincing the homeowner that the morels are noxious and must be removed ASAP.



© Richard Morrison

Morchella snyderi, or Snyder's Morel, is our woodland morel that fruits in conifer to mixed woods in mountainous areas, and sometimes in old burn sites. Found in groups or as scattered individuals they can be tough to spot in a darkened, sunlight dappled woods.



© Richard Morrison

Mycena laevigata can fruit in winter when temperatures are above freezing. The species name means smooth, or polished. This cluster was photographed on a downed Douglas fir tree in mid-January 2018 at Stimpson Family Reserve. This tree has produced a crop every January to February since 2016.



© Richard Morrison

Mycena nivicola is a snowbank mushroom that fruits in mountainous regions under conifers during snowmelt. Until recently, it was thought to be *Mycena griseoviridis*, but is now recognized as a distinct species. The species name *nivicola* means snow dwelling.



© Richard Morrison

Peziza varia belongs to a group of similar looking brown cup fungi that fruit on wood chips and lignin rich organic material. These specimens were found fruiting in mulch with a potted plant.



Pleurotus pulmonarius (left) has several common names, including Lung Oyster, Italian Oyster and Phoenix Mushroom. A very popular edible, it is most often found fruiting on dead and downed alder trees. The mushrooms can be produced in abundance as temperatures warm in April and May. *Pleurotus populinus* is an edible look-alike species that fruits on dead poplar.

© Richard Morrison



Cups of *Sarcoscypha coccinea* have a brilliant red fertile spore producing inner surface. This cup fungus is fittingly named the Scarlet Cup. It fruits in late winter to early spring on decaying hardwood sticks and branches on the ground, and can be difficult to spot when covered over with leafy debris. It is edible, and reportedly tasty.

© Richard Morrison



Verpa bohemica, the Early Morel or Thimble Morel, is a relative of true morels, but differs in having a skirt-like wrinkled cap attached only at the top of the stem. Fruiting is in early spring before the true morels. Look for it in damp, wooded habitats, especially under cottonwoods. It is a popular edible, but can cause stomach upsets in some people.

© Richard Morrison

That purple margined *Peziza* from Vermont

by Buck McAdoo

I can't even recall who found it. Either myself or my seven year-old grand nephew, Andre Brondino. The largest cup measured 7 cm across. I knew instantly I had never seen this in a popular mushroom guide. So I decided to have it sequenced. The result was startling. The only *Peziza* close to it was one *Peziza limnaea*, a European discomycete that looked nothing like it and had much larger, and more warty spores.

The two photos represent two different collections found on nearby logs on the same day. Microscopic analysis of both collections showed they were the same. This examination took place about six months after the ascophores had been dried in my dehydrator and filed away in my herbarium. The next question now was "Who would be interested in researching the species for possible sp. nov. status?" Here below is the combined description:

Ascophores: Cupulate with wavy and slightly inrolled margins. 5–7 cm wide and very fragile. Largest specimen with a hole in the center.

Interior hymenium: Smooth, olive-brown to ochre-brown with a violet to lilac band at the margin.

Exterior surface: Gray-brown to olive-brown with ochre-gray to rusty granules on the surface.

Stipe: A knob about 1 cm long and 1 ½ cm wide. White tomentum at the base, in one specimen tinged with pale violet.

Habitat: Found on rotten hardwood logs in the McCullough Woods outside of North Bennington, Vermont, on June 8, 2019.

The microscopic features included the tips of the asci turning blue in Melzer's solution, an indication of *Peziza* or maybe *Plectania*. The asci were roughly 14 microns wide. The spores were dark ochre in a water mount and fusoid in shape. They measured 10–11.2 x 5–6 microns. (The spores of *Peziza limnaea*, the closest relative, measure 15–20 x 8–10 microns.) The spore walls seemed to be smooth or very faintly roughened, an indication that they might be minimally warty in a scanning electron microscope. The paraphyses were filiform, simple septate, and not enlarged at the apices.

If all this didn't impress Karen Hansen, world expert on the Pezizaceae located in Sweden, what would? I marshaled all my forces and emailed the photos, the description, and the sequence in her direction. A month seemed to pass. This had been greeted by absolute silence. I then notified Dr. Mike Beug, our own Northwest ascomycete expert, and author of the superb guide, *Ascomycete Fungi of North America*. I heard back right away. The response was "Most *Peziza* questions go unanswered." He suggested I contact AscoFrance. Not about to happen. I speak and write French but I know in advance I will get all entangled in navigation problems that will end in a new password that won't be accepted. The far better



Photos by Buck McAdoo

move would be to send my findings to Dr. Hans Otto Baral in Germany. If you pronounce 'Hans Otto' very quickly, you hear the word 'zotto', and this is what Dr. Baral prefers to be called. This expert has helped us before. He once identified *Hymenoscyphus peruni* for us, a possible first record for N. America. He would be even more entranced than Karen Hansen at the sight of this new *Peziza*.

Before proceeding further with this article, it might help a beginner to know that a *Peziza* belongs to a group called the ascomycetes. The spores form within asci which look like long tubes with a hinged lid on one end. When the spores are mature and conditions are just right, the lid blows open and the spores are discharged. These are called *operculates*. If the asci have no lids, they are called *inoperculates*. These asci are interspersed with slender rods called paraphyses. Maybe they are there to help aerate the spaces between the asci. But that is all there is to look at in the hymenium, a.k.a. the fertile surface. Just three things... the spores, the paraphyses, and the asci. It would be a vacation compared to examining a basidiomycete with all their different kinds of cystidia, the layers of the pileipellis, the gill trama, etc. So, why, I wondered, do *Peziza* questions go unanswered?

Somewhat to my surprise, Zotto replied. He emailed back that he hardly looked at opercules anymore. And without micro photos it would be impossible for him to proceed. In the meantime, things I should look out for were the contents within the paraphyses and the oil drops in the spores. To view these correctly I would need to mount bits of the hymenium in water.

I was so happy! This I could do. I proceeded to place a tiny shaving of the inner surface of the cup onto a slide. Water was duly found. The first thing I noticed were the asci. Millions of them, but all apparently empty. After over an



hour I found two spores stuck in one end of an ascus. These would be immature spores. You want to measure the mature spores that are found outside the asci. At least I now knew what the spores were supposed to look like. So I moved to another fruiting body and eventually found the same shaped spores outside the asci. Four of them in all. These were subsequently photographed. I then hunted for paraphyses, eventually selecting the ones with dark refractive contents for the photo. The apices looked like they had been sprinkled with black pepper. And now it was back to Zotto again.

He kindly emailed me back. "Well, these are dead paraphyses and it is normal that dead plasma appears granular. Living paraphyses look quite different. If you meet the fungus again, please take the chance for vital studies. I assume you know my paper in *Mycotaxon* from 1992."

Well, to tell the truth, I did not know that paper. But I was staggered by the whole situation. How could Zotto not want to launch this new species just because an amateur made a dumb mistake and photographed the wrong paraphyses? Then I came to my senses. How could this collection ever represent a sp. nov. when only six spores could be found over two days? The type might even be devoid of spores!

But what the heck... I might as well learn the difference between a dead and an alive paraphysis so I headed up to the WWU library to check out Zotto's paper. It turned out to be a fifty-page article entitled *Vital Verse Herbarium Taxonomy: Morphological Differences Between Living and Dead Cells of Ascomycetes and Their Taxonomic Implications*. As I began perusing this work I became aware that I was entering a province of such meticulous detail that I wondered if even a seasoned mycologist could follow it. For instance there were the empty paraphyses, but also ones with refractive content reflecting different kinds and sizes of oil drops. On one page there was an exquisite digicam of these paraphyses running the length of the page. I was stunned by the beauty. The different patterns of oil drops and vacuolar bodies would make fascinating designs for a belt or a tie, or even wall paper. There was even one with a sort of honeycomb pattern which might represent carotenoids and thus be important in

discerning one *Peziza* from another. Zotto can look at these and gauge what growth stage the *Peziza* is in.

Some of his observations on paraphyses follow here: Living paraphyses are those that appear to be empty. Dead paraphyses are those with granular contents in their apices. These are best seen in water mounts under bright field optics. The granular contents consist of vacuolar bodies. There are two kinds; multiguttulate and elongate. During development the multiguttulate ones can increase in size. The oil drops within living paraphyses are important diagnostic features. There are also at times colored granules that are called carotenoids. These can affect the color of the ascophore, for example the orange in *Aleuria aurantia*. Zotto also cautions that paraphyses revived from dried herbarium material could have shrunk as much as 25% from their original sizes.

And now for the asci. Zotto noted that living asci are usually longer than the paraphyses, but upon drying, they become shorter. Shrinkage of asci after spore discharge can run up to 50%. Indications of dead asci are thicker walls that have been imbibed by water and become swollen. Also, clusters of spores at the bases of the asci. Dead asci also show more variation in their apical contents. Living asci should always be measured in water in their fresh state. The living ones have globose guttules arranged at their tops. Another way to test for living asci is to add KOH, Melzer's, or lactic acid to a water mount. The asci will immediately begin to shrink. If there's no shrinkage, they are already dead.

Asci also go through stages of development. The mature ones demonstrate strongly dehydrated cytoplasm and often one huge vacuole filled with transparent water. In some species, in a premature phase of ascus development, the spores will produce asco conidia, which will then be discharged in aggregations of 4–8 balls. If you don't actually find spores, you might mistake these for spores.

And then there are the real spores. One would suppose this to be a simple task. Find a mature spore outside an ascus and measure it. But spores go through four growth stages; the immature phase, the mature phase, the first germination phase, and the second germination phase. The immature phase is obvious. Those are the ones still in the asci. But when you measure the ones outside the asci, you need to know which phase you are measuring. A spore might reach phase one of germination only a few hours after it has been discharged. Drying an ascophore in a dehydrator induces immediate discharge of spores. The first phase of germination may lead to the protrusion of a germ tube or a pale brown wall pigmentation. Spores in phase one or phase two of germination should be measured separately. The number of septa in a spore, the type of ornamentation, the wall pigmentation, the type and number of oil drops are all clues to what phase you are observing. Some mycologists prefer reviving dead material in KOH just to avoid this phase quandary. This is not good, according to Zotto. Spores that have been killed by the use of cotton blue, Melzer's solution, KOH, or lactic acid, should never be measured. Spores also

die from dehydration or from heating. Revived spores from old herbarium material never attain the size of fresh, living spores. You also need fresh, living spores, to assess the type of guttulation. This helps determine what phase you are seeing.

According to Zotto, vital taxonomy means you must be ready for study whenever a species is collected. Ascomycetes can be stored in the fridge at about 5–10 degrees centigrade for several days or even weeks without damage. So I emailed him again to discover what steps we should take if we encountered this showy *Peziza* again. The response was not exactly what I expected. I was advised to lift with a needle a tiny piece of the hymenial surface to study in water. I was warned that there was no way to define the bases of paraphyses, so I would have to measure the lengths of terminal cells and lower cells separately. He also included photos and diagrams of living and dead hymenial elements for me to compare. There was a photo of living and dead

cells within the same hair apex. The contents of the dead spores, asci, and paraphyses all looked like they had been sprinkled with black pepper. The living ones had much larger guttules. But just for fun he included a photo of the spores of *Ascocoryne cylichnium*. Here it was just the opposite case. The living spores seemed sprinkled with pepper, while the dead ones were smooth between partitions of septa. Insider knowledge was obviously of some importance here.

To the burning question of what was the best way to mail him material of this *Peziza* overseas, his response was, “No, please study yourself. Earlier I received every day fresh samples from various collectors. Finally I had to stop this. Since then I get photographs every day, sometimes more than half a dozen each day.”

In pure baseball terms it could be said that Dr. Zotto has knocked the ball out of the park. The question now is whether the ball can even return to the park.

One interesting *Tubaria*

Yet another Jack Waytz find, this one from the parking lot at the trailhead to Galbraith Mountain on March 14, 2017. Thinking this was an especially large and showy *Galerina*, we wanted to make it a mushroom of the month. This parking lot is on the western edge of Sudden Valley. The species was all over the place on wood chip mulch.

When the spores didn't fit *Galerina* or *Cortinarius*, we sent samples to Dr. Brandon Matheny at the University of Tennessee. He most likely had it sequenced. The result? It's a *Tubaria* in the *T. confragosa* group. *T. confragosa* itself has a ring on its stem. Most others in this group have some sort of velar material. This one doesn't appear to, which makes it something of an anomaly in the group.

Here's a brief description for those who follow the little orange-brown mushrooms:

Caps: 1 ½–3 ½ cm wide, campanulate becoming convex to plane with wavy, irregular margins. Discs shallowly depressed in age, margins striate halfway to disc, becoming grooved in age. Smooth, lubricous, tawny-ochre fading hygrophanously to pale cardboard color when dried. Context thin, tawny ochre.

Gills: Adnate to almost short decurrent, pale rusty-ochre at first, then rusty in age. Subdistant, thickish, edges entire. Four tiers of lamellulae. Dried gills are a dark purple-brown.

Startling, to say the least.

Stipe: 1 ½–3 cm long and 3–4 mm thick. Smooth, hollow, pale rusty with faint pruina at apex. Equal, often curved. Some white tomentum at base.

Odor and taste: Mild.



Photo by Buck McAdoo

Spores: Pale rusty. Ellipsoid, smooth, no germ pore. 7.6–9.2 x 4.5–5.8 microns.

Cheilocystidia: Irregularly cylindrical to rarely capitate. One measured at 69 x 9 microns.

Pleurocystidia: None seen.

Gill trama: Of subparallel hyphae, often with rounded ends. Up to 15 microns wide.

Pileipellis: A cutis of sinuously parallel hyphae 4-5 hypha deep. Subpellis and context densely interwoven.

Clamps: Present.

Comment: Species we can't put a name to are not candidates for “mushrooms of the month.”

However, that doesn't make them any less interesting; thus the presentation here. —**Buck McAdoo**



Mushroom of the Month

Ganoderma lucidum (Curtis) Karsten by Buck McAdoo

Photo by Buck McAdoo

It was circa mid October, 2019 when I got the call. I happened to be in the downtown Bellingham Public Library. The caller was Jack Waytz, and he was only a few blocks away. He had something to show me. We soon met up and walked a couple blocks down Grand Street. There was this non-native oak on the sidewalk about forty feet north of Henderson's Books. At the base of this oak was a polypore in various shades of oxidation red. Parts of the cap looked shellacked and parts did not. Waytz had done it again. I could be looking at a week's work with microscope and keys.

It turned out to be a slam dunk. One look at the spores with double walls, cross partitions between the walls, and truncated ends of the spores got me into *Ganoderma*. The partially shellacked surface of the caps and the association with a hardwood led me right to *Ganoderma lucidum*.

Jack had found the "Mushroom of Immortality." As Li Shih Chen, a famous 16th century Chinese physician once remarked, "taken over a long period of time, agility of the body will not cease and the years are lengthened to those of the Immortal Fairies."

"Immortal Fairy" might not have been what Jack had in mind, but it was a decent sort of start. Paul Stamets reported that from around 206 B.C. to 220 A.D. the imperial palace of Kan-ch'uan was being built. Ling Chih (or Ling Zhi), the Chinese name for this *Ganoderma*, was found fruiting on timbers of the inner palace, presumably the most sacred part

of that palace. So striking was this omen that the fungus reached a level of near reverence. It became associated with royalty, longevity, sexual prowess, health and recuperation, wisdom, and happiness. Jack did seem happy to have found it.

Stamets went on to note that a Chinese belief was born that if a specifically made tincture of this mushroom was laid upon the chest, it could bring the dead back to life. I mean . . . how much further can you go? It does seem auspicious that this particular polypore appeared just a few months prior to our coronavirus outbreak.

Jack had found the "Mushroom of Immortality" and his find may well be the second report from Washington state.

Jack's find may well be the second report from Washington state. Dr. Mike Beug found the first one in Washington just north of the Columbia Gorge. (Before making either of these claims, though, one should check in with Brian Luther, our northwest polypore expert.) Although exceedingly rare in the Pacific Northwest, *Ganoderma lucidum* is well known from the east coast and southwest, and actually common in the Gulf states. It prefers warm, humid conditions. Besides the U.S. and Canada, it is found in the Philippines, Australia, Asia, Siberia, North Africa, India, Argentina, Europe, and the Valle de Cauca in Colombia.

Ganoderma means “shiny skin” in Greek. Lucidum means “luminous” in Latin. It seems a bit strenuous to be calling it “the luminous shiny skin,” so besides being known as Ling Zhi in China and Reishi in Japan, David Arora calls it “the varnished conk.” The calligraphy for Ling Zhi is composed of three characters that together mean shaman, praying for, and rain. Dried fruiting bodies are hung from doorways as a talisman to protect the household from evil.

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Caps of *Ganoderma lucidum* have been measured as 4–35 cm wide and up to 3 cm thick. The carpophore first appears as a white knot-like structure. At this stage, according to Pacioni & Lincoff, the flesh is soft and flavorful. It becomes bitter and inedible as the lacquered crust on the pileipellis forms. The caps soon pick up this lacquered look, yellowish at first, then blood-red before becoming more of a dark chestnut color in age. This varnished look can be tempered by a powdery layer of brownish spores, brought there by wind currents. According to Worthington G. Smith, this varnished appearance is due to the presence of resin. The oldest specimens lose this lacquered aspect, which makes identification a bit more dicey. Perhaps to counter this possibility, Woehrel & Light note that KOH stains all parts of the fruiting body black. This helps separate it from other Ganodermas. Caps have generally been described as flabelliform, applanate, reniform, fan shaped, semi-orbicular, or sessile. The margins usually, but not always, form an irregularly wavy whitish band. The caps are concentrically furrowed as they grow in spurts. The whitish margin grows right along with it up until a certain point. Aged specimens always seem to be a concolorous red. Jakob Schlittler notes that young caps are supple while old ones are hard and brittle.

The pore surface is whitish at first, then a cream color before it dries eventually to a tobacco brown. The pores themselves are rounded to angular and about 4–7 per mm. The young pore surface darkens when touched. At this stage one can draw on it, similar to the Artist Conk. The tubes are ochre and measure up to 2 cm long. According to Marchand, they become rusty brown in age. The cap context is white, turning purple-brown in age.

The stipe is another matter altogether. Often it is not there at all, like *Ganoderma applanatum*. It can be central but more likely to be laterally eccentric measuring up to 25 cm long and 1–4 cm thick. They are as highly lacquered as the caps, a bright reddish-chestnut color darkening towards purple-brown below, and then blackish at the base. They are gnarly and sculpturesque, irregularly lumpy all the way down. Miron Hard likened them to barnacles on a stick. He further noticed a “distinct root extending into the ground several inches.” No one else seems to comment on this. Woehrel & Light noted that when found in clusters, both stipitate and non-stipitate forms can be observed in the same cluster. The correct term for all this variation is simply *polymorphic*.

Ganoderma lucidum is an annual species, very light weight

in age, and hardy enough to over-winter, which might make it seem perennial. In Japan, it has historically only been found with wild plum, and so rarely that it was known as the “phantom mushroom.”

Besides plum, it is saprophytic on oak, chestnut, hornbeam, willow, beech, birch, maple, ash, alder, elm, and poplar. In southeast Asia it is found on palm oil trunks. It very rarely appears on conifers, and in Britain is suspected of being also parasitic. It can be solitary or found in overlapping clusters at the bases of stumps, on buried roots, or at the ends of rotten logs. It produces a white rot of the wood. Yerich & Marrone noted that “repeated mowing and foot traffic causes the mushroom to develop multiple overlapping lobes that are lumpy and misshapen, often with grass and other vegetation growing between them. It looks like someone dropped a pizza on the grass and left it to mold.”

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Besides being found with the above tree associations, *G. lucidum* has been found on lakeside pile dwellings in Italy and Switzerland, and preserved in peat bogs in the fens of eastern counties in England.

Microscopically, the authorities seem to be divided about 50-50 on whether the hyphae are dimitic or trimitic. Domanski, Orlos, and Skirgiello hold out for trimitic. They discovered thin walled generative hyphae with clamps, tortuous and branched binding hyphae 2–3 microns wide, and pallid thick walled skeletal hyphae 6–8 microns wide. Also noted were incredibly short clavate basidia at 10–14 x 9–12 microns. The pileipellis consists of cylindrical to clavate cells in a hymenoderm pallisade. The spore deposit is rusty. As mentioned before, the truncate spores, which measure 7–13 x 6–8 microns, have two walls. The inner wall is smooth, the outer wall warty. Both walls are cyanophyllous. Marchand noted that most of the time the spores are imbued with one oil drop.

Because of its many shapes and colors, the mushroom of immortality has had its taxonomic adventures. It was first introduced as *Boletus lucidus* by Curtis in 1781. Karsten moved it to *Ganoderma* in 1881. It briefly became *Fomes lucidus* in 1888. Karsten must have corrected this by pointing out that he had erected *Ganoderma* to encompass woody forms of *Fomes* with a resinous, laccate crust and brown truncate spores. Thirteen synonyms have been reported from Europe alone. I visited *Index Fungorum* and counted 53 synonyms before the page ran out of space at the bottom. (Only a computer guru could have found page two.)

As for look-alikes and close relatives, here they are in no particular order: *Fistulina hepatica*, the beefsteak fungus, shares the reddish cap surface but has a much softer texture that is matte rather than lacquered, and lacks the

concentrically furrowed zones. Another mentioned look-alike is *Ischnoderma resinosum*. This differs by exuding amber colored droplets when young. Among Ganodermas, *Ganoderma tsugae* differs by its white cap context and habit of only fruiting with conifers. *Ganoderma curtisii* is considered by some to be a rare yellow form of *G. lucidum* often found with maple on the shores of the Great Lakes. Woehrel & Light beg to differ. They consider it an independent species due to a cap surface negative with KOH, consistently paler yellow cap colors, and different bands of color within the cap context. The European *Ganoderma carnosum* has a more somber brownish chestnut colored cap and fruits on yew and fir. *Ganoderma valesiacum* has a whiter context and only fruits on larch. *Ganoderma meredithae* is associated with pines, and finally *Ganoderma resinaceum* differs by never having a pipe-like stem and having a less warty outer spore wall.

The reishi mushroom was considered expensive until it was able to be cultivated. The cultivation was pioneered by Shigecki Mori of Japan. He spent 15 years developing a culturing method by using old plum sawdust. The process originally took up two years from start to finish, and yielded the much sought after red reishi. In *Edible and Poisonous Mushrooms of the World* by Cole, Buchanan, Hall, Stephenson, and Yun, one can view a photo of Ling Chih being grown in China. They are fruiting from bags of plum sawdust covered with soil. Above them are suspended plastic sheets to capture the most valuable spores. The cultivation process is sensitive. The smallest change in the growing environment can produce a radically different form. It can even produce a form like antlers. This is achieved by introducing a climate high in carbon dioxide. Antlers are considered the most valued form and are traditionally given to men by women in Asia as an expression of sexual interest. While nothing like this has ever arrived in my cockpit, it looks like antlers have been successfully grown in Alberta. Helene Schalkwijk-Barendsen notes that they must be grown in the dark. The final product had an aromatic odor, and two layers of tubes were discovered when sectioned.

So why aren't we all growing the reishi as retirement projects?

Bill Roody wrote that *G. lucidum* can be grown on logs and stumps. It has now become big business. According to Robert Rogers, reishi is now grown in fifteen countries with an annual production of 15,000 tons. Peter Roberts and Shelley Evans affirm that this industry is now worth 2.5 billion dollars a year.

So why aren't we all growing antlers as retirement projects? The health and food benefits are astounding. You can even save money on pork. In Viet Nam and parts of China pigs are fed reishi in order to stupefy them. In this state they are easier to steal.

In *The Mysterious Reishi Mushroom* by Kosai Matsumoto in 1979, six kinds of reishi are explored according to color.

The most potent is the red reishi. It has a bitter taste, aids the internal organs, improves memory, and enhances vitality. The blue reishi has a sour taste, calms nerves and improves eyesight and liver function. The white reishi has a hot taste, improves lung function, and gives courage and strong will. The yellow reishi has a sweet taste, calms the spirit and strengthens the spleen. The black reishi has a salty taste and protects kidneys. The purple reishi has a sweet taste and enhances complexion. It also helps the ears, joints, and muscles.

In the classic *Icons of Medicinal Fungi from China* it mentions that Ling Chih can now be obtained as a syrup, an injection, a tincture, and a tablet. The mycelia from submerged culture is made into a syrup by adding the mycelia to the culture fluid. It has varying curative effects on dizziness, high serum cholesterol, chronic hepatitis, insomnia, neurasthenia, pyelonephritis, hypertension, coronary heart disease, rhinitis, chronic bronchitis, bronchial asthma, gastropathy, leucocytopenia, and duodenal ulcer. In *The Fungal Pharmacy*, Robert Rogers has six pages devoted to reishi trials on patients with different ailments. The vast majority of patients recorded significant improvement. Here is just one example: "A human clinical trial of 143 cancer patients was conducted by Yinhuai Gao et al. in 2004. In this randomized placebo controlled study 26.6 % of the patients had stable disease for 12 weeks or more when treated with the reishi extract." Another paragraph reads: Yong-Tae Jeong et al. (2008) found reishi reduced formation of tumors by 40% and increased natural killer cell activity of splenocytes by 52%.

Christopher Hobbs, author of *Medicinal Mushrooms*, adds that *G. lucidum* has benefits for anorexia, diabetes, maldeveloped brain, retinal pigmentary degeneration, muscular dystrophy, liver pain, atrophic nyotonus, and osteogenic hyperplasia. Besides diabetes, it alleviates Alzheimer's and hyperlipidemia. It relieves high altitude sickness by oxygenating the blood. When I read that it was used to treat arrhythmia (irregular heartbeat), I paid attention. This is what I have going right now. Wouldn't it be appropriate to use the specimens from Grand Street to get my heart back in step?

I decide to email Dr. Mike Beug for advice. Since retiring from teaching botany at Evergreen State College, Mike has been into fungal toxicology for years. He would be up on this stuff. Here goes the response: "I would worry about the mushroom picking up toxins (from passing cars) and so would not advise it."

My other question was whether Ganoderma lucidum could be effective against the coronavirus.

My other question was whether *Ganoderma lucidum* could be effective against the coronavirus. This response is also worth reporting. "Paul Stamets has seen anti-viral activity in

several species of mushrooms in test tube trials. However, last winter, Anne [Mike's wife] and I both got viral pneumonia even though we take medicinal mushrooms daily. Also depending on the mode of action of the virus, medicinal mushrooms could make matters worse. I remember years ago at a medicinal mushroom conference, Dr. Andrew Weil told me that 'boosting the immune system would have made the 1918 Spanish Flu epidemic worse by triggering a cytokine storm in users.'"

(So on behalf of our club I'd like to thank Mike for permission to use this statement here.)

And finally for those of you who pay close attention to

the chemical constituents of medicinal fungi, here are a few mentioned by Hobbs: The fruiting body of Ling Chih contains acid protease, ergosterol, and fungal lysozyme. The mycelia contains lactones, sterols, alkaloids, polysaccharides, and some 100 different triterpenes. The spores contain betaine, choline, stearic acid, tetracosane, ergosterol, behenic acid, tetracosinoic acid, palmitic acid, ergosta-7, nonadecanoic acid, hentriacontane, and B-sitosterol.

Small wonder the Chinese were capturing spores in plastic sheets high above the growing specimens. Only the highest flying spores would tend to have all these intriguing contents.

—Buck McAdoo

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Hats off to Brennan



Cooper and Brennan

Some five months ago Brennan Brown quietly resigned as president of our Northwest Mushroomers Association. We would like to say thank you, Brennan, for four good years at the helm. Brennan presided over our Board at a

time during which our club increased greatly in numbers and knowledge. He came out of the blue when we needed him, a guy from the next generation whom we may have only seen at the downtown Food Co-op, to offer his services. As a single dad with plenty on his plate already, this was exemplary. When a potential new foray site opened up near Custer, he went there to check it out. He cared. He even worried that an overweight goat might get eaten by the local bear.

Brennan was absolutely supportive and consistently focused on improving the club for the benefit of its members. He also successfully strengthened NMA's relationship with the Bellingham community through a particularly challenging time in the club's history. And it was a great experience having the opportunity to work with someone with a fresh generational perspective. This club owes Brennan a debt of gratitude for his efforts toward excellence in our behalf. We appreciated his candor, his enthusiasm, and his steadfast loyalty to our club, and we hope to see him around for years to come.

—Jack Waytz and Buck McAdoo



**Northwest
Mushroomers
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The **Northwest Mushroomers Association** promotes the understanding and appreciation of mushrooms: furthering the study of fungi, their identification, natural history, ecology and conservation. We serve mushroom enthusiasts in northwest Washington State, including Whatcom, Skagit, and Island counties.

To comply with physical distancing during the Covid-19 outbreak, NMA has put its membership meetings and talks on hold for the time being. When to resume meetings and forays will be reevaluated by our Board on a monthly basis. To stay apprised of forays, events, meetings, and more, please join our googlegroups email list automatically by joining up as a member. Or visit northwestmushroomers.org/events.

MushRumors is published online approximately quarterly at northwestmushroomers.org. Club members are encouraged to submit stories, photos, recipes, and artwork. We appreciate your interest! Send your ideas, words, and art to [chanterellerin \(a\) gmail.com](mailto:chanterellerin(a)gmail.com).



Photo by Buck McAdoo