



Symbiosis[©]

The newsletter of the Prairie States Mushroom Club

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Summer

<http://iowamushroom.org>

Looking Forward

by PSMC President Glen Schwartz

What a difference a year makes. The last few years have been hot and dry during the summer, while this year has been the opposite. Go out to just about any woods to see an abundance of mushrooms. Also, we are seeing late-summer fungi fruit in late spring. Not unheard of, but still unusual. We have fewer scheduled forays this year compared to other years, but we have been trying to make up this deficiency by having more short-notice forays.

Once again we find ourselves looking for a newsletter editor. Gabby is moving to Chicago, but he has agreed to continue as newsletter editor until we can find a replacement. So, once again, we are putting out the call to any member that would like to contribute to the wellbeing of the club. We need you to step up and help out by accepting the position of newsletter editor. The club officers and former newsletter editors will help you get started. Note that this position will make you a club officer.

Our annual meeting and potluck lunch is tentatively set up for Grimes Farm in Marshalltown on October 18th. As normal, we will foray from 10:00 am until noon, followed by the lunch and the meeting. See the foray page of the website for more details: <http://www.iowamushroom.org/forays.php>

We can always use more photos for our SmugMug photo-hosting site. <http://iowamushroom.smugmug.com/> This is a club website for our mushroom pictures. If you have some photos you would like to add, just send them to our email, iowamushroom@gmail.com and we will get them on the SmugMug site. If you have many pictures to upload, we can give you the password so you can upload them yourself.

See you in the woods,
Glen



Cultivating morels?

by Todd Mills

Someone could make a million dollars if they learned how to grow morels... If I had a nickel for every time I heard this, I may not become a millionaire, but I would sure have a lot of nickels.

With the prices that morels have been fetching these days, it is only natural for one to think about growing these delicacies themselves. While morels can and are cultivated indoors, the process that is patented here in the United States is both cumbersome and results in mushrooms that don't taste quite like the wild ones. With a gritty texture and lack of flavor, the miniature morels purchased from indoor cultivators leave a little hole that just isn't filled.

But what about those grow kits for outdoor morel patches that are popping up in magazines and all over the internet? Well, I am here to say, that they DO indeed work; but, proceed with caution. Typically you find kits that are from a location like Washington State or Indiana. While these kits will most likely produce an abundance of mushrooms in those locales, it may not be the best strain of morel for your area. While there are a few different species of morels (*Morchella esculenta*, the yellow morel, is the most widely known), there are millions of different strains within every species. A strain is produced when two spores mate and create a culture capable of producing mushrooms. Just like plants, mushrooms adapt to their environment. Different strains within a species may perform better in one environment than another. That morel kit you put in three years ago may not be fruiting because the conditions just aren't right, and may never be right for that particular strain of morel.

While there is never a guarantee with growing morels outdoors, there are a few things you can do to improve your chances. The first method (and most difficult) is to actually clone a strain of morel from your area or create a spore print and expand a culture out yourself. There is no better way to

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Cultivating morels?

(cont. from cover)

ensure success than to take matters into your own hands. The startup costs for this are pretty substantial on a large scale, but on a smaller scale, it could easily be performed by a backyard hobbyist. Also, you may be able to find a local mushroom grower in your area who has already taken care of producing a strain native to your locale. You could then purchase spawn and install an outdoor bed similar to the type you see advertised, except specifically adapted to growing in your area. If you were able to get a strain native to your own backyard, in the hands of a local grower and have them clone it (to produce spawn for you), that would be even better!!

But for those of you that want to keep it low-tech and not so involved, there are other methods for spreading morels far and wide. One of the most common is to use a mesh sack while hunting, instead of a basket or plastic sack. The mesh allows the gills of the mushrooms that are traveling on their journey to your kitchen to have a chance to fall out and spread throughout the woods. Another method is, after soaking your mushrooms, dispose of the water they soaked in in an area where you know they are likely to grow. You are essentially spreading the spores of the mushrooms around and giving them a little drink while you're at it. You can even take this method a step further and really bump up to a massive spore bomb: for widespread dispersal, soak your mushrooms overnight in water (no salt). Take the

water and dump it into a backpack sprayer and fill it the rest of the way up with water. The water you used to soak the mushrooms is full of millions of spores, and you only need two of them to mate in order to get some mushrooms. Walk through your spots where you know you have found morel mushrooms before and spray away, focusing on spots under bushes and areas you would like to grow if you were a mushroom. Then you sit back while Mother Nature gets to work!

In the meantime, while you are waiting for your millions to come flowing in, try to get your hands on some oyster mushrooms (*Pleurotus ostreatus*). They are the most similar in flavor to a morel, don't cost nearly as much when you can find them at the farmers markets, are extremely healthy (studies have shown they possess compounds that specifically target colon and breast cancer cells), and can be easily found all over the United States. If you fry up an oyster mushroom in a little egg and cracker, you might just fool your family into thinking it was a morel!

Todd Mills is a Louisa County mushroom cultivator. He owns and operates Mushroom Mills, which supplies edible mushrooms to grocery stores and restaurants in Southeastern Iowa. Contact him at millsmushrooms@gmail.com, by phone at (319)-473-0209, or find him weekly at farmers markets in Iowa City and Cedar Rapids. 

The Precious Gold Trapped in E-Waste Can Be Filtered by Fungi

by Ben Richmond

This article originally appeared on Motherboard.vice.com

In 100,000 cell phones, it's estimated that there is 2.4 kilograms of gold, more than 900 kilograms of copper, 25 kilograms of silver, and more. Depending on the market prices, that's about \$250,000 dollars worth of metals, spread in small amounts across 100,000 high-disposable devices. To more easily recover those rare, expensive, or potentially harmful materials from cell phones and other forms of e-waste, researchers are looking for help from nature's own decomposition specialists: fungi.

The VTT Technical Research Centre of Finland has developed a biological filter made of mushroom mycelium mats that could recover as much as 80 percent of the gold in electronic scrap. Gold adhered to the biosorbents, such as fungal and algae biomass, far better than when just chemical preparations were used, which typically recover 10 to 20 percent of the gold.

Recycling electronics is a difficult process. Ruediger Kuehr, the executive secretary of the Solving the E-Waste Problem Initiative, told Motherboard's Stephen Leahy that each mobile phone is "made up of 40 to 60 different elements," all of which require processing.

And for a myriad of reasons, you don't want those elements to reenter the ecosystem. Some of the elements are heavy metals that could be harmful if they seep into the groundwater; some are environmentally taxing to mine and collect. And some, like copper, silver, and gold, are rare and valuable. In addition to the environmental concerns, recycling phones could keep the price of future electronics down.

As part of the Associated European Research and Technology Organizations' "Value from Waste" project, the team from VTT engineered biological filters that were aimed at recovering gold in a less environmentally hazardous way than the current methods of smashing, separating, and smelting. Much like how one makes an omelet, though, the first step was still to break all the phones.

"Because it is difficult to remove the components from the circuit boards, the first step in most recycling processes is to crush everything into particulates and that's how we start too," Jarno Mäkinen, Research Scientist at VTT Technical Research Centre, told EE Times Europe.

"But then, using non-toxic water-based solutions, we have managed to engineer mycelium-based biomass that acts as a biosorbent specifically targeted at gold complexes," Mäkinen said. The researchers didn't want to go into too much detail on biomass engineering, which relied on organic chemistry and ionic liquids to dissolve the gold particulates and form new complexes, but they did explain that they envision one day creating particular layers designed for recovering particular elements.

The VTT team isn't the only one tapping nature's own recyclers. A team of Indian and South Korean researchers researched using biomaterials to filter lead out of wastewater from an e-waste recycling facility.

E-waste is a growing problem, increasing at a rate of 3 to 5 percent a year, which is three times faster than any other solid waste stream. Stemming the tide of electronics flowing into dumps is important, but thus far even e-waste recycling processes are energy intensive and ecologically questionable. But fungi have been in the waste disposal game for a long time. It seems only natural that eventually we'd take a cue from them. 

The early squirrel gets the mushroom

Roger Heidt spotted this guy munching on a Xerula cap from his yard.



Deadlier than Amanitas

by Mike Krebill

What mushroom causes more poisonings in North America than all of the amanitas combined? This ghoulish deceiver grows in arcs, troops, or fairy rings of dark-green grass and beckons the gullible from its home in cemeteries – “*Come join me!*” Fortunately, death is not a given. Nausea, vomiting, and diarrhea are, however, and serious cases may wind up in the hospital... or the cemetery.

This sinister mushroom is *Chlorophyllum molybdites*, and it is of special concern as it frequents not only cemeteries, but also lawns and playgrounds, tempting those not knowledgeable enough about mushroom characteristics to make the mistake of eating it. In years of adequate rainfall (or in well-watered lawns), it can be plentiful from summer to fall. Once known as *Lepiota morgani*, or the Green-Spored Lepiota, this mushroom is fairly widespread in North America, but less common on the West Coast.

Unfortunately, it shares many of the characteristics of a good edible, the Shaggy Parasol Mushroom (*Chlorophyllum rhacodes*). Indeed, a person finding photos of the Shaggy Parasol on the Internet might assume incorrectly that they have found it when they have found the poisonous mushroom that looks similar at a glance. Both have white caps that can range up to the size of a dinner plate. On both mushrooms, the caps have light-brown patches on the surface. Both possess a double-edged ring around a whitish stalk. Look under their caps and you will see that their gills are not attached to the stalk but clearly stop short of the stalk.

However, distinctions begin to emerge: the close white gills of the poisonous one become a gray greenish-brown as the mushroom matures, and the spore color is the grayish-green

color of the penicillium mold that grows on oranges. The white gills of the edible one become brownish with age, but it always has white spores. To check for grayish-green spores in the field, look for overlapping caps and lift the one on top to see the fallout on the surface of the cap below. You may have to check several overlapping caps to find it, as the spores only drop when conditions are right.

The grass around *Chlorophyllum molybdites* becomes darker green and luxuriant as the mushroom’s mycelium breaks down organic matter in the soil and its acidic enzymes work to make minerals available. This release – particularly of nitrogen, phosphorus, and potassium – has the same effect on grass as fertilizer. That’s how the dark-green arcs are formed. “Troops” occur where there happens to be quite a few mushrooms growing in a dark green patch, but the patch has no discernible shape. Where conditions are right, the mushrooms will grow outward from a center point, forming an ever-expanding circle of luxuriant, dark green grass. Such circles are known as fairy rings, and the largest circles are the oldest. Typically, the mushrooms forming them are found near the outside edge of the bright-green grass. Several species of mushrooms other than *Chlorophyllum molybdites* are known to form fairy rings, including the tasty Scotch Bonnet (*Marasmius oreades*) and the poisonous *Clitocybe dealbata*.

From July 8–10 this summer, Legacy Learning of Boone River Valley invited me to do a workshop on wild edibles of the Midwest. Caravanning to a prime place to pick mulberries, we passed Graceland Cemetery in Webster City, Iowa, which had an abundance of fairy rings and troops with dark green grass and hundreds of these poisonous mushrooms. Later, I returned to take these photos. 🍄



The leading edge of a giant fairy ring of *Chlorophyllum molybdites* mushrooms advances to the right in Webster City’s Graceland Cemetery.



My iPhone used for scale to show the dinner-plate size of the larger *Chlorophyllum molybdites* cap.



Once white, the gills turn a gray-greenish brown as the specimen matures. The overturned mushroom on the right side shows that the darkened gills stop short of the stem attachment to the cap. The double ring on the stems of both up-ended mushrooms is visible.

Enoki in the Yard!

By Dave Layton

On April 12th this year, one willow tree near our house was sprouting fresh oyster mushrooms, and today Sally noticed a few *Flammulina velutipes* at the base of our hackberry stump. They were actually growing from under the bottom of the stump, on long white-and-golden stems. They were just the top caps on a beautiful bundle of tender enoki. I figured if ever there is a time these are edible, it's now – but how best to prepare them?

They seemed to get lost when I'd cooked them with other mushrooms in the past. One answer I found on the internet is really easy: save all but the base of the stems and eat the smaller ones raw in salad.

We made a light vinaigrette tossed salad with sliced roast beef. The little larger ones we ate with cream cheese in

sliced beef roll-ups – delicious! The largest ones I sliced and threw into cream-of-mushroom soup with some of the oyster mushrooms and a variety of frozen mushrooms. In the soup they provided an excellent golden contrast to the lighter mushrooms and the darker blewits.

In all my years of mushroom hunting this is the first time I've found wild *Flammulina* to be absolutely delightful! The only problem is we kind of pigged out on them and they're now gone – until the next harvest, that is. These were the first spring edible mushrooms, but a few weeks above freezing in winter could produce the same thing, so I don't know if I even consider them spring mushrooms. With the right weather conditions, oyster mushrooms and enoki can be found any month of the year, but cold-weather harvests taste best.



Provisional List of Fungi from Ryerson Woods south of Iowa City, IA (July 2014)

Compiled by Dean Abel, incorporating the identification assistance of Dr. Rosanne Healy, Dr. Robert Embree, and members of the Prairie States Mushroom Club

ASCOMYCOTINA

Apiosporina morbosa
Ascocoryne cylichnium
Ascocoryne cf. *turficola*
Biscogniauxia atropunctata
Bisporella citrina
Chlorociboria sp.
Daldinia concentrica
Galiella rufa
Humaria hemispherica grp.
Hypocrea latizonata
Hypocrea sulphurea (= *citrina*)
Hypoxyton sp.
Morchella esculenta grp.
Sarcoscypha occidentalis
Scutellinia pennsylvanica (= *Melastiza pennsylvanica*)
Scutellinia scutellata (= *Patella scutellata*)
Scutellinia cf. *subhirtella*
Urnula craterium

HYPOGEOUS FUNGI (TRUFFLES) manifested as asexual spores mats (ID by RH)

Hydnobolites sp.
Pachyphlodes sp. 13
Pachyphloides annagardneri nom. prov.
Pachyphloides tessellatus nom. prov.

ASCOLICHENES

Phaeocalicium polyporaenum

BASIDIOMYCOTINA GASTEROMYCETES

Calvatia craniiformis
Cyathus striatus
Lycoperdon perlatum
Lycoperdon pyriforme
Scleroderma sp.

HYMENOMYCETES

Agaricus sp.
Aleurodiscus oakesii
Antrodia serialis
Armillaria tabescens
Artomyces pyxidatus (= *Clavacorona pyxidata*)

Boletus fraternus grp.
Boletus griseus
Cantherellus cibarius
Cerrena unicolor
Climacodon pulcherrimus
Collybia radicata grp. (cf. *Xerula* spp.)
Cortinarius distans
Crepidotus spp.
Cystolepiota cf. *seminuda* (= *Lepiota pusilla*)
Ductifera pululahuana (= *Exidia alba*)
Entoloma abortivum
Exidia glandulosa
Exidia nucleata
Flammulina velutipes
Fuscocerrena portoricensis
Galerina marginata
Ganoderma applanatum
Gyroporus castaneus
Hapalopilus nidulans
Hericium coralloides
Hohenbuehelia petalooides grp.
Hygrophoropsis aurantiaca grp. (cf. *Hygrophoropsis rufa*)
Irpex lacteus
Lactarius hygrophoroides
Lactarius piperatus
Lentinellus ursinus
Lepiota cristata
Lepiota rubrotincta
Melanophyllum haematospermum
Mycena haematopus
Mycena leaiana
Mycena luteopallens
Perenniporia medulla-panis
Phellinus gilvus
Phlebia incarnata
Phlebia tremellosa
Phleogena faginea
Pholiota sp.
Pleurotus ostreatus
Pluteus admirabilis
Pluteus cervinus
Pluteus lutescens
Polyporus alveolaris
Polyporus arcularis
Polyporus badius

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Provisional List of Fungi...

(cont. from pg. 6)

Chicken in A Pickle

by Cody Gieselman

Polyporus elegans
Polyporus radicans
Psathyrella echiniceps
Puccinia podophylli
Pycnoporus cinnabarinus
Ramiria stricta
Rhizomarasmium pyrrocephalus (= *Marasmius elongatipes/longipes*)
Rhodotus palmatus
Russula cf. *foetens*
Russula spp.
Schizophyllum commune
Sebacina conrescens
Steccherinum laeticolor
Stereum complicatum
Stereum hirsutum
Stereum lobatum
Stereum ostrea
Thelephora cf. *terrestris*
Trametes elegans (= *Daedaleopsis ambigua*)
Trametes hirsuta
Trametes versicolor
Trametes conchifer
Tremella aurantia
Tremellodendron pallidum
Trichaptum bifforme
Tricholomopsis platyphylla
Uromyces caladii
Xeromphalina kauffmanii
Xylobolus frustulatus

DEUTEROMYCOTINA (IMPERFECT FUNGI)

Fusarium sp.
Polycephalomyces tomentosus

MYXOMYCOTINA (SLIME MOLDS)

Arcyria cinera
Ceratiomyxa fruticulosa var. *flexuosa*
Ceratiomyxa fruticulosa var. *poriodes*
Lycogala epidendrum
Stemonitis sp. 

Most of us are familiar with the delightful plentitude of chicken of the woods, and at times we may even experience the overabundance a single *sulphureus* or *cinnatus* can provide. In this case we have several options to avoid spoilage: we can binge on it for a few days, stash some in the freezer for up to a couple months, or give some to appreciative friends; or, we may opt for longer-term storage via pickling. While the fundamentals of lactic fermentation are fairly static, there is room to experiment with additional flavors according to personal preference. Variations on pickling abound, so I will share what has been successful for me.

The ratio of water to vinegar should be at least one to one, and whether it's apple cider, white balsamic, white wine, or plain distilled vinegar, it should have at least 5% acidity. Less vinegar or acidity will shorten the shelf life, as will the inclusion of fats such as olive oil. However, a shorter shelf life may be a worthwhile tradeoff to some taste buds.

First, set up canning gear and boiling water to sanitize jars. Sauté the fungus with salt and minimal oil, just long enough to drive out some of its water. The cooking process will continue during canning. For every two cups of vinegar solution, add roughly one tablespoon of kosher or pickling salt. Turn off heat, and stir in herbs and spices. This part is up to personal taste, but I generally add a couple teaspoons of each herb or spice for every tablespoon of salt. Many herbs and spices are also antibacterial, aiding in the preservative function of the vinegar solution. A short list includes rosemary, thyme, coriander, black peppercorns, mustard seeds, and chili peppers. Many of these have additionally been shown to have anticarcinogenic properties. I tend to keep my pickling projects simple, opting for two, maybe three, from the preceding list.

Pack mushroom mix into jars and top off with vinegar solution. Add more vinegar if necessary to cover the mushrooms, always leaving a half-inch headspace. Wipe the rims, and finger-tighten lids to the jars. Process in boiling water for 15 minutes.

Any mushroom can be pickled, but the textural changes that occur during fermentation are especially harmonious with chicken of the woods. See how long you can keep your fork out of it. 

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<http://iowamushroom.org>



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Upcoming Forays

10:00 am, Saturday September 27th:

Pioneer Ridge, near Ottumwa in Wapello County, Iowa.
Directions: Pioneer Ridge Park is located 6 miles south of Ottumwa on Hwy 63. Lets meet at the nature center.

See this page more information about the park:
<http://wapellocounty.org/departments/conservation-board/pioneer-ridge-nature-area>

10:00 am, Saturday, October 18th:

Grimes Farm in Marshalltown, Marshall County, Iowa.
Grimes Farm is located on the southwest edge of Marshalltown. Exit Hwy 30 at Oaks Ave and go north 1 mile.
Note: Oaks Avenue turns into Highland Acres Road. Turn left on 233rd Street and go west 0.6 miles to the entrance to Grimes Farm. Meet at the Nature Center. There will be a potluck lunch after the foray. Note that the annual meeting will be held after the lunch.

See this page for more information about the park:
<http://www.mycountyparks.com/county/Marshall/Park/GrimesFarm-Conservation-Center.aspx>

For more information about foray times, contact Dean Abel PSMC Secretary, 319-354-3510, email dean-abel@uiowa.edu

In the past, Prairie States Mushroom Club has had some short-notice unscheduled forays with a notice sent out by e-mail. The majority of our members have e-mail but there are a few that do not. For those that would like to be informed of any unscheduled forays not published in the newsletter, please contact Roger Heidt and he will try to leave a phone message for you: Roger Heidt, PSMC Treasurer and Membership, 319-573-4795.

If you have a favorite mushroom hunting place where you'd like to have a foray, please let us know. Contact Glen Schwartz, PSMC President, 319-393-7705, email GlenASchwartz@gmail.com

