

SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 507 December 2014



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Spore Prints

is published monthly, September through June by the

PUGET SOUND MYCOLOGICAL SOCIETY

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Annual dues: single or family \$30; full-time students \$20

CALENDAR

Dec. 9 Membership Meeting and Holiday "Cookie Bash,"
7:30 pm, CUH (doors open at 6:30 pm)

Dec. 15 Board Meeting, 7:30 pm, North Seattle Community
College

BOARD NEWS

Marian Maxwell

Jon Hall and Luise Asif volunteered to be on the Nomination Committee for 2015. We will be electing a new president, secretary, and five board of trustees members. We still need at least one committee volunteer from the general membership. The Board voted to give the South Sound Mycological Society \$1000 from proceeds from the NAMA foray in October as a thank you for helping with the event. Student memberships will receive only digital copies of the *Spore Prints* from now on. Board meetings will return to the Center for Urban Horticulture in January of 2015. We have increased the honorarium for speakers for our general meetings. We will discuss Mushroom Maynia at the January 2015 board meeting. We will also review the criteria for the Ben Woo scholarship fund in January. We will be reminding members to renew their dues if they haven't done so yet. We will also request that they add an emergency contact and update the information on their PSMS profile page. We decided to have members sign up for the December Cookie Bash since our numbers have grown and seating is very limited. Marian will get a banquet permit for the hall, so the event will be for PSMS members only.



MEMBERSHIP MEETING

Tuesday, December 9, at 7:30 pm, in the Center for Urban Horticulture, 3501 NE 41st Street, Seattle

**Annual Holiday Party and Cookie Bash
Members Only** - We will have sign-ups online.



Food. December's membership meeting is once again our famous "Cookie Bash," hosted by your very own Board of Trustees. Please bring a plate of hors d'oeuvres, a casserole, baked goods or other treats, and/or a dessert (cookies!) to share. Also bring your favorite beverage or wine (we will have a banquet permit); put on your best fungal-themed jewelry, attire, and/or hats; and be prepared to have a great time. This is a family event, so children are welcome.

Photos. Members are invited to contribute up to 5 photos that they would like to share and discuss. They will be loaded into the PSMS laptop before the meeting to be projected. Short video presentations on a DVD format are also welcome. Please email these photos to Daniel Winkler at *me@danielwinkler.com* prior to December 2nd to be included in the program.

Door Prizes and Edible Art Contest. Release your inner Myco-Angelo (expression coined by Milton Tam) and enter our annual edible mushroom art contest. Prizes will be awarded by popular acclaim, and entries may be consumed after the votes are in. The theme for your creation this year is "The Beauty of Fungi." Arrive at 6:30 pm to set up your work of edible art. We will have prizes for the top three winners.



Reserved Seating. Doors open at 6:30 pm. Reserved seats will be held till 7:45 pm. Any empty seats remaining at 7:45 pm will be given to any PSMS members who are waiting at the door at that time. Space is very limited so sign up early. People who do not have reservations may not be able to be seated.

FIELD TRIP REPORT, Nov. 1

Brian S. Luther

The Park Manager and Head Ranger was expecting us and had the large shelter all cleaned out, the lights, power, and water on, and a nearby bathroom house fully opened up early in the morning. What great service! The day before this field trip and the day after were both very rainy, but our good luck at getting a window of clearing on Saturday may be one of the reasons we had over a hundred members attend.

I brought down a big load of firewood about 7:30 am and when I dropped it off I was pleased to see Dick Sieger, longtime member and former PSMS President (1992-1994). Dick & Agnes decided to camp for a couple of nights in the adjacent campground, and it was great to have a chance to talk, briefly, before the other members arrived. They recently returned from a six week trip to Europe and Dick presented me with a fantastic Hungarian mycelium hat as a gift.



Our last fall 2014 field trip was hosted by Erin & Brady Raymond, and they had their work cut out, supplying hot coffee and goodies for so many people. Everybody was thankful for the selection of goodies they had, and I'd say members pretty much "licked the platter clean." Thanks, Brady and Erin, for a job well done!

As usual, I had an information meeting at 10:00 am, and then Professor Erica Klein (from the UW Tacoma campus) briefed members on collecting for her study of heavy metals in edible fungi, after which everybody took off collecting. Wren Hudgins again organized six field trip guides, who took new members out in groups, showed them the habitat, and discussed mushrooms that they found along the way. Thank you, Josh Powell, Sweta Agrawal, Bill Buck, Erin O'Dell, Jamie Ardena, and Wren.

I was kept more than busy all day helping members with their collections and documenting the specimens collected in the park.

We had several picnic tables covered with mushrooms, and I've not yet made a complete tabulation. Many excellent collections of Chanterelles and Matsutake were found, with Winter Chanterelles and some Hedgehog mushrooms found as well. One especially interesting mushroom that came in was what we used to call *Hygrophoropsis olida*, which is a very small orange mushroom with a fragrant odor like bubble-gum. It has been incorrectly called *Hygrophoropsis morganii* by some books. It was recently described as a new genus and is now *Aphroditeola olida*. Also, the beautiful *Cortinarius citrinifolius* was found, with a viscid, bright yellow cap and an odor of ripe peaches.

We had an early potluck at 3:00 pm which was enjoyed by many. Those who stayed helped to get the shelter all cleaned up as if we hadn't been there.

I hope everybody had fun on the fall field trips and thanks to all members who contributed in various ways to make them enjoyable.

Stay tuned for the spring 2015 outings, most of which I already have reserved or scheduled. Best wishes for the holiday season.

PSMS 51ST ANNUAL WILD MUSHROOM SHOW
Kim Traverse, Randy Richardson, Milton Tam

Our annual fall mushroom show at the Mountaineers facility was certainly different this year! First, it was two weeks later than usual, on October 25 and 26, because many of us were busy earlier in the month with the NAMA foray in Eatonville. Fortunately for us, this year's season was a long one, and in late October there were still plenty of mushrooms to be found.

The first day of the show was open *only* to PSMS members and their invited guests. With the "soft" opening time of 11 am, many members arrived early and helped in setting up the exhibits or assembling a display tray. Both our potluck lunch and evening wine and cheese reception were fun, delicious, and well attended. The feedback we received for this members-only day was uniformly positive, and we think that our goal of planning a relaxed, enjoyable day just for our members, with lots of social activities and the opportunity to enjoy the exhibits was certainly met, if not exceeded.

On day two, a blustery, showery Sunday, we opened our doors to the general public. For the first time, we offered tickets online at our website with staggered entry times, the idea being to better control crowds and to ensure that everyone attending the show had a quality experience. We had 1,236 paid admissions on Sunday, but the facility didn't really seem overly crowded at any time.

Our committee chairs came through once again. Thank you all for the special effort you put in: Jamie Ardena (Cultivation); Carlos

Cruz (Crowd Control/Security); Marilyn Droege (Arts and Crafts); Brenda Fong (Hospitality); Kathy Lennebacker (Books); Brian Luther (Mushroom ID); Jamie Notman (Cooking and Tasting); Ann Polin (Membership); Pacita Roberts (Feel and Smell); and Sherwood Stolt (Ticket Sales). Special thanks go to our fine speakers this year—Alissa Allen, Marian Maxwell, Danny Miller, Noah Siegel, and Daniel Winkler—for presenting thoughtful, interesting, educational, and informative lectures.

The volunteer turnout for both days was great, and your enthusiasm and hard work were much appreciated. We'd like to add a few thank yous to those already sent out to our volunteers. Some people get overlooked year after year or have provided an extra measure of help, and they need to be acknowledged. To all our mushroom collectors, we truly appreciate the efforts that you unsung heroes have made to look far and wide, high and low, to gather mushrooms and duff for our exhibits. Without fresh mushrooms there would be no show! Thanks to Dr. Katie Glew and Dan Paquette for putting the lichen displays together and to Alan Smith and Shelley Evans for spending Sunday telling people about lichens! Thanks to Jo Ann Henderson, S. Joyce Budisana, and Sweta Agrawal of the new Mycophagy group for overcoming the formidable logistics and Health Department regulations to make our first ever mushroom soup sale a reality! We also can't forget to thank Jeremy Faber for his generous donation of mushrooms for the soup. Many thanks once again to Sara Nelson of Fremont Brewery for the fine keg of IPA that was enjoyed by many at the evening reception. Thanks to Stan Hain for hours of shop time constructing the new book display racks! Finally, kudos to our tireless treasurer, John Goldman, who agreed to double duty this year in tracking the expenses and receipts for both the show and the NAMA foray. Thanks again to everyone who made the show such a huge success this year and make it so much fun every year.



BIOLUMINESCENT FUNGI ON STAMPS

Brian S. Luther

We have several common species of macrofungi in the Northern Hemisphere that are known to be bioluminescent, including the Jack O' Lantern fungi *Omphalotus illudens*, *O. olearius*, and *O. olivascens* (and related species), *Panellus stipticus*, *P. pusillus*, several species of *Armillaria*, and a surprising number of species in the genus *Mycena* (Desjardin, 2008). There are also a number of tropical mushrooms that glow in the dark. Depending on the species, only the fruiting bodies, the lamellae (gills), the mycelium, the rhizomorphs, or even the spores alone may be bioluminescent. They vary in the strength of the light emission, but bioluminescent fungi all emit a continuous greenish light at a wavelength of approximately 530 nm. The woody substrates that these fungi decompose also become bioluminescent because of the mycelia; these are known historically and in folklore as "touchwood," "punkwood," or "foxfire" (Rolfe & Rolfe, 1926).

The precise molecular processes involved in fungal bioluminescence are still not fully understood (Mori et al., 2011), but there is considerable information available. For an excellent paper specifically reviewing fungal bioluminescence refer to Desjardin et al. (2008). If you're interested in learning about the most recent developments concerning what's known about the chemistry of fungal bioluminescence then refer to Oliveira et al. (2012) and Shimomura (2012). For a listing of many of the bioluminescent macrofungi refer to the following website: http://en.wikipedia.org/wiki/List_of_bioluminescent_fungi

Only a few countries have issued postage showing, specifically labeling, and noting that the fungus shown is bioluminescent. However, there are many examples of postage stamps showing a bioluminescent fungus, although there's no indication on the stamp that it has these qualities and it's being shown for other reasons. The first postage stamp showing a fungus with bioluminescent qualities (*Armillaria mellea*), for example, is Scott 1229 issued in 1958 by Romania. This is only one stamp of a larger set showing popular edible fungi (Scott 1225–34). There is no mention on the stamp that it's bioluminescent. It was illustrated only because it's edible. Many other countries have issued sets of stamps with this species on it over the years.

Another example is *Panellus stipticus*, which is shown on stamp sets from Nicaragua, Mali, etc. An additional example is *Omphalotus illudens/olearius*, which is shown on stamp sets from Bulgaria, France, Hungary, Sierra Leone, Tanzania, and Uganda, etc. These are poisonous mushrooms and that's why they're shown on these stamps, not because they're bioluminescent.

You might be surprised to learn that a number of common North American species of *Mycena* are bioluminescent. The mycelia of *Mycena epipterygia*, *M. galopus*, *M. inclinata*, *M. maculata*, *M. olivaceomarginata*, *M. polygramma*, *M. pura*, *M. rorida*, *M. sanguinolenta*, and *M. stylobates*, as well as both the mycelium and basidiocarps of *M. haematopus*, are bioluminescent (Desjardin et al., 2008). As of 2010, the number of known bioluminescent macro fungi totaled 71 (Desjardin et al., 2010).

The following list of postage stamps is for species other than those in *Armillaria*, *Omphalotus*, or *Panellus*. I'm mostly focusing on a small, select group of stamps that show tropical species that glow in the dark, are examples of the same species, even if not shown glowing, or are noted on the stamps as being bioluminescent.

All catalog numbers are from the Scott Postage Stamp Catalogues. s/s=souvenir sheet; FDC=First Day Cover, an envelope with stamps cancelled on the first day of issue and usually with a colorful cachet or envelope illustration.

Solomon Islands. January 30, 1984. Scott 518, *Filoboletus manipularis*. No mention is made on the stamp that it's bioluminescent and it's illustrated as seen in daylight.



Brian S. Luther

Samoa. April 17, 1985. Scott 647, *Mycena chlorophos*. This is the first postage stamp showing a bioluminescent mushroom actually glowing in the dark. The species epithet literally means "green light," which is what's given off.



Brian S. Luther

Vietnam. August 26, 1996. Scott 2729. Part of a six val. set, the 5000^d value stamp is labeled *Filoboletus manipularis* and is shown glowing in the dark. This is a stylized illustration of this fungus, without showing real life features. Refer to the Solomon Is. stamp to see what this species actually looks like.



Brian S. Luther

The set also comes without perforations. The FDC for this set has a mushroom shaped cancel that says "NAM" on it.

Indonesia. April 1, 1999. Scott 1832c & 1838, *Mycena sp.* These stamps show the mushrooms glowing in the dark. The illustration was issued in two different stamp shapes and the Scott Catalogue assigns them different numbers: the diamond shaped stamp is Scott 1832c and the rectangular shaped stamp, found only in the booklet, is Scott 1838. Also, the full sheet showing the complete set is assigned the number Scott 1834d; this has some non-stamp fungal illustrations on it in the border as well.



Brian S. Luther



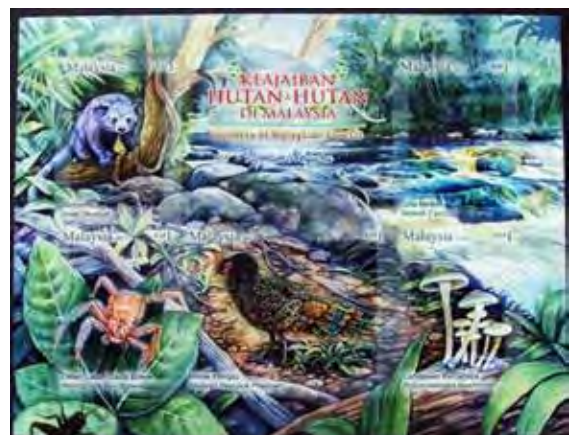
Brian S. Luther

The complete set is assigned the number Scott 1834d; this has some non-stamp fungal illustrations on it in the border as well.



Brian S. Luther

Malaysia. 2013 Wonders of Malaysian Forest s/s with five different stamps on the overall scene. The stamp in the lower right-hand corner has a clump of mushrooms labeled "Bioluminescent mushroom," RM1 value. The mushrooms are not shown glowing



Brian S. Luther

in the dark and they are also not identified to genus or species; however, they appear to be a gilled mushroom. This sheet is one of three (each with five stamps) issued at the same time with the same title but different illustrations. It was issued too recently for me to get a Scott Cat. number. This stamp, as well as one of these other three sheets mentioned (which has an owl, Hornbill, tiger, etc.), also shows five caps of a Turkey Tail-like fungus growing on wood. All of these were issued just after my article discussing Malaysian mushroom stamps was published (Luther, 2013).



Brian S. Luther

In case you didn't already know, Taylor Lockwood has T-shirts available with some of his photos of bioluminescent fungi.

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FLYING FUNGUS? DECOMPOSABLE “BIO DOME” TAKES TO THE SKIES

<http://www.cnet.com/>, Nov. 14, 2014

Spore-atically, new drones impress us. Take this “biological drone.” It has a fungal body with a protective bacteria covering so it can degrade into the landscape without leaving a trace if it crashes.

This type of drone is perfect for flying over sensitive environments or, better yet, to conceal spying, says Lynn Rothschild of NASA's Ames Research Center, an adviser for the student team that created it.

“No one would know if you'd spilled some sugar water or if there'd been an airplane there,” she told *New Scientist*.

The body of the prototype drone is made from the vegetative part of fungi called mycelium. The drone is covered in sheets of lab-grown bacteria.

“Coating the sheets are proteins cloned from the saliva of paper wasps—usually used to waterproof their nests,” *New Scientist* reported. “Circuits were printed in silver nanoparticle ink, in an effort to make the device as biodegradable as possible.”

The bio-drone made its first flight earlier this month at the iGEM (International Genetically Engineered Machine Competition) student synthetic-biology competition in Boston.



New York-based company Ecovative Design, which also makes wine packaging from sustainable materials, helped mold the fungi material into the shape of the bio-drone.

While the bio-drone is made from unusual stuff, it also has non-biological parts that do not easily disintegrate (yet at least) such as controls, RC quadcopter propellers, and a standard battery. The team, however, plans to make everything, including the sensors, biodegradable.



NEW ANTIBIOTIC FOUND IN HORSE DUNG FUNGUS

Tim Sandle

Science, Nov. 17, 2014

Researchers have isolated a new substance from a fungus that kills bacteria. The substance, known as copsin, has the same effect as traditional antibiotics. The substance was found in the common inky cap mushroom that grows on horse dung.

Copsin is a type of protein, whereas traditional antibiotics are often non-protein organic compounds. The substance was found and characterized by scientists based at ETH Zürich and the University of Bonn. The chemical is derived from the *Coprinopsis cinerea* mushroom (although it is also likely to be present in many other fungi). The mushroom is commonly known as the gray shag.

On discovering the substance, the science group began to consider how the fungus and various bacteria affect each other's growth. To see this, the fungus was grown in a laboratory alongside various bacteria. It was found that *C. cinerea* is able to kill many types of bacteria. Further study revealed that the copsin produced by the mushroom was responsible for this antibiotic effect.

Copsin falls within a group of chemicals called defensins. These proteins are produced by many organisms to combat microorganisms that cause disease. Copsin is an exceptionally stable protein. It seems to work by binding to lipid II, an essential building block for the cell wall of bacteria.

What fascinates scientists is how fungi have been using copsin for thousands of years to prevent bacterial infections without the bacteria becoming resistant (whereas, in contrast, humans have only been able to use antibiotics for around seventy years before resistance became widespread).

Although the results are of interest, whether copsin will one day be used as an antibiotic in medicine remains to be seen. It has yet to be determined if antibiotic medicine for humans and other animals can be developed from this protein.

The findings have been published in the *Journal of Biological Chemistry*, in a paper headed “Copsin, a novel peptide-based fungal antibiotic interfering with the peptidoglycan synthesis.”

VIETNAM CAN PRODUCE CATERPILLAR FUNGUS

My Le

<http://english.vietnamnet.vn/>, Nov. 12, 2014

VietNamNet Bridge - The Institute of Plant Protection Research has recently announced its success in producing caterpillar fungus (*Ophiocordyceps sinensis*), a rare medicinal mushroom with the potential to increase the capacity of the body against cancer.

After a visit to a center for cancer prevention in the United States where caterpillar fungus was produced in 2011, scientists at the institute began researching the mushroom and they have successfully produced this fungus.

Ophiocordyceps sinensis is a fungus that parasitizes larvae of ghost moths and produces a fruiting body valued as an herbal remedy. The fungus germinates in the living larva, kills it, and then the stalk-like fruiting body emerges from the corpse.

Ophiocordyceps sinensis is known in the West as a medicinal mushroom, and its use has a long history in traditional Chinese medicine. The hand-collected fungus/caterpillar combination is valued by herbalists and as a status symbol; it is used as an aphrodisiac and treatment for ailments such as fatigue and cancer, although such use is mainly based on traditional Chinese medicine and anecdotal evidence.

In the world, the caterpillar fungus exploited in the wild is extremely rare, occurring mainly at an altitude of 3,200 meters in the Himalayas and Tibet. Each year the output is only 80 kg, so the price is very high, from \$60,000 to \$80,000 per kilo. This fungus is not yet cultivated commercially.

Dr. Pham Van Nha, a member of the research team, said this fungus contains high nutritional value, in which the team focused on the two main compounds—cordycepin, used in the fibroid treatment and precancerous prevention, and adenosine, which is used in the treatment of cardiovascular problems.

The researchers cultured the fungus by two methods: in an artificial environment and on a host, that is, silkworms.

Dr. Nha said the market price for 1 kg of the fungus is \$50,000, but the Institute envisions only VND 100–200 million (\$5,000–10,000) per kilo for the fungus cultured on silkworms and VND 7 million (\$350) for the fungus cultured in an artificial environment.

Experts warn that up to 70% of caterpillar fungus in the market is fake.



Cordeceps growing on silkworm pupa.



Cordeceps growing on artificial medium.



MAGIC MUSHROOMS TRANSFORM BRAIN INTO NEW HYPERCONNECTED STATE

Stephen Morgan

Health, Nov. 18, 2014

Using functional magnetic resonance imaging (fMRI), researchers have found out that magic mushrooms disassemble the brain's normal communication paths and then reassemble them in an entirely new way that links parts of the brain which normally don't interact with one another. How it boosts the brain in this way isn't yet fully understood, but the results are conclusive.

Live Science quotes Paul Expert, a physicist at King's College London and co-author of the study, who says that the fungi connect "brain regions that don't normally talk together." The study says the scientists found "a less constrained and more intercommunicative mode of brain function."

The findings were published in the *Journal of the Royal Society Interface* as part of ongoing studies to see how the mushrooms may help psychological health.

The team of scientists scanned the brains of 15 healthy volunteers, first after they had taken a placebo and then after they had taken the hallucinogenic plant. They compared the brain activity of the individuals and mapped the differences in connections between different regions of the brain.

What they saw was that the drug linked up regions of the brain not normally connected and in a highly synchronized way. This meant that the mushrooms were stimulating new long-range connections in the brain which normally don't exist. Once the effects of the drug wore off, so did the new connections.

A remarkable image from the experiment taken by the *Journal of the Royal Society* is reproduced in an article on the research in the *Huffington Post* which shows the amazing stimulation of neural networks caused by the drug.

Researchers are hypothesizing that the active ingredient, psilocybin, could create a brain state similar to synesthesia, a condition in which different sense stimuli pair up with another, so that, for example, when people hear music, they simultaneously see colors and link it or other stimuli like smells or sounds to a specific number, like 5. Something which doesn't normally happen in everyday brain functioning.

But the scientists also think that the creation of these new communication pathways could have psychological effects, which, with further research, may turn out to be useful in treating mental health problems.

Apart from hallucinations, many people also report profound spiritual experiences, as well as positive feeling of happiness and oneness with the world. Some studies seem to show that the drug can even alter people's personalities, provoking greater openness, a wider interest in different experiences, and an appreciation of things such as art or music, which they may not have had before.

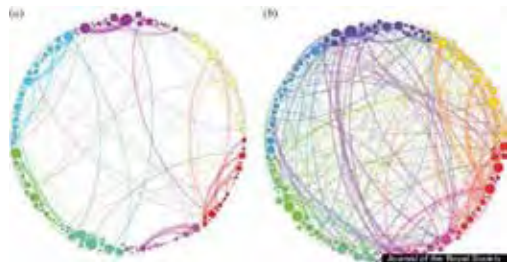
One of the experts said that some people report the effects of taking the drug as being "one of the most profound experiences they've had in their lives, even comparing it to the birth of their children."

Scientists know that the mushrooms act on the mood regulator serotonin, but how these experiences are connected to its ability to rearrange brain communication isn't yet clear.

The researchers believe that their findings may even help us to understand what consciousness really is and how we construct our sense of self.

Mitul Mehta, a psychopharmacology researcher at King’s College London, said that “through studies such as these we can really begin to tackle the questions of how we achieve coherent experiences of ourselves in the world around us and understand what makes this break down.”

The website “Collective Evolution” quotes from another study done at Hopkins University, where researchers believe their results could also help reduce anxiety, discomfort, and fear among people facing death from diseases like cancer.



Hyperconnectivity of brain’s neural pathways (a) before using magic mushrooms and (b) after using magic mushrooms.



NEW VERSION OF MATCHMAKER AVAILABLE

Ian Gibson, Danny Miller, and the rest of the MatchMaker team are happy to announce that version 2.2 of MatchMaker, the free mushroom identification computer program, is now available for downloading at www.matchmakermushrooms.com. This computer program helps you identify your mushrooms using advanced techniques not possible with any book. Instead of reading a key that asks you questions you might not know the answers to, you tell the computer what you do know. It helps you find the right mushroom and guides you to figure out what else you need to know.

Features

- MatchMaker includes 4,000 species from the Pacific Northwest, more than 2,200 of them with color photographs.
- You can see a list of all the mushrooms similar to the one you’re studying.
- Optionally, you can work with any smaller group of mushrooms you are studying instead of all 4,000 of them.
- A built in quiz shows you pictures of the ones you are studying for you to identify using various skill levels.

New in Version 2.2

- MatchMaker now works on both a PC and a Mac! (And the pictorial key works on a smart phone!)
- It includes tables that compare many similar, hard-to-identify groups of mushrooms.

- It includes a pictorial key to 1,500 of the most common species, showing photos of related and similar mushrooms side by side, emphasizing their differences and how to tell them apart.
- This pictorial key can be installed onto most smart phones and will work in the wilderness without cell or Internet reception!
- The tables and the pictorial key will be updated frequently.

We hope you have as much fun using it as we did making it. Let us know if you have any problems.

Danny Miller (education@psms.org)
Ian Gibson (ig@islandnet.com)



CHRISTMAS TREES

http://botit.botany.wisc.edu/toms_fungi/xmas.html

Tom Volk

The primary, although indirect, benefit of fungi to people is mycorrhizae, which are associations between fungi and the roots of plants. Approximately 90% of plant species in nature have a mycorrhizal association with a fungus! Of course the primary Christmas thing that is the direct result of this association is the Christmas tree.



Without the fungi the trees would not grow very well at all—at most a couple of feet or less than a meter tall in ten years! Most of the Christmas trees from the north (pines, firs, Douglas fir, spruces) are ectomycorrhizal—they form an association with Basidiomycota (and a few Ascomycota), which form fruiting bodies (mushrooms) that are very familiar to most of us. Some other evergreen trees (juniper, cypress) form endomycorrhizae with microscopic members of the Glomeromycota (formerly called order Glomales of the Zygomycota), so there are never mushrooms under those kinds of trees. The fungi receive sugars from the plants’ photosynthesis and, in return, the fungi provide the plants with increased absorption of water and mineral nutrients. Both the plants and the fungi benefit from this association.

... and while we’re at it, don’t forget about that partridge—where would it sit without that endomycorrhizal pear tree?—and where

would we get our figgy pudding without that mycorrhizal Ficus tree?



*May you be poor in misfortune
and rich in blessings
slow to make enemies
quick to make friends
and rich or poor, slow or quick,
as happy as the Year is long.
-Irish toast*

BELLY BUTTON HEDGEHOG (*Hydnum umbilicatum*) PIZZA **Brian & Arnica Luther**

Pizza dough

- | | |
|---|----------------------------|
| One package of yeast | 1 teaspoon of sugar |
| 1 cup of warm water | 2½ cups of bread flour |
| Salt, if desired | 2 tablespoons of olive oil |
| A few dashes of herbs to taste - basil, oregano, etc. | |

Toppings

- | | |
|---|--------------------------------------|
| Olive oil | Simple white or Alfredo sauce |
| <i>Hydnum umbilicatum</i> ,
¼ to ½ pound | 4 garlic cloves,
coarsely chopped |
| ½ onion, coarsely chopped | Mozzarella cheese |
| Romano cheese | Fresh spinach leaves |

1. Chop up and sauté *Hydnum umbilicatum* in butter or olive oil until all juice is cooked out.
2. Pre-heat oven to 450°F and set oven rack in middle or higher position.
3. Mix yeast, sugar, and warm water together in a medium sized bowl. Let sit for 15 minutes, stirring occasionally.
4. Add remaining dough ingredients, including some herbs, and knead into a blob of dough; let sit for another 5 min., or longer.

5. Sprinkle cornmeal liberally over a cookie sheet or pizza pan to prevent dough from sticking
6. Spread and stretch dough out onto the pan until pretty thin.
7. Brush the top with olive oil, then coat with homemade white sauce* or Alfredo sauce.
8. Add cooked mushrooms, then garlic and onions evenly.
9. Grate Mozzarella over these ingredients, covering them.
10. Chop a big handful of spinach leaves and add to the top, then grate a layer of Romano cheese on top to hold it all together.
11. Bake for 17 to 20 minutes on a middle rack (or above) in the oven, until crust is brown.

***Homemade white sauce**

Add some milk, flour and butter together in a frying pan, slowly heating and constantly stirring with a whisk until a thick sauce is made. Usually, a full cup of thick sauce is plenty.



Brian S. Luther

Happy Holidays!

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