SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 458 January 2010

## A COOL MEANDER AND A TINY, MYSTERIOUS FUNGUS

**Ron Post**

As the frost settled in the first week of December, Dan Paquette invited me to walk part of Woods Creek Road northeast of Monroe. He was out to find Explorer Falls and collect mosses there. I looked for interesting fungi and listened for birds.

The area is full of wetlands, being part of the City of Everett's watershed. To the east lies Spada Lake, but we stayed westward and remained at a low elevation, beginning our trip at an open gate on DNR land. Almost immediately we saw a red-tailed hawk and heard the whispering calls of winter songbirds. The vegetation was a nice mix of conifer, alder, and cottonwood, with some regularly spaced true firs that must have been planted in the last 30 years.

So much moss! The beautiful *Neckera* moss and an assortment of liverworts also thrive there, and an assortment of lichens.

Dan, who set up our lichen display at the 2009 annual exhibit, is a patient guy, as I couldn't tell the differences between common mosses such as *Dicranum* and *Isothecium*.

We saw several species of *Cladonia*, the lichen genus that includes "British soldiers" and the "lipstick lichen." A flesh-colored paste growing on alder went unidentified. Was it a lichen or was it a resupinate fungus? I did not collect it but will certainly in the future!

Ron Post

Tremella *sp.*

We found jelly fungi (*Tremella*) and candlesnuff (*Xylaria*) as well as some white microfungi that I had not seen before.

One of these white fungi resembled a tiny polypore. It was "large" enough so that three or four specimens would just about fit on one of your small fingernails.

Ron Post

Xylaria *sp.*

When I plugged the few known features of this tiny fungal specimen—less than one centimeter across, white cap that is at first plane but later curved inward, and just a rudimentary stem if any, all of this growing on moss—into my copy of Ian Gibson's Matchmaker CD, several species (many of them not white) came up immediately. I tossed out those that seemed to have cup-shaped fruiting bodies or were any color other than white.

*Arrhenia retiruga and Cyphellostereum leave* seemed to be the best choices. (Both are also online at zipcodezoo.com, a really interesting website about planetary biota.)

I ruled out *Arrhenia* based on the fact that specimens of small Arrhenias display rudimentary gills or at least veinlike ridges. Also, the species *retiruga* is often rather grayish.

One clue: it was growing on the seta of a *Polytrichum* moss. (Some explanation is needed to avoid confusion here. In mushrooms, the term "seta" refers to an elongated or bristle-like sterile cell, usually brownish and easily seen with a hand lens on some species—for example, in the genus *Hymenochaete*, a lovely fungus I'm sure you have run across on the decaying bark of small tree trunks or limbs. But in mosses, seta refers to the tiny stem that carries a spore-bearing capsule at its end, and it may be quite long and featureless.)

These moss seta featured the white fungus peeking out at several points along the stems. The fungi might have been bits of eggshell or clamshell, but for their setting among hummocks of green along the road.

This mushroom was very very white, had no veinlike hymeneal structures, nor did it have any pores! Also, hardly any of the specimens were narrow at the point of attachment, i.e., most were not stipitate. I don't know if that will prove to be the rule or the exception, but I thought this mushroom belonged somewhere other than the Agaricales, where *Arrhenia* is placed.

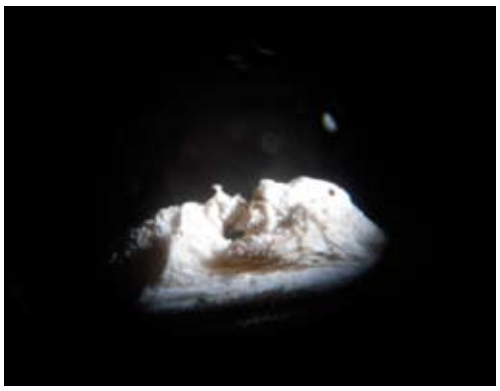
*Cyphellostereum leave* is not well studied but is most likely parasitic on moss and the records seem to have it growing frequently on *Polytrichum*, the same genus Dan identified where we collected the fungus. I was pretty confident the fungus was *C. leave.* Its spores (the few I could find) were very small and the sterigmata (spore-bearing cells at the tips of the basidia) were rather long, almost as long as the spores were wide.

Other characteristics also seemed to fit *C. leave*, which is placed in the order Polyporales in the family Podoscyphaceae. These fungi include others that are tiny yet very pleasant to look at, such as the inch-or-so-wide *Cotylidia* species (page 608 in my *Mushrooms Demystified*). Those mushrooms grow on soil or decaying litter and form very pretty rosettes that may appear funnel shaped.

I checked with Dr. Ammirati to see if he's found either *A. retiruga* or *C. leave* around the Cascade foothills. Neither appears to be uncommon. But they are difficult to notice and to study!

Some other tiny white fungi that I collected along Woods Creek eluded my identification skills. They are even smaller than *C. leave* and will wait until I find more time to research their microcharacteristics. Meanwhile, I'll be returning to the falls, a destination with a 40-foot water cascade (and a trail from there that heads toward Echo Lake, according to a hiker I met). But down along the road is a nice, cool walk, through wetlands and young forests full of green and white gems.

Ron Post



*Cyphellostereum leave*

# Spore Prints

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## CALENDAR

| | |
|---|---|
| Jan. 12 | Membership Meeting, 7:30 pm, CUH |
| Jan. 14 | Start of Beginners' Mushroom ID classes, 7:00–9:00 pm, Douglas Classroom, CUH (registered people only) |
| Jan. 19 | *Spore Prints* Deadline |
| Jan. 25 | Board Meeting, 7:30 pm, CUH |

## BOARD NEWS — Denise Banaszewski

The Board reconsidered the decision to provide the newsletter only to members, and decided to continue to allow nonmembers access to *Spore Prints*, minus the field trip information. The field trip information will be sent to members only via an insert included with the paper version of *Spore Prints*, and will be available (and updated if necessary) on the website in the password-protected area. We currently have nominations for President and Treasurer, and seven nominations for Board positions. We still have several Wild Foods Calendars available for purchase (includes recipes). There will be a Beginner's Mushroom ID class starting January 14, 2010. We are planning to have Intermediate ID classes and will share more information as it becomes available. We are working on rescheduling a felting/dyeing class. Finally, we are also looking into allowing people to join/renew memberships online using PayPal. Stay tuned!

## LIBRARY RECALL — Kim Traverse

If you have any library materials, please return them at the next meeting.

## MEMBERSHIP MEETING

Tuesday, January 12, 2010, at 7:30 pm at the Center for Urban Horticulture, 3501 NE 40th Street, Seattle

Our speaker this month is Peter Kennedy, a Professor of Biology at Lewis and Clark College in Portland. The title of his presentation is "Exploring patterns of host-plant specificity among ectomycorrhizal fungi." Peter was awarded his Ph.D. from the University of California, Berkeley, where he studied ecological factors affecting forest encroachment into coastal California grasslands. Peter's current research interests include examining symbiotic interactions between plants and mycorrhizal fungi, the fungi providing plants with nutrients and water in exchange for carbon compounds. This plant–mycorrhizal symbiosis is extremely widespread and appears to have an important, but yet significantly understudied effect on plant interactions and community dynamics. Until recently, identifying and manipulating fungi was extremely difficult, but a number of recent breakthroughs in molecular biology and stable isotope methods have allowed researchers to ask ecological questions about the role of mycorrhizal fungi in the dynamics of plant communities. Please come and hear Peter describe some of his discoveries and how these new research tools have and will continue to advance our understanding of this exciting new field.

*Prof. Peter Kennedy*

Will people with last names beginning with the letters A–K please bring a plate of refreshments to share after the meeting.

## YAHOO DISCUSSION GROUP

Want to stay in touch? The PSMS e-mail discussion group maintained by Yahoo Groups is an easy way to keep in contact with other members, circulate information about PSMS events, and post general mushroom information. To join, follow the directions on the PSMS website (http://psms.org/members/index.html) or on page 40 of the PSMS roster.

## BEGINNING MUSHROOM ID CLASSES — Colin Meyer

| | |
|---|---|
| What: | PSMS Beginning Mushroom ID Course |
| Where: | Center For Urban Horticulture, Douglas Classroom |
| When: | Thursday Evenings, 7:00 pm – 9:00 pm 1/14–2/4/2010 |
| Cost: | Members $35, cash or check payable to PSMS (bring on first day of class). Nonmembers $70. |
| Book: | *Mushrooms Demystified*, by David Arora |
| Bring: | Fresh mushroom specimens |
| Contact: | education@psms.org (for questions or to register). If you don't have access to e-mail, you may call 425-678-8350, but e-mail is preferred. |

## A POISONOUS MUSHROOM BY ANY OTHER NAME IS STILL POISONOUS: *Galerina autumnalis* is now *Galerina marginata*

**Brian Luther**

DNA studies have turned conventional mycological taxonomy upside down. That's because DNA doesn't lie, but there are differences in interpretations. Previously, observable macroscopic and microscopic features and structures, along with habitat and distribution, allowed us to compare what we thought were similar or related fungi, but there were always some doubts. A case in point is the fungus *Galerina autumnalis,* which we all recognize as deadly poisonous, being one of the few common mushrooms in the Pacific Northwest that contains cyclopeptides, along with some *Lepiota* and *Conocybe* species that show up here.

Previously, the definitive work for any mycologist studying the genus *Galerina* has always been the detailed monograph by Smith & Singer (1964). On the front inside jacket of the original book it boasts "A world monograph of this group which is the last word on this Genus"—a pretty arrogant comment, knowing that we're dealing with living organisms and that a lot of basic inventory work world wide was still in order. Granted, it was the best at the time, but as we learn more and have better scientific tools at our disposal, things change. And things have really changed since DNA research has taken off.

Gulden et al. (2001) did comparative DNA studies on several related species of *Galerina* and discovered that *G. autumnalis*, *G. marginata*, *G. oregonensis*, *G. unicolor*, and *G. venenata* are all identical genetically, with the oldest valid name—*G. marginata*—taking precedence. Thus all of the above species must now be called *G. marginata*. This means that the re-defined species *G. marginata* demonstrates substantial variability in all characteristics now that what were once five different species are now wrapped up into one name.

Under *Galerina autumnalis* Smith & Singer (1964) state (p. 248) that "*G. autumnalis* is a common species variable in nearly all the characters considered important in *Galerina*." The authors' admitted inconstancy of the characters in this complex of species is precisely the reason why it was a good candidate for DNA studies**:** that is, to sort out once and for all what is and isn't a true species here.

Brian Luther

*Galerina marginata* (*autumnalis*)

Historically, I would like to point out that Overholts (1927), in his earlier monograph of *Pholiota* (*Galerina* was placed in *Pholiota* at that time), already considered *G. autumnalis* a synonym of *G. marginata*, but Smith & Singer (1964) did not agree. Turns out that Overholts was right all along, seventy three years before the recent DNA study was done.

*References*


Gulden, Gro., Susie Dunham & John Stockman. 2001. DNA studies in the *Galerina marginata* complex. *Mycological Research 105*(4): 432–440.

Overholts, L. O. 1927. A monograph of the genus *Pholiota* in the United States. *Annals, Missouri Botanical Garden 14*(2): 87–210.

Smith, A. H. & Rolf Singer. 1964. *A Monograph of the Genus Galerina*. Earle. Hafner Publishing Co. 384 pp.


## MAN PLEADS GUILTY TO GIVING MUSHROOMS TO FRIEND

**Associated Press**

Dec. 10, 2009

PADUCAH, Ky. - A young man has pleaded guilty to supplying hallucinogenic mushrooms that led to the death of a Paducah teenager as he tried to enter the wrong house.

The *Paducah Sun* reported 20-year-old Taylor Thompson pleaded guilty Wednesday to trafficking in a controlled substance, marijuana possession, and having drug paraphernalia.

Taylor told police he brought mushrooms to a party in July, ate some himself, and gave some to other people.

One of those was 18-year-old Caleb Barnett, who later broke into a neighbor's home, thinking it was his own. The homeowner fatally shot him. Barnett died in surgery at Baptist West Hospital on July 30.

Circuit Judge Craig Clymer will sentence Thompson Feb. 3. The prosecutor has recommended 2½ years.

## BABY INGESTS MAGIC MUSHROOMS

**Edecio Martinez**

CBS News.com, Dec. 7, 2009

DENVER - Denver police say a toddler is in good condition after he ingested hallucinogenic mushrooms.

The incident happened on Sunday at an apartment complex, where police say he got the drugs from a friend staying in the home.

The 24-month-old boy was rushed to the hospital after his parents called 9-1-1.

"It was a friend who was staying in the house who was sleeping on the couch," Officer Joe Ramirrez told CBS Denver affiliate KCNC-TV. "He had the mushrooms in a backpack that was accessible to the minor, and it appears that that is the way that the minor got into the mushrooms, by taking it from the backpack."

The parents have not been charged and investigators are on the lookout for that friend.

The Denver Police's child abuse unit is investigating the incident.

## HOW SPORES THAT LIVE UNDERGROUND MOVE AROUND

**Susan Goldhor**

Boston Mycological Club *Bulletin*, *65*(3), 2009

Because we forayers spend all of our time above ground, looking for fungal fruiting bodies, we tend to forget the many species that spend their lives under our feet, buried in the soil. (Except, of course, when digging into our wallets which is how most of us extract truffles.)

### Vesicular Arbuscular Mycorrhizal (VAM) Fungi

While truffles may be the most delectable subterraneans, the most common underground fungi that form mutual partners with plants are the VAM fungi. VAM stands for "vesicular arbuscular mycorrhizal" (they are also called "arbuscular mycorrhizal" fungi or "endomycorrhizal" fungi). Unlike the ectomycorrhizal fungi, VAM fungi do not send up fruiting bodies.

VAM fungi evolved impressively early (about 350–450 million years ago), beating the ectomycorrhizals into what G. Evelyn Hutchinson called the ecological theatre and the evolutionary play. And while we humans may focus on the ectos, or at least that fraction of ectos that form above-ground fruiting bodies, the current estimate is that only about 3% of seed plants are ectomycorrhizal. The vast majority of plants (about 80% or more) are looking for and generally finding partners among the VAM fungi. This includes most of the plants and trees in hardwood-dominated forests.

As to why the VAMs are so successful, one can offer two reasons. First, they evolved so early that they were well established on Pangaea before it separated into two entities about 100 million years ago and, subsequently, into quite a lot more. While researchers think that the ectomycorrhizals and their tree and plant hosts probably evolved just about the time of that initial separation, the VAMs were everywhere first. (And I do mean everywhere. VAM fossils have been found in Antarctica, attached to subtropical vegetation.)

Second, they have the great advantage of promiscuity or, at least, non-specificity, while ectomycorrhizal colonizers invented monogamy in the form of host specificity. Both types of fungi have survived and evolved on all vegetated continents, and so we assume that both confer advantages on their hosts and perhaps both are necessary in ecosystems. But since the ectos send up fruiting bodies containing billions and trillions of spores, it's puzzling to consider the great success of the VAMs, who create a single spore underground. How do they do it?

To some extent, they simply grow out from their plant partners, forming a potentially endless net: the wood-wide web. They also are carried by physical movement of the soil itself; for example, by erosion. But their major movers are the animals that dig and tunnel in soil. To quote from the fascinating book *Trees, Truffles and Beasts"*

> *Ants and other tunneling creatures bring moist, spore-bearing soil to the surface, where it dries. Once dried, the soil and its embedded spores are readily blown about by wind, thereby dispersing the spores for propagation. This mechanism is profoundly important in Australia, with its unequaled abundance and diversity of ants. In the Pacific northwestern United States and elsewhere in the world, gophers, ground squirrels, burrowing reptiles, and other subterranean creatures perform a similar service. Insects, such as grasshoppers and crickets, eat the spores and expel them later, or they carry them about on their bodies.*
>
> *Despite these dispersal strategies, the VAM fungi are often the last to colonize new soils in moist habitats, such as those exposed by retreating glaciers. There, the moist, spore-bearing soils are not readily blown about.*

On the other hand, when VAM hosts are early invaders after fires or other disasters, they are capable of taking over the soil, often keeping out ectomycorrhizal fungi (and, thus, their tree and plant hosts) for decades. And, although spores borne by the jet stream for long distances may be killed by desiccation and radiation, soils provide a long-lasting spore bank, ready to replenish the ecosystem after fires, volcanic eruptions, timber harvesting and other disasters. The spore bank, like its Swiss counterparts, it accepts deposits from all comers, so it contains not just VAMs but also ectos and rot fungi.

Some spores—like some seeds—may need to be activated by fire, although others, which would be destroyed by heat, are protected by being deeply buried. Because of the long lives of the banked spores, the fungi which show up in an ecosystem after a disaster may be different from their predecessors, although they will probably fill the same niches.

### Ectomycorrhizal Fungi

VAM fungi aren't the only ones that produce spores underground. Many ectomycorrhizal fungi produce below-ground fruiting bodies. You know them—they're called truffles. As a human consumer, I'm aware of three types: the Italian Norcia black, the Perigord black, and the Italian Alba white (listed in order of increasing price). In the days before I followed the mycological literature, I thought that truffles were a rarely occurring fruit of gastronomically advanced cultures. I got my first lesson to the contrary when I took a walk in our local woods with Bill Neill and he scanned the ground, dug a small hole, and pulled out a truffle. Truffles turn out to be common as dirt, but—for a variety of reasons—rarely consumed by humans and thus unnoticed. (In fact, the ones consumed by humans are rapidly becoming rare, due to our tendency to overharvest without excreting the spores back into the local landscape.)

As my small contribution to this trend, I recently purchased two minute bottles of preserved black truffles from a shop in Perugia, hoping to repeat at home the delicious risottos I had eaten there. One bottle cost 5 Euros and the other 15; the difference being due to season, so I bought both as an experiment. The other day, I decided to cook a risotto for friends and frugally thought that I'd use the cheaper bottle. When I cut into those black truffles, the inside was white, and they had no flavor or aroma, so I had to open the other, more expensive bottle, whose truffles were flavorful and black all the way through. Goodness only knows why the Italian truffle companies have decided to bottle an unripe product, but it's clear that unripe truffles are bland because the truffle doesn't want to be dug before its spores are ready for dispersal.

As it happened, I cooked my risotto during an interim of reading *Trees, Truffles and Beasts,* so that I became immersed in truffle lore—not gastronomic, but ecological, as the book's well-deserved subtitle is *How Forests Function.* I cannot recommend this book highly enough. The subject matter is fascinating, the writing is beautiful and clear, and the authors are experts in the field. Two (Chris Maser and James M. Trappe) work in our Pacific Northwest and the third (Andrew Claridge) works in Australia, which allows

them to demonstrate the similarities in function across two wildly dissimilar ecosystems, which have evolved separately for 100 million years. (From now on, this group of authors will be referred to as MCT, individual authors by their names.)

Having recently touted the brilliance of the systems devised by mushrooms for getting their spores up and out, it was useful to read this book's summation of the limitations of those systems. It points out that for many fruiting bodies coming up in deep duff or fallen leaves, the spore-bearing portion of the mushroom never gets above the surface (as those of us who have hunted matsutakes or lobsters can attest). Depending upon weather, mushrooms can either rot, freeze, or desiccate before their spores have matured. Citing more recent and less well-known work, MCT write: "Elegant studies by mycologist Michael Allen and colleagues in California showed that nearly all spores produced by mushrooms in forests are deposited within 3 feet of the fruit-body because, even in storms, the air movement at the surface is slow and laminar. Only at forest edges, where air is turbulent, are significant numbers of spores transported farther away." Meanwhile, the truffles are safe underground, protected from the vicissitudes of weather. Of course, this means that they are also protected from wind, so they must depend upon animals to spread their spores.

I knew that animals ate truffles, and I even knew that there are a few animals that eat a *lot* of truffles, with some squirrels depending upon them as major and often sole food sources. What I hadn't known was how many different kinds of animals eat truffles. I knew that the animals that ate truffles spread truffle spores; I didn't know the importance of truffle eaters in overall forest health, or the many ingenious devices by which truffles seduce their eaters, and the behavioral quirks of the eaters, all of which combine so that spores may be spread.

There are believed to be close to five thousand species of truffles worldwide, all of which depend upon animals for propagation. So it's clear that a few squirrels just wouldn't get the job done. Nevertheless, squirrels are extremely adept mycophagists, and seem to have co-evolved with truffles. Consider this: truffles have a tough outer coat, which protects them from dehydration while they mature underground. However, once they have matured and produced spores, if they are not eaten soon, they can rot within their coverings. When a grad student named Martha Kotter observed tassel-eared squirrels in Colorado storing food for the winter, she noticed that they collected both mushrooms and truffles and hung them in trees to dry. But, before they hung up the truffles, they took a bite out of them. This broke the skin and allowed the inner mass to dry. As MCT write, "How did the squirrels know this—by instinct? Did their mothers teach them?"

They also point out that although fungal fruits have low vitamin D levels, Paul Stamets has shown that when dried fungi are exposed to sunlight for six to eight hours, their vitamin D level skyrockets. "Therefore, squirrels that hang mushrooms or truffles in trees to dry in the sun are producing vitamin D supplements in their diets, a habit which might be of particular importance to these furred and sometimes nocturnal creatures."

A wide range of animals eat truffles in our forests, at least occasionally. I wasn't surprised to learn that deer, bear, and elk appreciate truffles from time to time, but 1 was astounded to learn that fisher cats, which I've always thought of as carnivores, have been found with stomachs full of them. Of course, given the wide range of odors produced by ripe truffles (onion, garlic, fruit, cheese, aniseed, sausage, used motor oil, sewer gas, dog feces, etc.), it's completely conceivable that the fisher cat thought that it was eating a dead animal. Then there are the accidental mycophagists, such as the spotted owl, which feeds primarily on the northern flying squirrel and the California red-backed vole, both of which feed primarily on fungi. Insects carry spores around, but they may be less important than the larger animals which carry large numbers of diverse spores to more distant locations. This is of particular importance in reviving areas of forest that have been devastated by, say, fire or logging. Since we now know that truffles enjoy sex, carrying a lot of spores raises the chances of successful matings and, hence, a successful transplant. Lots of spores of multiple species are also helpful in overcoming the risks run by a small number of these very tiny and delicate messengers. What's especially nice is that the behavior of many opportunistic and occasional mycophagists seems to have evolved specifically to revive devastated or newly regrown areas—both on this continent and on Australia. (The obligate mycophagists are less helpful here since they stay within the healthy old growth areas—after all, that's where the truffles are.)

For example, in the Pacific northwest, "deer mice and chipmunks may eat fungi in the forest but then travel into adjacent openings, such as clear cuts or burns, to forage for seeds, fruits and insects." Of some Australian forests, Andrew Oaridge writes, "I have noted that individual long-nosed potoroos will routinely move from mature forests to neighboring younger stands regenerating from logging or fire and vice versa. In making these forays, the potoroos carry spores from truffles excavated and consumed in the forests and deposit these in their fecal pellets within the younger stands. Conversely, ingested spores from truffle species peculiar to the young stand may then be deposited back into the forest on the return trip. This behavior is common to a number of other mammalian mycophagists, including bandicoots and small rodents such as the bush rat." Among the devastated environments which have been (or are being) revived by mycophagist's scat are volcanic lava flows from the Mount St. Helens eruption and the ground exposed by the retreating fronts of glaciers.

Australia, parts of which are notably arid, hosts about 1,500 of the world's (more or less) 5,000 species of truffles. Because conditions are often too dry for above-ground fungi, truffles play the major fungal role in these acada- and eucalyptus-dominated forests, where the greatest destructive force (apart from humans) is fire. One Australian truffle genus, *Mesophellia,* is fire-adapted in a typically truffle-ian manner: fire changes the odor of the truffles from mild and nut-like to a strong, rotten onion aroma. This odor seems to incite wallabies into a feeding frenzy, where they use their claws to dig deeply, apparently eating both the stinky and the more deeply buried, milder truffles, and—as lagniappe—opening up the burn sites to expose more fertile soil.

The arid Australian soil tends to become hard-packed and hydrophobic so that when it does finally rain, the water simply runs off. (We see this in many of our own deserts, where rain runs off the parched soil to cause flash floods.) The places where it does sink into the soil are the holes left by the truffle eaters, digging out their meals. This digging also mixes nutrients into soil. These unexpected benefits of truffle consumption occur world-wide, leading MCT to write, "it has been suggested that, where mycophagous mammals have gone missing from the local fauna, the general quality of the soils declines." That the importance of mycophagy in forest management is becoming more widely appreciated, is indicated by the Colorado Mycological Society's *Spores Afield*

*cont. on page 6*

**How Underground Spores Move,** *cont. from page 5*

(July 2009), in which Dr. Jack States (a Rocky Mountain wildlife ecologist with a special interest in truffles) writes that "forest managers have selected tassel-eared squirrels, *Sciurus aberti,* to be the official indicator of forest health and ecosystem sustainability."

There is one form of transport that terrestrial fungi do not seem to use, and this is via ocean currents. At least so I deduce from an article in the 2008, *48*(1) issue of the Finnish mycological journal *Karstenia,* entitled "Wood-rotting basidiomycetes of Svalbard (Norway)." The article starts, "Svalbard comprises several islands in the northern part of the Arctic Ocean. No larger tree species grow on the islands, but driftwood and construction timber have accumulated on the islands during the last 200 years." Although 152 observations of basidiomycetous fungi on wood were recorded, all of these were on construction timber. The authors examined several hundred driftwood logs, but did not find a single fungus. I can well imagine that long immersion in seawater might inactivate even the toughest terrestrial fungus (or render its home uninhabitable), but I'd be interested to hear from anyone who has knowledge to the contrary. (This does not, of course, refer to the small number of true fungi that actually live on wood submerged in salt water, including two tiny puffballs, *Nia vibrissa* and *Digitatispora marina,* which I learned about from the always informative *Mainely Mushrooms 24*(2).)

## TURKISH ACADEMICS DISCOVER THE *MORCHELLA ANATOLICA* MUSHROOM

**Betül Çal**

*Hürriyet Daily News & Economic Review*, Dec. 8, 2009

ANTALYA, TURKEY - After nearly 20 years of cataloging and categorizing Turkey's fungi, scientists at Muğla University have discovered a new tmushroom unique to Turkey's mountain slopes: *Morchella anatolica*.

The discovery was first published in *Mycologia*, an international scientific journal, and has attracted attention from international science organizations and the Turkish academic world.

Dr. Hakan Alli, an academic at the biology department of Muğla University, told the *Hürriyet Daily News & Economic Review* that their years-long work on the fungus has resulted in the discovery of a completely new type of fungi, or mushroom, in the Elmali village of Muğla's Ula district.

"During my academic studies in different parts of Turkey, I had the chance to scan different regions in terms of the fungus variety, and I can safely say that I have never detected this type before," said Alli.

Agreeing with Alli, Professor Mustafa Işıloğlu said he has been studying fungi since 1989 and has never seen this variety of mushroom in any parts of Turkey other than Elmali village.

*Morchella anatolica*

"It may be possible to find it in some other regions, but neither I nor my colleagues have seen such a type during our 20 years of work. This is a first," he said.

Emphasizing that this is an important study initiated by a Turkish university and Turkish academics, Işıloğlu said they preferred to call their new discovery *Morchella anatolica*, meaning it is a species of the Morchella fungi family pertaining to Anatolia.

"There are 40 different types of Morchella fungi on Earth, and *Morchella anatolica* is the 41st type," he said.

Marking the trading potential of the new mushroom, Alli said the meadow mushroom from which *Morchella anatolica* comes has an important commercial value, so the value of this type must at least be at the same level if not higher.

"The meadow mushroom sells for 70 to 80 [Turkish] liras per kilo today. Although the trading value of *Morchella anatolica* has not been determined yet since it is not consumed in the domestic market, we expect it to be higher," he said.

However, the new type of mushroom faces the danger of extinction since it exists in very small amounts, and there is no possibility to cultivate it in laboratory conditions.

"We struggle to keep the current amount since we cannot grow it artificially for now. So we never encourage the local people to consume this mushroom because it is a first and open to developments in time," added Allı.

Moreover, Muğla University has collaborated with British academicians for two years during the studies on *Morchella anatolica*, which has given an international perspective to the project.

*I got lost in the woods one day*
*I just couldn't figure my way*
*I couldn't get out*
*No one answered my shouts*
*So I just decided to stay*

*—Charmoon Richardson*
*SOMA News, Sonoma Co. Myco. Assoc.*

## FUNGI COULD BE THE DEATH OF STYROFOAM CUPS

**Stephen Messenger**

www.treehugger.com, Dec. 2, 2009

For years now, coming into contact with polystyrene, or as it's better known, Styrofoam, has been nearly unavoidable, despite the well-documented hazardous effects it has on the environment—namely, that it can't easily be recycled nor does it biodegrade. Oh, and it's petroleum based, too. As a result, far too much of the 35 million tons of the stuff produced yearly ends up floating in our oceans, lakes, and streams or blowing like tumbleweed through our streets and parks, years and decades after it served its brief role as a disposable coffee cup or carrying case for your leftovers.

But, with the advent a completely biodegradable material derived from fungi and the roots of agricultural residues that has the same performance as polystyrene, the death of Styrofoam may finally be at hand—so say the two inventors of the EcoCradle.

Efe Eben Bayer and Gavin McIntyre, both graduates of Rensselaer Polytechnic Institute in New York, say the idea for the eco-friendly material was inspired by observing wild fungi roots. The pair went on to found the company Ecovative to promote their idea, which has already received praise from the Environmental Protection

Agency, the U.S. Department of Agriculture, and the National Science Foundation.

Along with the support that EcoCradle is garnering from environmental groups, manufactures, too, seem keen on the idea of going green. The pair has already received orders for 100,000 units of their innovative product for 2010. As the demand increases for eco-friendly products and companies that are using polystyrene now are encouraged to jump on board, more great, green innovations are bound to follow.

So, with the creation of alternative, eco-friendly material to replace the hazardous material used predominately today, the death of Styrofoam should be swift and clean. Sadly though, its white, petroleum-based ghosts will be haunting us for years to come—to remind future generations, perhaps, of a time before consumers demanded environmental responsibility

## FEMALE PLANTS MORE LIKELY TO BE COLONIZED BY MYCORRHIZAL FUNGI THAN MALE PLANTS

**http://7thspace.com**

Nov. 15, 2009

The war between the sexes has been fought on many fronts throughout time—from humans to birds to insects, the animal kingdom is replete with species involved in their own skirmishes. A recent study by Dr. Sarah Eppley and colleagues at Portland State University published in the November issue of the *American Journal of Botany* (www.amjbot.org/cgi/content/full/96/11/1967) demonstrates that certain plants, with some help from fungal friends, may also be involved in this fray.

Most flowering plants form symbiotic relationships with mycorrhizal fungi. The plants produce food that the fungi need to survive, and the fungi provide several benefits to plants. They may assist the plants in nutrient uptake, provide protection against fungal pathogens that would harm the plants' roots, and improve the soil structure. With the many benefits these mycorrhizal fungi provide to plants, they have the potential to play a significant role in shaping plant populations.

Interactions between the plant and the mycorrhizal fungi may be influenced by the genetic composition of the plant. This raises the question: for species with separate male and female plants, do interactions with mycorrhizal fungi vary between the sexes and consequently play a role in the male/female structure of the population?

"We know that male and female plants often differ in physiology, but little is known about whether the sexes differ in their interactions with other organisms," Eppley noted. "If males and females differ in how they interact with organisms in their community, such as with mycorrhizal fungi, then we expect a cascade of effects within a community."

Eppley and colleagues analyzed mycorrhizal colonization of roots of male and female members of the marsh grass *Distichlis spicata* to determine whether the sex of the plant influences the interaction between the plant and mycorrhizal fungi.

In populations of *D. spicata*, males are found almost exclusively in habitats that have a low nutrient concentration and females are found almost exclusively in habitats with a higher nutrient concentration. The relationship between *D. spicata* and mycorrhizal fungi is known to have a significant effect on the health and reproduction of the grass. If *D. spicata* exhibits sex-specific interactions with the mycorrhizal fungi, this distribution may be due to those interactions.

Eppley and colleagues found differences in mycorrhizal colonization between males and females. Female plants were more likely to be colonized by the mycorrhizal fungi than male plants. Although some of the plants they studied had not yet reached reproductive maturity, these immature plants also showed the same pattern of sex-specific colonization.

Intersexual competition has been hypothesized to be a likely cause of the spatial segregation of the sexes in *D. spicata* populations. It may be that the female plants, with the assistance of mycorrhizal fungi, are able to out-compete the male plants for the coveted phosphorous-rich sites within the marsh.

"Although intersexual competition in plants has rarely been studied," said Eppley, "understanding the differences in how males and females compete is important because it is likely to play a role in the evolution of population sex ratios."

## PRESIDENT'S MESSAGE

**Patrice Benson**

May your New Year be filled with happiness, good health, and, of course, mushrooms!

You will notice a few new additions to our mushroom-related offerings in the new year.

**New Classes**: In an effort to increase the pool of identifiers for our Monday ID sessions as well as for the field trips and the mushroom exhibit, we will be focusing on sharpening mushroom ID skills in this new year. Our ID chair, Brian Luther, and our ID coordinator, Hildegard Hendrickson, will be helping evaluate our needs and resources.

We will be offering more classes, owing to increased demand. There will be a four-session beginner class January 14, 21, 28, and February 4. Some beginners have been known to take this course multiple times! The times, dates, and registration information are listed both on our website, www.psms.org, and on page 2 of this newsletter. Intermediate classes will be offered in March/April, dates to be announced later.

Dr. Joe Ammirati will be assisting in this endeavor later in the summer. More information about this will be forthcoming.

We would like to have a beginning mushroom-teaching seminar for teachers. If anyone is interested in helping please call Patrice at 206–819–4842.

**Members-Only Info:** In an effort to control (somewhat) the enthusiasm surrounding our field trips, which are a benefit of membership, we will be restricting the information about these events in the Members Only section of the website. This information will be inserted in the printed copies of *Spore Prints* but will be placed in the password-protected members page on the website. This allows the main body of the *Spore Prints* to remain available on the World Wide Web for all to peruse and enjoy. Thank you, Agnes Sieger, for editing the newsletter for more than 25 years.

We are also forming a members-only web list to communicate time sensitive and field trip information. If you are experienced in large numbers of list communication, please call me at 206–819–4842, as we need some help deciding exactly how to do this!

*cont. on page 8*

## President's Message*, cont. from page 7*

**Election:** The PSMS elections take place each year in February. Each single membership has one vote and family memberships have two votes. This year we are voting for President, Treasurer, and five trustees; details of the candidates will be in the February issue of *Spore Prints*. You must be a current member to vote, so get your membership renewal fee in before January 15 to receive the February *Spore Prints* and a ballot. Winning candidates will be announced at the March Survivor's Banquet which takes the place of our regular monthly membership meeting.

**Dyeing & Felting Workshops:** There will be a mushroom dyeing workshop sometime this spring as well as a needle felting class. Look to the next issue of *Spore Prints* for times and dates.

*Have a safe, healthy, and happy new year!*

## FUNGUS THREATENS DOUGLAS FIRS IN CALIFORNIA

**Melissa Murphy**

*Daily Democrat*, Woodland, CA, Dec. 16, 2009

The threat of Sudden Oak Death, caused by an invasive fungus, *Phytophthora ramorum*—which has caused damage to several tree species in Oregon and California, including Douglas firs—has officials with the California Department of Food and Agriculture keeping a close eye on trees crossing the border.

"They weren't expecting high traffic," said Jay Van Rein, spokesman for the CDFA. "We're making sure that individual trees don't cross the border by people who didn't know about the quarantine. One is too many in this case."

So far, only one county in Oregon is under quarantine, Curry County, which is about 17 miles north of the California border.

## WILD MUSHROOM BREAD PUDDING

**Hildegard Hendrickson**

1 medium onion, sliced
2 garlic cloves, minced
1 tablespoon butter
8 ounces coarsely chopped wild mushrooms
2 cups whole milk or cream
2 eggs
½ teaspoon salt
¼ teaspoon pepper
½ teaspoon rosemary
4 cups packed 1-in. cubed bread
¼ cup shredded Parmesan cheese

a. Preheat oven to 350ºF.

b. In a saucepan over medium heat, sauté the onion and garlic in butter. Add the mushrooms and cook until soft.

c. Whisk together the milk or cream, eggs, salt, pepper, and rosemary. Add the cubed bread and let it soak 20 minutes. Once the bread has absorbed most of the liquid, add the mushroom mixture and cheese, and stir together.

d. Bake in a 10-in. dish for about 45 minutes or until a knife inserted comes out clean, (*serves 6*)

***Aflatoxin***

*If you happen upon moldy nuts,*
*Best eschew them, no ifs, ands, or buts!*
*Their foul aflatoxin*
*Will spread like a pox in*
*Your liver, destroying your guts.*

—Tim Alborn

**Note user name and password in block on page 2.**



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