SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 403 June 2004

## *AMANITA PANTHERINA*, THE PANTHER *AMANITA*

**Brian Luther**

As PSMS member Karen Boyden found out the hard way (see related article on "Puppy Poisoning" on page 5 of this issue), *Amanita pantherina*, the Panther Amanita, is widespread in the Pacific Northwest, both in the city and in the countryside.

### Habit and Habitat

*Amanita pantherina* is mycorrhizal with and scattered to gregarious under confers, but in the PNW it is most commonly associated with Douglas Fir (*Pseudotsuga menziesii*). It usually fruits in the spring, but occasionally in summer or fall.

It's been my experience over the years that even though spring is the real season for this species, it's rarely found in any quantity and is only infrequently brought in to me for identification on field trips. I'd say that perhaps just a few sporocarps are brought in on all the spring outings, which is very little material. It isn't clear to me why so few are collected and brought in to the spring field trips, because this is its season. It's rarely brought in during fall.

The most abundant fruitings of this species that I've ever seen in my life occurred in pure stands of Douglas Fir (*Pseudotsuga menziesii*) in Fort Lewis and in Camp Murray (a large Washington National Guard reserve adjacent to Fort Lewis) that contained maybe 150 to 200 year old trees on average. When still in the Army National Guard I used to have to take courses, go to the firing ranges, and have training and FTX exercises (Field Training Exercises) in Fort Lewis and Camp Murray, and when there in spring I was amazed at how abundantly *Amanita pantherina* grew mycorrhizally associated with these pure stands of Doug Fir.

This general area of Pierce County, Washington, is somewhat arid, with a microclimate much like that of the San Juan Islands—lower rainfall because of the pronounced rain shadow caused by the Olympic Mountains. This general area of Pierce County is one of the only places where you can find Ponderosa pine (*Pinus ponderosa*) and Garry Oak (*Quercus garryana*) growing naturally in western Washington. Interesting. I've never seen large fruitings of *Amanita pantherina* in Eastern Washington.

Every year is different, and perhaps the extra dry conditions we've experienced here in the PNW this late winter and spring might result in some unusual fruitings of any number of fungi, including *Amanita pantherina*.

### Description

*Amanita pantherina* caps are 5–30 cm broad, convex, or becoming plane or expanded further to an uplifted margin with age. The caps are moist and viscid when fresh with a clearly striate margin and are covered with regularly spaced or scattered whitish to cream colored, flat to conical patches of universal veil tissue (or warts) at maturity. The cap color varies from tan to brownish tan, buff, yellowish-brown, dark brown or even a brassy brown and is usually slightly lighter at the margin.

The gills are free (not touching the stem), close, somewhat wide, white, and with a distinctly crenulate, eroded, or scalloped edge.

The stem is 5–15 cm long and up to 2.5 cm wide, tapering upward, with an enlarged bulbous base. It is white, smooth, and silky above the annulus and fibrillose roughened below.

The species has a membranous, white partial veil (annulus), centrally located or more often superior on the stem. The veil is cottony to fibrillose, and becomes ragged and torn with age and hanging on the stem.

The volva has a distinctly free collar or lip around the top of the bulb, with some fibrillose zones.

The spores are white in deposit, 9–12 × 6.5–8 µm in size, elliptical, smooth, and inamyloid.

### Toxicology

*Amanita pantherina* contains ibotenic acid and muscimol, nervous system toxins which disrupt the normal neuro transmissions in the brain. The first effects can begin within a half an hour of ingestion. Muscles begin to twitch, the face gets flushed, followed by dizziness, delirium, and possibly vomiting. Then after a while the victim gets really sleepy. Eating small amounts of the mushroom will cause an intoxicated drunkenness, and the person effected normally becomes unconscious. The effects are profound and can be likened to a grossly overexaggerated drunken stupor, with other unpleasant symptoms. This pronounced inebriation syndrome can, briefly, result in some pleasant thoughts and symptoms, but these are usually short-lived and normally the symptoms are predictably to violently unpleasant, depending on a number of factors, such as how much mushroom was eaten and the consumer's size, weight, sex, and emotional state. Very deep sleep with vivid dreams (pleasant and unpleasant) is a characteristic of intoxication.

A large enough dose can be fatal. Most people eventually fully recover from a smaller dose. However, others are permanently emotionally scarred by the experience, which may result in many unseen problems in the future.

## BEGINNER'S CLASS LAST SESSION

The final session of the spring beginners class will be held 6–8 PM on Sunday, June 6, in the Douglas Classroom at CUH. Subjects will include compass setting, maps, safe hunting practices, preservation and cooking of mushrooms, and assorted other aspects of artistic merit. Any PSMS member may attend by bringing $7 to cover the cost of room rental and supplies. Those who have registered for the class will not need to contribute.

# Spore Prints

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**PUGET SOUND MYCOLOGICAL SOCIETY**

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## CALENDAR

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|---|---|
| June 5 | Field Trip, Chatter Creek Campground |
| June 6 | Last Beginner's Class, 6–8 PM, Douglas Classroom, CUH |
| June 8 | Membership Meeting, 7:30 PM, CUH |
| June 12 | Field Trip, Swauk Creek Campground |
| June 14 | Board Meeting, 7:30 PM, CUH |
| July 3 | Summer Picnic, noon–4 PM, Steward Park |
| July 10 | TrailsFest 2004, Rattlesnake Lake, North Bend |
| July 19 | Board Meeting, 7:30 PM, CUH |
| Aug. 16 | Board Meeting, 7:30 PM, CUH |
| Aug. 24 | *Spore Prints* deadline |
| Sept. 14 | Membership Meeting, 7:30 PM, CUH |

## PSMS DISCUSSION GROUP — John Goldman

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. By signing up, you can send a message using only one address (psms-members@groups.yahoo.com) and have it reach everyone who also has registered—no need to maintain individual e-mail addresses for all PSMS members!

There are two ways to sign up. The simplest way is to e-mail subscribe-psms-members@groups.yahoo.com and you will be added to the list and only get e-mail. If you want to get e-mail and have access to the Web-based features of Yahoo Groups, go to http://groups.yahoo.com/group/psms-members. Follow the link that says "Join this Group." (You will need to sign up for a free Yahoo Groups membership if you do not have one already.) By joining this way, you can access the e-mail from any computer (not just the e-mail inbox of your computer), search messages, and have access to the photo section and the "file" section where other documents are stored (recipes, PSMS bylaws, etc.)

## MEMBERSHIP MEETING

Tuesday, June 8, 2004, at 7:30 PM at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle

The June meeting features Storm of the Olympic Park Institute. Storm has written about primitive uses of fungi and his experiments in mycophagy for the *Bulletin of Primitive Technology* and *Mushroom, The Journal of Wild Mushrooming*. He will tell us about eating neglected or avoided mushrooms, and talk about some of the Stone Age and Bronze Age uses of fungi. To conclude, Storm will, with burning intensity, build a smolder and then a fire using a wooden drill, polypore tinder, and lots of sweat and muscle.

After the demonstration, we will be celebrating our volunteers with a brief announcement and the usual food and mingling.

If your last name begins with the letters N to Z, please bring something festive and maybe even primitive to share at the meeting.

This is the last PSMS membership meeting until September 14.

## BOARD NEWS — Ramona Owen

Flowers and a card were delivered on behalf of the club by Karin Mendell to Joy Spur, who would appreciate hearing from members as she recuperates. Membership renewal reminders were mailed out; those folks will not receive *Spore Prints* until subscriptions are renewed. The new PSMS roster will be printed this summer after membership data are updated. The treasurer's report included a discussion about rolling over the club investments into a CD or Treasury Note, comparing the yields and maturation dates, with a decision tabled pending more research by John Goldman. A microscopy class to be taught by Judy Roger is being developed; the date, to be announced, will be either June or September. PSMS has eight working microscopes and five that need various levels of repair. The Board agreed on $500 microscope repair budget. Ron Post offered to build microscope cases this summer. Field trips have been going well. Ron Post reported that several young members were very interested in the cultivation kits from Fungi Perfecti that PSMS made available to them on the last field trip. The Circle 8 field trip was attended by 40 people; Dave Hunt reports that the cabins have been refurbished. Park rangers informed the field trip group that a cougar had been sighted in the fields and to make sure any kids were especially warned of its presence. Certain book costs for serious PSMS identifiers may be underwritten by the club. The Fall Wild Mushroom Exhibit will be co-chaired by Ron Post and an as-yet-to-volunteer member; your support and enthusiasm are much needed. All the steps and contacts for the job have been meticulously recorded by immediate past President, Karin Mendell, who, with past co-chair David Hunt, will mentor this year's co-chairs. Funds will be allocated for an Environmental Display by Karen Behm. We still need a few volunteers to help with the TrailsFest.

## 29 PINES FIELD TRIP REPORT — Brian and Arnica Luther

Leaving Seattle early Saturday morning, May 15, we were looking forward to a day of pleasant weather and, just possibly, a little luck finding a few morels, too. When departing from Seattle to 29 Pines, weather conditions were satisfactory, to say the very least, with mellow temperatures and crisp, clear skies. Its perfection was altered with time, however, as the horizon's appearance

became increasingly formidable. After making the mandatory stop at the Cle Elum Bakery for some fresh maple bars (and Owens Meats for pepperoni, beef jerky, and smoked salmon), we proceeded toward our destination. Soon, snow-covered Mt. Stuart was in view and loomed ahead of us as our beacon to the field trip campground, which is 13 miles up the beautiful Teanaway River Valley Road. Blue Camas was abundant and in full bloom in many places along the sides of the roads and in the meadows by the river, and the whole area seemed so inviting.

Our new president, Ron Post, was the host for the day. He camped out Friday night and so was well prepared with coffee and snacks for the 31 people who signed in at the campsite. As an added surprise, Ron was giving out free mushroom cultivation kits to all the kids under 18 who came along. Thanks, Ron, we couldn't have done it without you.

An old friend and previous member of PSMS (in the '70s), Scott Chilton, had made special plans to come to this field trip all the way from North Carolina. Scott is now Prof. Emeritus of Botany at North Carolina State University at Raleigh, NC, and just retired last year. He was formerly Assoc. Professor of Organic Chemistry at the University of Washington, leaving around 1980 for an advancement. He has a special interest in the chemistry and toxicity of the central nervous system toxins found in the *Amanita muscaria*, *A. pantherina*, *A. gemmata* group and was hoping to either find or have some *A. pantherina* brought in to this field trip. Although primarily a spring mushroom, *A. pantherina* is only rarely brought into the field trips, and although he didn't get any of that species, a nice collection of several of the yellow form of the spring *A. muscaria* were found, and he was glad to get them for his research. I introduced him to the group, and it was great to see Scott after so many years. We're delighted that he still has an interest in active research related to fungi. He just sort of disappeared before potluck, and I was hoping to get a chance to talk with him more, but maybe we didn't communicate our dinner plans to him very well. Just maybe we'll get lucky and Scott will come visit us a little more often, but 3,000 miles is a long way to come to a field trip.

If you go to the NCSU Botany website http://www.cals.ncsu.edu/botany/Directory/faculty.html, Scott is the fourth person from the left, on the back row of faculty. For those of you interested, Ron Post has some excellent digital photos of Scott and others at this field trip.

Just before potluck, there was a change in the weather which was first noticed as a shrouding of the jagged, majestic peaks of Mt. Stuart in the distance. The PSMS members who stayed until the end were being cheerful and optimistic and would not let something such as the sudden, soaking rain dampen their hardy spirits. Instead, they tucked themselves happily under trees and warmed themselves next to the glowing fire as the menacing clouds began to move on their way. The fire, provided by the Lennebackers and some friends, was a very hospitable spot for dinner. The potluck, as usual, was very satisfying with spaghetti, two four-bean salads, a spicy soup, and other fine delicacies only possible through the efforts of our members. The experience was, in the very least, wonderful.

Conditions were much drier than I can ever remember at this location and time of year, so we didn't have the luck we were hoping for. But a few meager collections of morels were found. Some were in good condition, but most were already somewhat desiccated. There have been years when lots of morels could be found right in the campground, but this wasn't one of them. This is a peculiar time of year when both *Verpa* and true morels can be found at the same time, and several large *Ptychoverpa bohemica* were brought in. We had 35 different species of fungi on the ID table, but nothing was found in abundance. One family was lucky enough to find a downed cottonwood by the river with a good sized fruiting of Oyster Mushrooms (*Pleurotus ostreatus*) growing on it, which was a good find in these otherwise sparse fungal conditions. Arnica and I went out for a while by ourselves, but being unsuccessful at finding fungi, we did some botanizing and plant collecting. Marian Maxwell brought a beautiful *Boletus* that they had collected previously at the ocean. It was of the *B. pulcherrimus*, *B. hematinus* persuasion, but had some characters which made it quite distinct from those species in the literature.


Ron Post

*A happy Verpa hunter,*
*29 Pines field trip, May 15, 2004*

Our earlier optimism about both the weather and collecting success would end up needing some revision, but we all had a fun day anyway.

*Brian Luther, Scott Chilton, and Arnica Luther,*
*29 Pines Campground, May 15, 2004*

## UPCOMING FIELD TRIPS — Cathy Lennebacker

**June 5** — **Chatter Creek**
**(**elev. 2400 ft, 150 miles east of Seattle)

This lovely spot is reserved for the whole weekend, including camping Friday and Saturday nights in the group site. Trailhead passes are needed within ¼ mile of established trails. Find late morels while hunting for spring boletes. *Host: Mike Lovelady.*

Driving Directions: Take Hwy. 2 over Stevens Pass and proceed 34 miles to the first Leavenworth intersection. Turn right and proceed 16.1 miles up Icicle Road to the Chatter Creek campground. Follow the PSMS signs to the group site. You can also take I-90 over Snoqualmie Pass to exit #85 and go over Swauk Pass to Hwy. 2. Turn left, go through Leavenworth to the north side, turn left on Icicle Road for 16.1 miles, and follow the PSMS signs.

**June 12** — **Swauk Creek Campground**
(2500 ft elev, 110 mi. east of Seattle)

Meet at the picnic area. Camping is available in the adjacent campground. *Host: Doug Ward.*

Driving Directions: Take I-5 over Snoqualmie Pass to exit #85. Follow Hwy. 10 east of Cle Elum for 2½ miles. Turn left onto Hwy. 970. After 7 miles bear left onto US Hwy. 97 (north) and continue another 16 miles. The campground is on the right. Swauk Pass is 4 miles beyond the campground.

## PRESIDENT'S MESSAGE — Ron Post

Not all amateur science clubs can boast about their public exhibits for 40 years running. This October's show will potentially be our 41st in a row thanks to the knowledge and dedication of you mushroomers past and present. If you ask me, our current contingent of club members is quite formidable, and I'm looking forward to a good exhibit. To all of you, Dr. Joseph Ammirati, our board, and others who help staff the exhibit, I'm thankful.

The whole experience of being in our club and working together is not an easy one to describe. Perhaps, in matters like these, it's best to turn to an articulate person such as the Nobel Prize-winning poet, Wislawa Szymborska: "On the road to perfection, it's wisest to stop a few steps short of the finish line, since it may turn out that the finish line will be found hanging over a cliff." How's that for wisdom?

We are not exactly running off a cliff, but we are definitely stopped short of the finish line as far as the exhibit goes. There is still no chairman. And despite what some people may think, this is a not a job that falls back on the president when no one else shows up to do it.

Oh, Wislawa! Like you I don't really crave perfection. I have asked a number of people to become co-chairs, and it's a bit like glimpsing a colorful slime mold as it dries up and fades from view. Help, Wislawa! You, who penned: "Nature, left to its own devices, is diabolically inventive."

I think the board of trustees does not wish to travel over any cliffs. So, being diabolically inventive, they will allow me to take up to three or four volunteers to share this job.

Any of you with some experience can help. We'll divide up the duties for the October exhibit in a way that will significantly lighten the workload. The committee chairs are already in place.

Of course, one person stepping up to the plate would be the best thing. We do need a chair who will be on-site (I will be at my nephew's wedding in California) and coordinate a list of tasks for that one weekend. But we'll make do with what we get. I will coordinate the exhibit until then, but only until we get people to run things.

The thought of me chairing the annual exhibit might cause even the great Szymborska, who had a kind word for everyone, to express careless, critical remarks.

By the way, this spring I've met at least a dozen newer club members from a variety of backgrounds and cultures. I hope to visit with many more of you at the picnic in July and other upcoming events.

## PROTECTING A NOBLE FUNGUS — Ron Post

There may not be any old-growth noble firs (*Abies procera*) standing in your backyard, but in a manner of speaking there really are, and some of them are home to *Bridgeoporus nobilissimus*, the new name for what used to be called *Oxyporus nobilissimus*.

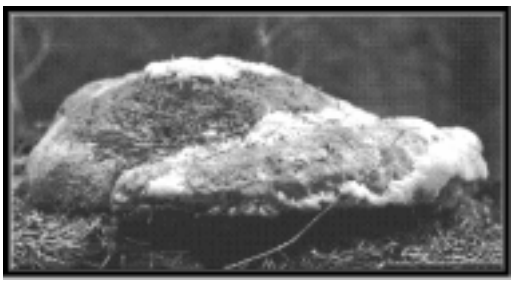
Two of our members are involved in protection of this rare, giant polypore found almost exclusively on noble firs or stumps. Joe Ammirati, who co-published the new genus (see Tom Volk's Fungus of the Month for June 1997 or *Mycotaxon, 60*: 387–395, 1996), and Judy Roger, who lives in Gladstone, Oregon, have been keeping an eye on several of the known specimens.

Judy and others surveyed an area on Mount Hood for this species and, according to Dr. Ammirati, "It's relatively common in Mount Rainier National Park." Joe has loaned a specimen to PSMS in the past to display at our exhibit, and the fungus in the wild is reported to have algae and vascular plants growing from the organic material built up in its cracks and crevices. Both Joe and Judy are keeping an eye on the specimens they know about, and the fungus may also be keeping an eye on them.

The governments in charge of protecting rare species have more than one way of managing land where *Bridgeoporus* grows, and the bureaucratic language describing that system is … pretty bureaucratic. It's sufficient to say that a botanist is called out to find specimens if the land is in danger of being thinned, roaded, or logged.

*Bridgeoporus* was the first fungus to be listed by any government agency as an endangered species. The USDA Forest Service (Forest Ecosystem Management Team, or FEMAT) has listed it as a sensitive species.

*Abies procera* is common at mid-to-high elevations in the Cascades and found elsewhere along the Oregon coast. It can be told from the California red fir by the "groove" running the length of the needle on top, and its unique cones. The specimens of *Bridgeoporus* growing on it extend from Mount Rainier south to Mount Hood and into Oregon's central Cascades. Specimens are also known from the coastal mountains of both states.



*Bridgeoporus nobilissimus*

## PSMS SUMMER PICNIC JULY 3

**Where:** Seward Park Shelter #5 (same shelter as last year)
**When:** Saturday, July 3, 2004

Early birds can come and share coffee/tea and breakfast treats. The picnic lunch starts around noon and lasts until 4 PM, but some of us will be nibbling all day!

**Directions:** Go to the west side of Mercer Island and swim across the lake or, from Seattle, take I-5 to I-90, get off at exit 3 (west side of Lake Washington), go south on Rainier Ave S. about 3 miles, and take a left onto S. Orcas Street, heading east. South Orcas Street ends at Seward Park after intersecting Lake Washington Blvd. S. Once in the park, continue to drive up the hill to the first parking lot on the right. Shelter #5 is nearby. (PSMS signs will lead the way once you are in the park.) If there are lots of events in the park that day, we can carpool folks back and forth from the shelter. But if park workers stop you en route, indicate that PSMS does have reservation and you need to unload.

**Food:** Please bring a potluck salad, side dish, or dessert to share. Bring your own meat to barbecue, buns, sauces, eating and serving utensils, and sunscreen (hopefully). Drinks, plates, cups, charcoal, and lighter will be provided by PSMS.

**Facilities:** Shelter, tables, grills, tennis courts, kids' playground, rest rooms.

**Activities:** Bring any games you'd like to share such as badminton or croquet sets. There are also trails through or around Seward Park, swimming, Frisbee catching, kite flying, boating (a public boat ramp is nearby), bicycling, and mushroom hunting (in July?).

## PUPPY POISONING

**Karen Boyden**

Our family had an extremely close call in mid-April with our two 12-week-old Cavalier King Charles Spaniel puppies. This breed is a toy spaniel, so they weighed only 10–11 pounds at the time. Our saga began as the two, Moby and Toby, were romping around our yard and spending some time "grubbing" under some fir trees with rhododendron understory. At one point I spotted Moby with a whitish mushroom in his mouth and immediately threw it away. Our family was on our way out for the evening, but since Moby threw up twice before we left (within an hour of ingestion), we felt safe leaving him since he "emptied his stomach."

Five hours later, our family arrived home to find Moby unable to keep his feet under him, heavily salivating, having difficulty breathing, and seizing. We found a 24-hour veterinarian clinic open and wondered if he would survive the 10-minute trip there. The vet immediately sedated him with Valium, warmed him as he was hypothermic, drew blood work to check his kidney and liver function, took a chest x-ray, gave him oxygen, and eventually pumped his stomach and got *more* mushrooms out! We reluctantly left him at the clinic overnight, where he almost died around 4 AM with what the vet thought was cerebral edema, which she treated with Mannitol. It wasn't until 7 AM that the vet was comfortable telling us Moby would survive, $1000 later!

In attempting to identify the culprit on the Internet, my son and I came up with the Death Cap mushroom (*Amanita phalloides*) which has a course that can result in death 7–10 days later owing to irreversible liver failure. Not wishing to spend the week worrying and wondering, we took our sample mushroom to Dr. Ammirati at the University of Washington Botany Department. He was kind enough to identify our mushroom and educate us about mushrooms in general. Although we were correct in identifying our mushroom as an *Amanita*, luckily, it was an *Amanita pantherina* which meant our dear Moby was not in danger of dying a slow death. With deep appreciation to Dr. Ammirati, we were able to celebrate the survival of our little friend.

We learned the "hard" (and expensive!) way that we have toxic mushrooms in our own backyard!

*Karen Boyden/Dan Gottlieb Family: Aaron, Zachary, Ethan, Genevieve, Moby and Toby*

## WHAT'S NEXT—GREEN FLUORESCENT MUSHROOMS?

**Kelly Ivors,**
*Mycena News,* via *Mycolog,* Humboldt Bay Myco. Soc., April 2004

Have you ever seen a jellyfish glow, sometimes giving the ocean a luminous gleam of fluorescent light? Or found glowing bits of fungus-colonized wood along outdoor trails at night? Special proteins are responsible for this "bioluminescence," which can be seen in many forms of life—from fireflies, to fungi, to sponges and squid.

*Aequorea victoria* is a brightly luminescent jellyfish. It has a cytoplasm that is densely packed with granules containing green fluorescent protein (GFP), a photoprotein that absorbs blue light and re-emits it as green fluorescence. The GFP gene of this jellyfish was originally isolated in 1992, and since then (to the amazement of many investigators), this gene or derivatives thereof have been successfully transformed into a variety of organisms, including bacteria, nematodes, yeast, mammals, fruit-flies, plants, and yes…even fungi. Numerous variations of this gene have been produced for optimized expression in different organisms.

The vast majority of studies utilizing GFP expression in fungi have been with yeast. Presently GFP expression has been reported in over 18 species of fungi, including *Agaricus*, *Aspergillus*, *Botrytis*, *Fusarium*, *Ganoderma*, *Schizophyllum*, *Trichoderma*, *Ustilago*, and *Phytophthora* species.

GFP is currently a popular tool used by scientists for many reasons. It can be utilized as a molecular lantern, illuminating events going on inside fungal cells with the aid of microscopy. Nucleus-targeted GFP in the mold *Aspergillus nidulans* allowed visualization of nuclear migration and mitosis, detailing for the first time the behavior of nuclei at various stages of fungal cell development. Mitochondria of *A. nidulans* were also tagged and their migration within growing hyphae was observed (see the "glowing!" video at http;//www.unimarburg.de/mpi/movies/ mitochondria/mitochondria.html).

GFP can also be used to visualize fungi in their environments. Whole fungi have been labeled with GFP for tracking their growth and colonization within plants and soil, to monitor their distribution, and to estimate their biomass. For example, corn varieties have been screened for resistance to *Aspergillus flams* (an aflatoxin-producing fungus) by using a GFP-modified strain of this pathogen.

Most important, GFP can also be used to optimize the genetic transformation of organisms. The unavailability of a practical gene transfer system has been the single largest obstacle precluding the use of molecular approaches for genetic improvement of the commercial button mushroom, *Agaricus bisporus*. GFP can act as a "reporter" because it allows detection of transgene expression when linked together. Recently GFP was used in experiments investigating efficient methods of fruiting body transformation in *A. bisporus*.

The USDA has already granted permits for the release of genetically modified fungi (http://www.nbiap.vt.edu/cfdocs/fieldtestsl.cftn). Ecological implications of introducing transgenic fungi into the ecosystem, especially those containing selectable genes, should be of serious concern. Many fungi produce thousands of spores that can be easily dispersed. Hence studies involving "GM fungi" need to be conducted in contained environments.

Who ever thought we would reach the day of being able to create green fluorescent mushrooms, all for the sake of bioengineering the "perfect mushroom"? Would you ever buy or eat a genetically modified mushroom? Yet I can't help but argue that Green Fluorescent Protein is a fascinating feature, one that is definitely lending a "brighter" future for investigations in fungal biology and biotechnology.

**A few references:**

Chen, X., et al., 2000. A fruiting body tissue method for efficient Agrobaderium-mediated transformation of *Agaricus bisporus*. *Applied and Environmental Microbiology*, *66*: 4510–4513.

Lorang, J. M., et al., 2001. Green fluorescent protein is fighting up fungal biology. *Applied and Environmental Microbiology*, *67*: 1987–1994.

*Condolences to Joy Spurr, who had a bad fall on rough stone steps at a temple in the Amani Islands of Japan in April. Fortunately there are no broken bones, although she was badly bruised. We hope you get well soon, Joy!*

## WILL YEAST CELLS RISE IN ORBIT?

*China Daily* at xinhuanet.com via *The Sporeprint*, L.A. Myco. Soc., May 2004

BEIJING, April 20 - British life forms are poised to make their first visit to the international space station this week: millions of Manchester's finest yeast cells. By sending the yeast to boldly go where no fungus has gone before, scientists back on Earth hope to learn more about how cosmic rays cause cancer.

Astronauts are exposed to 100 times the radiation level received on Earth, and the dangers need to be investigated before people are sent on long missions to Mars or beyond.

"There's all sorts of radiation in space and we don't know if they add up or make each other worse," said Richard Walmsley, a biologist at the University of Manchester Institute of Science and Technology, who is leading the project. "You can measure radiation up there with a Geiger counter but tying that down to biological consequences isn't as straightforward as saying many crackles equals a certain risk."

Instead, the researchers will directly monitor how space radiation damages DNA, a trigger for cancer. Organisms have mechanisms to sense this DNA damage and begin repairing it. The scientists have genetically modified the yeast so that when this DNA repair system kicks in, it produces a fluorescent green protein. The greener the yeast, the more the high-energy particles are damaging its strands of DNA.

The experiment blasted off from the Russian space agency's launch site at Baikonur, Kazakhstan, yesterday, alongside the relief crew heading up to replace the two astronauts who have been on the space station since October. They are scheduled to arrive tomorrow. The yeast will then spend nine days on the station before coming back to Earth with the returning astronauts.

Each day, one of the astronauts will press a plunger to mix about 1 million yeast cells with a solution of sugar and salt which they need to grow. It will also nudge half the cells beyond the protection of a metal shield, exposing them to higher levels of radiation. In Manchester, scientists will look at how green the cells are so they can compare the amount of DNA repair that was needed in the exposed and unexposed yeast, allowing them to link radiation levels received to the risk of cancer.

## FOSSIL MUSHROOMS

**Kelly Ivors**

*Mycena News*, February 2004 via *Mycolog*, Humboldt Bay Myco. Soc., April 2004

Amber (or succinite) is resin produced by many different types of trees that later hardened and became a fossil. It's also a beautiful stone that can be cut and polished and is considered a valuable gem. Particularly prized are pieces of amber containing plant or animal material; however, the most common inclusions in amber are insects. Such fossils have greatly increased the knowledge of the evolution of insects and plants, and allow us to determine if modem-day forms are more complex than their predecessors.

Until the most recent find, three fossil agarics (gilled mushrooms) were known to science. *Archaeomarasmius leggeti*, the oldest known fossil agaric (90–94 million years old), was found in Atlantic coastal plain amber in East Brunswick, New Jersey, in November 1994. Two amber fragments contained mushroom pieces, one with a stalk and a 0. 1 inch-wide cap. Morphological features were similar to the extant genera *Marasmius* and *Marasmiellus* (family Tricholomataceae). The genus name *Archaeomarasmius* means "ancient Marasmius, and the species name *leggeti* was given to honor J. J. Leggett, without whose alertness that specimen might never have been discovered.

The other three mushroom fossils, including the latest discovery, were all found in amber from the Dominican Republic and were estimated to be 15–20 million years old. Interestingly, the oldest known fossils of the fungus are also from Dominican amber from the same time period! *Coprinites dominicana* was the first fleshy agaric fossil found and was named such after microscopic examination indicated it had affinities with the present-day genus *Coprinus*. *Protomycena electa*, which was represented by a single complete fruiting body, is similar to the extant genus *Mycena* (the genus name means "first Mycena" and the species name refers to "amber"). The most recent fossil agaric discovered was collected in the Yanigua mine in the eastern Dominican Republic and purchased from an amber dealer in August 2000. A single fruit body was present, as well as many basidiospores which were laid down in masses, suggesting that the spores were produced by the fruiting body in the amber. *Aureofungus yaniguaensis* appears to be a member of the euagarics Clade, but its precise taxonomy is yet to be determined. Its generic name means "golden mushroom," and the species name refers to the collection locality. The identification of a third fossil agaric from Dominican amber suggests that many more such finds are possible.

DNA analyses of most fungal fossils have yet to be completed as a dispute has arisen about how to handle amber specimens—whether to open them up to retrieve DNA, how to open them, and whether there should be rules guiding expeditions and the use of existing collections.

Surprisingly all of these ancient mushrooms have strong resemblances to the living mushrooms of today and have been described as looking "quite modern," hinting that evolution has conserved basic forms of these fungi for a very long time indeed. As the fossils suggest, certain fruiting body morphologies have remained unchanged over tens of millions of years! However with just four fossils, the record is still too incomplete to provide a detailed picture of the history of morphological evolution among gilled mushrooms.

**Further reading:**

Hibbett DS, Binder M, Wang Z, Goldman Y. 2003. Another fossil agaric from Dominican amber. *Mycologia, 95*: 685–687.

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## CHILEAN FIRM SAYS NEW MUSHROOM TASTES LIKE MEAT

Ananova.com, January 16, 2004, via *The Sporeprint*, L.A. Myco. Soc., April 2004

A Chilean mushroom company claims to have developed a mushroom that tastes exactly like meat.

Funghi Chile Ltd. says sales have tripled since launching the new mushroom which is being sold as a healthier alternative to meat. Chief executive Ricardo Sanches told Las Ultimas Noticias online: "If you try one of our mushrooms blindfolded you will never know if you ate real meat or not. It tastes 100% like meat.

"Our mushrooms give you the pleasure of tasting meat without the fat or cholesterol of the real thing. At the moment the mushrooms are sold only in Chile but the company says it hopes to start exporting soon.

## *CLITOPILUS CYSTIDIATUS* HAUSKNECT & NOORDELOOS

Buck McAdoo, *Mushrumors*, Northwest Mushroomers Assoc., May–June 2004

Over the years Margaret Dilly has consistently brought intriguing fungi to our shows and forays. So I wasn't overly surprised when she brought a pile of gay-capped Clitocyboid fungi to the Deception Pass Foray on November 20,1998. Since they were found in grass in her orchard, it seemed reasonable to label them as *Clitocybe dealbata*, a poisonous species, for the lesson that was in it.

Almost as an afterthought I took the specimens back to the office for study. And almost immediately red flags began to appear. Several specimens had a more matte cap surface, and these turned out to have flesh-colored spore prints. Now we had two species instead of one. And then the gills of the white-spored group turned cinnamon in color when they dried. *Clitocybe dealbata* doesn't do that. In Bigelow's *Clitocybe* monograph the white-spored specimens eventually keyed out to a group in Subgenus Infundibuliformis, Section Infundibuliformis, Subsection Cinnamomeophyllae. Very possibly Margaret had brought an unnamed species of *Clitocybe* to that foray.

Then I turned my attention to the specimens with flesh-colored spores. Under the microscope they looked like slightly elongated footballs with longitudinal ridges. The genus *Clitopilus*! The caps were 6–6½ cm wide, broadly convex to plane with wavy, irregular margins. The surface was matte (like *Clitopilus prunulus)* and a grayish-tan color becoming tanner at the margins. The gills were decurrent, cream colored, and crowded, gradually becoming pinkish from the spores. The stems were up to 1½ cm thick and only 2 cm long. They were somewhat flattened, white pruinose over a grayish base. The odor was strongly farinaceous, the taste mealy. They arrived as a cespitose cluster, and after reading up on the literature after the species was identified, I surmise that Margaret found them somewhere in the woods where she collects on Whidbey Island.

The species did not key out in any North American monograph on *Clitopilus*, mainly because none exist (to my knowledge). Although they looked like gay-capped versions of *Clitopilus prunulus*, which Kauffinan claimed to have found in Minnesota, the spore sizes didn't match up, and the structure of the pileipellis (cap cuticle under the microscope) differed. Instead of a cutis of tangled hyphae, these specimens had a more radial orientation with many clavate ends protruding. The possibility of identification had drifted over my head.

The next step was to consult my unfinished index, the longest running joke in North American mycology. Nonetheless, there are unexpected fringe benefits from time to time, and a search of the *Clitopilus* heading revealed that along with Dr. Rolf Singer (now deceased), Dr. Machiel Noordeloos of the Netherlands had published the most on this genus in English. It was time to send the man a postcard. I located my stack of stick-on postcard backings and affixed one to the back of the photo accompanying this article. I jotted down a few of the characteristics and inquired if he would care to view a specimen.

The response was immediate! Not only did he want the specimens, he enclosed a copy of Fungi Non Delineati, Part 4 (Pholiota, Psilocybe, Panaeolus) as a gift. This was a princely gift of gorgeous photos of rather rare species in these genera. Included was a letter that commenced with "As you may know, I am particularly interested in this genus." What followed was a key to the European species of *Clitopilus*, which he had translated from the German for me. This is not a large genus, and in a few minutes it became evident that Margaret's find was going to be one of two species depending on whether cheilocystidia were present or not. To be honest, I hadn't thought of even searching for cheilocystidia because the genus *Clitopilus* was not supposed to have them.

A couple of months passed, and then in late May of 1998...the response. Dr. Noordeloos wrote, "I finally got the time to look at the material. My conclusions are that it must be the first known North American record of *Clitopilus cystidiatus*. It is not rare in the coniferous and mixed forests of central and southern Europe." It is separated from other species of *Clitopilus* by the presence of filamentous and septate cheilocystidia.

Ian Gibson, the author of Matchmaker, was then notified of its presence in the Pacific Northwest. Through his connections in Europe he was able to secure the original Latin description for me. One bizarre fact was that *C. cystidiatus* was first described from the oak forests of Sardinia where it is plentiful. It had lingered for years in Dr. Marco Contu's herbarium under the name *Clitopilus prunulus* var. sardoa.

And so the circle is complete. From Sardinia to Whidbey Island. If this global warming continues unabated, we should soon be running into those oddball Russulas from Morocco.

Congratulations to Margaret for this amazing discovery and many thanks to Dr. Noordeloos for the identification. It is the best for both worlds. Dr. Noordeloos learns that one of his species has leapfrogged to the far side of the globe), and we in Northwest Mushroomers have learned another species in our midst.

The question for Margaret Dilly: Since it is closely related to the delicious *Clitopilus prunulus*, should it be tested for the table or no?

**Bibliography**

Marco Contu, Funghi della Sardegna: Note e Descrizione.III in *Boll. Amer., 48*, Amno XV, (3–15), 1999. The key was sent from an article by Hausknecht and, Noordeloos in the *Austrian Journal of Mycology*. No more detailed information was given.

Buck McAdoo

Clitopilus cystidiatus. *Which audacious fungophile will be the one among us to test this for the table?*

## *Morchella* Tidbits

*Morchella* was first used as a scientific name in 1719 by Johann Jacob Dillen (Dillenius), German botanist. *Morchella* was first applied to a genus by Persoon in 1753. *Morchella esculenta* was originally classified as a *Phallus* sp. (stinkhorn) by Linnaeus.

## OYSTERS *MORCHELLA*

*Wild Mushroom Cookery*, Oregon Mycological Society, 1987

3 or 4 dried morels
Dry sherry
2 or 3 TBs butter
1 or 2 shallots, finely chopped
1/4 teaspoon finely chopped garlic
1/2 dozen fresh oysters, shucked, bottom shell reserved
6 TBs heavy cream
Grated Parmesan cheese

Barely cover morels with a mixture of half sherry and half warm water. Soak morels until reconstituted, adding more liquid if necessary.

Reserve liquid; mince morels. Over low heat, gently sauté morels briefly in butter with shallots and garlic. Add remainder of soaking liquid and reduce.

Place one rounded teaspoon of the morel mixture in each of the six oyster shells; top each with an oyster. Place shells on a baking sheet. Pour 1 TBs of cream over each oyster and sprinkle with Parmesan.

Broil just until the edges of the oysters curl. Serve immediately.

*Photos by*
*Patrice Benson*

## CIRCLE 8 FIELD TRIP

We didn't get a write-up on the Circle 8 field trip on May 8, but we did get some photos.


*That's it until September. See you then!*



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