

# SPORE PRINTS



BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY  
Number 402 May 2004

## BENEATH DESERT SANDS, AN EDEN OF TRUFFLES

Neil MacFarquhar

*The New York Times*, April 14, 2002

DAMASCUS, Syria - Now is the height of the fleeting season for desert truffles. (You didn't know?)

As soon as the first spring rains fall, the Bedouins who frequent the wide sand plains that commence just east of Damascus and stretch hundreds of miles to Baghdad begin scouring the ground for the telltale grasses and cracks indicating that truffles lie just beneath the surface.

They will tell you that the first sign of an auspicious year for the delicacy comes earlier. If lightning strikes in ferocious amounts during the first storms of November and December, the Bedouins say, the truffles will grow thick underground. If there is none, wait until next year.

"The thunder cracks the land, and then they appear," said Usama Calipha, who was plying desert truffles in carefully arranged one-foot-high pyramids in a downtown Damascus traffic circle for \$10 a kilo (2.2 pounds). "It has something to do with the autumn rains, and it has something to do with God."

Desert truffles are species of mushrooms, and are distantly related to their more pungent, far more costly European cousins. Numerous sorts grow from Morocco to Saudi Arabia, but the desert of Syria and Iraq produces two main kinds, both known here by the Arabic name *kamah*.

There is a dark, reddish version, which is more dense and more prized than the slightly spongy white one. Both resemble small round potatoes—some gnarled, some smooth—and the taste lies between the soft earthiness of a mushroom and the mealy chunkiness of an artichoke.

Desert truffles are packed with protein. Indeed, some aficionados compare them to tofu, in that truffles can serve as a meat substitute that both echoes and enhances the flavor of whatever they are cooked with.



Mohamed El-Dakhakiny for The New York Times

*Shoppers at the wholesale fruit and vegetable market in Damascus pore over bins of desert truffles, which are related to the European version.*

a hostess in Beirut, Lebanon, who likes to serve the truffles with meat and rice in a stew, searches for the least crinkled available. "Big or small doesn't matter; you want them smooth so you can just wash and peel them," she said.

The main hurdle in cooking truffles is the cleaning. As they expand, the truffles can embrace the sand in which they grow, so the more gnarled they are, the more likely they are to contain grit.

*cont. on page 5*

## PRESIDENT'S MESSAGE

Ron Post

At one of my first field trips with PSMS, Nettie Laycock was the identifier and Larry Baxter was helping us beginners look for fresh material. I found what looked like a small group of dingy puffballs. Larry, a kind soul, asked, "Were these found in front of a depression or hole in the ground?" Indeed, they were!

The thought must have crossed his mind to make up some imaginative story, but instead Larry smiled, told me it was rabbit dung and we continued our search. With his help, we brought a few nice specimens of fungi back to the ID table.

I've helped a number of beginners on field trips since then, and one person, at least, has pointed out a similar find. I remember Larry's words well. What a nice guy he is. And a good role model for all of us. We should all be so kind. But I can't muster his generosity or patience. So I just tell beginners, "Taste a little bite of it, it won't kill you."

See how much fun it is learning about mushrooms?

I'm hoping you all have been out mushroom hunting and that you can recognize a rabbit hole easier than I could when I started.

It would be very hard not to learn something from the people we meet in PSMS, wouldn't it?

Well, we have a wealth of knowledge to share. Please feel free to stand up at the beginning of the membership meeting and tell us what you have to offer. Another thing about meetings: they're for your benefit. Let us know if hearing the speaker is a problem.

If you have some news to share with the club, please share it. And if you want to share written material, make copies and put them on a table for distribution. You'll be reimbursed the cost of copying. Also, all committee expenses are reimbursed. Just contact a board member.

If you have questions about anything the board has discussed or about the club's future plans, or if you just want to alert me that something is happening, such as a member falling ill or that someone is traveling on a mushroom trip, contact me—or another board member.

I want to thank each one of you who has called or e-mailed to share your views on a number of issues facing the club this spring. We'll be keeping our library intact as a result of that communication. Remember, my number is (206) 527-2996.

# Spore Prints

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## CALENDAR

May 11 Membership Meeting, 7:30 PM, CUH  
May 15 Field Trip, Twenty-Nine Pines Forest Camp  
May 17 PSMS Board Meeting, 7:30 PM, CUH  
May 18 *Spore Prints* deadline  
May 22 Field Trip, Crystal Springs Campground  
June 5 Field Trip, Swauk Creek Campground

## BOARD NEWS

Our secretary has returned for the remainder of the spring, but we will need to appoint a replacement for the fall. New board members—two were absent but excused—and new officers were introduced. The president spoke about long-range planning. Also, the idea was floated to offer a retreat, probably in the fall, for those club members who are involved in research projects this year. There is still a need for an exhibit chair. Past President Karin Mendell was voted life membership for her service to the club. Summer events are the July 3 picnic at Seward Park, from noon until 4 PM, and TrailsFest 2004 on July 10 from 9 AM until 4 PM. A new roster will be in preparation soon, and members should renew or send in change of locations/phone numbers/e-mail addresses to Pacita Roberts. Postcard reminders were to be sent out to those who haven't renewed their membership. Discussion of the library holdings resulted in a decision not to give away any of the club's inventory. Vice President Patrice Benson and two other members will form a committee this summer to discuss hiring a part-time librarian and other library accessibility issues. Discussion of the Website resulted in a vote to allow Molly Bernstein and Trustee Steve Bigelow to proceed with putting up a redesigned site. Trustee John Goldman is the person to contact with opinions or questions about the redesign.

## MEMBERSHIP MEETING

Tuesday, May 11, 2004, at 7:30 PM at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle



**MOREL MADNESS in MAY!**

Our Membership Meeting this May should not be missed. We will have a panel of experienced mushroom hunters (and I mean veeeeerrrry experienced!) to explain the **WHAT, WHEN, WHERE AND WHY** of true and false morel hunting in the Pacific Northwest. There will be photos, books, maps, and possibly tastings (if you and we are lucky).

If your last name begins with the letters A to M, please bring some refreshments to share at the meeting.



## CALLING ALL MEMBERS—ROSTER UPDATE

Meticulous Bob Mendell will again be working with his trusty sidekick, Karin, to update the PSMS roster. Please stop and review your current information in our last PSMS roster. Almost everyone has had at least an e-mail address change or a phone number change since they joined. Your information is not automatically changed in our database. You need to send any updates to Pacita Roberts, to correct your address, phone, and e-mail address information. This is what is used to print our mailing addresses for our newsletter, as well as updating our roster, periodically. This may be your **LAST** chance to send your updated information to Pacita at [r6379@u.washington.edu](mailto:r6379@u.washington.edu). We are currently waiting for all the renewals to take place. Shortly after that occurs, we will begin the process of updating our roster by receiving a database update from Pacita. Please make sure we know your correct info.—So we can all reach each other! Thanks.

*Bob & Karin*

## CONSERVATION

**Karen Behm**

I am now the Conservation and Ecology Committee Chair, just a regular person with an interest in mushrooms and without a degree in mycology. To start with, I compiled a document on various passes and permits needed for mushrooming on our public lands. Look for that on the Website or by the books and membership tables at the monthly meeting. I am looking for ideas on what to focus on and potential fall show exhibit topics.

Here are some discussion points for starters:

*Healthy Forest Initiative* - How could it affect us and should we care? What other potential federal legislation affects fungi? Are there upcoming "rules" or decisions that we as a club could educate ourselves on or take a stance on?

*New management regulations* - The DNR just passed some new management regulations. Will any of these affect recreational mushroom hunting? Does anybody even care?

*Biosolids in forested areas* - What and where? Why is this important? Feel free to contact me with your interest in helping, comments, ideas, or to pass on information. I look forward to hearing from you! Karen Behm, (425) 391-4124, [klbehm@nwlink.com](mailto:klbehm@nwlink.com).

## UPCOMING FIELD TRIPS Cathy Lennebacker

Remember to dress for the weather and bring something for one of our excellent potlucks.

### May 15 **29 Pines Forest Camp** (elev. 2500 ft, 102 mi. east of Seattle)

Take I-90 over Snoqualmie Pass to exit #85. Follow signs to Hwy. 970 east of Cle Elum for 2.5 miles. Turn left on Hwy. 970 and go 4.5 miles. Turn left onto Teanaway River Road. Continue about 6 miles, bearing right at the fork onto the Teanaway North Fork Road and continue another 6 miles just past the new fish hatchery on the left and Jack Creek. Twenty-Nine Pines is on the left. There is no shelter or water, but there are outhouses. *Host:* Ron Post. *Identifier:* Brian Luther.

Bring your children or grandkids who are interested in learning about mushroom cultivation. Kids make super mushroom pickers. They have sharp eyes and enthusiasm and are closer to the ground. Our grandkids regularly outpick us fossils. Camping is free at this lovely riverside campground.

### May 22 **Crystal Springs** (elev. 2400 ft, 60 miles east of Seattle)

Located near Stampede Pass, this campground has picnic tables, outhouses, and free riverside camping across the road. *Identifiers:* Brian Luther & Joy Spurr.

Driving Directions: Drive east on I-90 over Snoqualmie Pass. Continue east for 8 miles and take Stampede Pass exit #62. Turn right at the stop sign. After ¼ mile, before the bridge, turn right to enter the camp.

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

Chatter Creek Campground is 16.1 miles up Icicle Creek Road out of Leavenworth. This is a reserved group camp with a shelter. Check in with the campground manager. Friday check-in time is 2 PM. There will be a \$5 camping fee for overnights. Pay the PSMS field-trip host(s). *Identifiers:* Brian Luther & Larry Baxter.

Driving directions: Take Hwy. 2 over Stevens Pass and proceed 34 miles. (You can also take I-90 over Snoqualmie Pass to exit #85, go over Swauk Pass to Hwy. 2, and proceed left for 6 miles.) Icicle Creek Road is on the north edge of town.

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

Swauk Creek campground is 4 miles south of Swauk Pass between east-west routes I-90 and Hwy. 2.

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. *Identifiers:* Brian Luther & Joy Spurr.

## MacDONALD PARK FIELD TRIP Brian and Arnica Luther

We had an anxious group of about 35 people show up at the shelter on March 27, just itching to get out into the woods to see what things were like after winter. There's always this rush of anticipation as you approach the suspension bridge over the Tolt River, pausing briefly as you look across, hoping that someplace on the other side you'll find a treasure or two. We all needed to at least

find something to put in our baskets, and most everybody did find a few things to bring back, but they weren't always mushrooms. Wildflowers, ferns, lichens, and slugs seemed to be popular items of interest, but, yes, there were some fungi too.

Thanks to our host—Michelle Huang, assisted by Don and Cathy Lennebacker—we were all pleasantly greeted at the shelter with a cheerful “good morning” and a very welcome sight for all, namely hot coffee and goodies. For a very brief moment, we all forgot about the day's mission, delving into and satisfying one of our primeval desires—food. We've been doing this for so long, I don't think it's possible to go mushroom hunting in the morning without hot coffee and goodies first. Special thanks to our host and helpers for starting the day out right.

Hildegard Hendrickson and I spoke briefly about the history of this, our earliest field trip of the season, and then discussed being prepared in the woods with the appropriate clothing, collecting equipment, and safety precautions to take. Then we talked about Verpas in general, including what they look like, where they grow, and how to prepare them and what precautions need to be taken if you wish to eat them. As usual, we divided in two, with Hilda taking one group to a nearby Girl Scout Camp (where, with permission, she's taken groups for years) and the others following me through the dense cottonwood, maple and alder woods of MacDonald Park. For my group, as we walked along the paths, I talked about some of the early blooming plants and other natives as well as briefly discussing cottonwood and *Verpa* ecology. We then dove into the woods. We did find a few Verpas, and some loud whistle blows summoned everybody to gather around me when the first Verpas of the day were found, to show everybody what they were looking for and how they grow. My group had fun, but came out of the thicket with only a few Verpas. Hildegard's group, on the other hand, was much more successful, and most people with her had either a few or a substantial number of Verpas in their baskets. Thanks, Hilda, for sharing your experience and expertise with our members.

Thirty different species of fungi were collected and set out on the ID table. Once the groups got back, I went over what was found and briefly talked about each of these species. Other edible fungi found included a couple of small collections of Oyster Mushrooms (*Pleurotus ostreatus* group) and a clump of Shiny Caps (*Coprinus micaceus*). Interesting fungi found included a single Scarlet Cup (*Sarcoscypha coccinea*) and a small collection of the unusual *Bolbitius vitellinus*.

If serving no other purpose, this field trip got people's interest and was a springboard to encourage enthusiasm for the other spring outings, which I know will be fun, bountiful, and rewarding.



Patrice Benson

Hildegard Hendrickson and Brian Luther briefing Verpa hunters on the MacDonald Park field trip.

## FLAMING GEYSER STATE PARK FIELD TRIP Tony Tschanz

April 3 was a beautiful and warm spring day for over 30 people to visit this great state park near Black Diamond. The geyser's flame was "strong" as ever, but it is always a good idea to have a match handy just in case some inquisitive kid (or adult) manages to extinguish it (One thumb could easily cover the hole and cut off the supply.) We were there for the Verpas and Oyster Mushrooms, however, and true to Hildegard's previous advice, most cottonwoods above the flood planes had Verpas, and "once you find one look carefully for the others that are guaranteed hiding out under the leaves of the same tree."

In addition to long-term members who had a good excuse of cabin fever to come to the field trip, there were many newcomers, and everybody had plenty of Verpas and Oysters to take home. Coffee, bagels, croissants, and Danish pastry were enjoyed by all. The host was Tony Tschanz, and the species were expertly identified by Colin Meyer as follows:

*Coprinus micaceus*  
*Crepidotus mollus*  
*Ganoderma applanatum*  
*Helvella queletii*  
*Hypholoma fasciculare*  
*Inocybe* sp.  
*Lichenomphalia umbellifera*  
(aka *Omphalina ericetorum*)

*Mycena haematopus*  
*Omphalina rosella*  
*Pleurotus ostreatus*  
*Polyporus badius*  
*Verpa bohemica*  
*Verpa conica*

## BOOK REVIEW

Ron Post

The title of my favorite chapter in Nicholas P. Money's book *Mr. Bloomfield's Orchard: The Mysterious World of Mushrooms, Molds and Mycologists* is "What Lies Beneath." It sounds like an adventure in the same vein as *20,000 Leagues Under the Sea*.

It's better, if you can get around the fact that there's no *Nautilus*, just the mind of an able scientist sailing into an ocean of tube-shaped hyphae and yeast cells.

His voyage reaches from our nearby Blue Mountains, which he cites as home to the World's Largest Organism (*Armillaria*), to the distant labs of long-dead mycologists.

Money is a Miami University (Ohio) professor with a straight-forward style of writing. He has an obvious ax to grind against anyone who discounts the scientific method. But he gives readers only small doses of this medicine, preferring to entertain us with lucid stories of how fungi make human bodies their hors d'oeuvre, why some fungi are strong as a speeding bullet, and the more mundane implications of fungal cell action, such as how they benefit from being electrically charged.

If all this sounds too academic, Money does pop in with some very practical, very human concerns.

He admits "mycology can be a tough sell" and goes on to tell the story of ordering a *Cordyceps* tea concoction from Paul Stamets at Fungi Perfecti. "I could not stick with the *Cordyceps* brew for the three weeks recommended for optimum manliness," he laments.

He also takes readers on some direct excursions into fungal research—his specialty—detailing many of the mysteries he would like to solve. His foray into medical mycology is not really ghastly, but *be prepared*—his choice of words leaves nothing to the imagination.

Although he doesn't get around to describing Mr. Bloomfield's Orchard until page 169, there are plenty of interesting puzzles along the way. Mostly, Money seems able to solve them all, or at least suggest how their solutions will benefit the fields of mycology, agriculture, and medicine.

He entertains us in several chapters with insights into the motivations of mycologists, and he tells more than a few obscure stories, such as how A.H.R. Buller in his 1934 *Researches on Fungi* did this crazy experiment: Using a mature specimen of the cup fungus *Microstoma protracta*, he held one of its cups to an ear and listened. As its apothecial spore sacs discharged a cloud of spores, he heard a fairly loud "hiss." Sounds like what you and I would do with any small, bright red fungus, eh?

His illustration does help to explain exactly how an ascomycete's spore discharge is different from a basidiomycete's. Basidia rely on rather a strange combination of physiology, moisture, and pressure, a process that you needn't worry would eject little things into your ear.

If all that's too academic, Money does have other things in store. Did you know the giant puffball, which grows in the Northwest, probably dwarfs all other species of fungi in number of spores produced? It's likely in the trillions.

The author, being an honest man, takes pains to admit there are "significant weaknesses in the field of mycology."

"Few of us have time for lichens," he says, even though "half of all the fungi that have been identified are ascomycetes, and more than 40 percent of these—13,500—are lichens."

Among the other interesting subjects he touches upon are these: why scientists spend their time trying to mutate inky caps, how the genus *Panellus* is bioluminescent on this continent but not on another, and the importance of truffle evolution.

This is a very readable and pleurably scientific book. If you have a rudimentary knowledge of how fungi grow and multiply, and if you're an avid mushroomer, get hold of it and sit on the beach—or in a nice sunny spot in the forest.

## UPCOMING EVENTS (NEW ADVENTURE INCLUDED)

Several spring and summer PSMS events are worth noting. The **May field trips** should be productive. See the field trip section for locations and directions. A child-friendly activity is scheduled for the 29 Pines field trip on May 15. Kids will get a Fungi Perfecti cultivation kit to take home. Remember to tell a board member at the membership meeting how many kids to expect from your clan, and remind your children not to wander away from the immediate camp area.

On July 3 from noon until 4 PM, we'll hold the **annual PSMS picnic at Seward Park**. Look for the club's signs to direct you.

A week later, on July 10 at Rattlesnake Lake near North Bend, we'll staff a PSMS table for **TrailsFest 2004**. This event, new for us, is advertised for those who "play really hard." Do you think our club really qualifies? Let's try not to strain anything, please. If you'd like to help by staffing our hard-playing table, call Emily Routledge at (206) 355-5221 and plan on playing with all those other outdoor clubs for one day, 9 AM until 4 PM. You can play, of course, and you can also eat s'mores, pet a llama, bird watch, listen to stories, look at gear, and learn to track a sasquatch (which many of you have already done—that is hard!). Easy does it, now. (Go to [www.wta.org](http://www.wta.org) to learn more.)



## Desert Truffles, *cont. from page 1*

Men scouring through baskets of the stuff in the Damascus wholesale fruit and vegetable bazaar also swear that truffles both soothe sore eyes and have a powerful aphrodisiac quality. "It makes you hotter," said Samir Rifai, a 28-year-old porter in the souk, adding quickly, "I mean for older guys."

Mostafa Abo el-Nil, a plant biologist at the Kuwait Institute for Scientific Research, who has studied the fleshy fungi, dismisses the Viagra-substitute idea. The lightning legend, though, appears to have some basis in fact.

The truffles spring from microscopic spores distributed just underneath the surface of the sand. (Cultivation has long proved elusive.) They grow into long, invisible threads, which attach themselves to the roots of squat rockrose bushes. Lightning triggers a chemical reaction that makes the accompanying rain rich in nitrogen compounds, which in turn seem to prompt the truffles to grow.

If there are no early thunderstorms, the truffles do not appear; indeed, sellers say five years can go by without any truffles. One Bedouin nickname for them translates as "the potatoes of thunder."

As they reach the size of golf balls, they begin to crack the surface of the sand, appearing as a field of bumps across the desert. Bedouins, knowing that they grow in tandem with rockroses, keep an eye out for those bushes before beginning their search for the unpredictable treasure. Big ones can be almost the size of a tennis ball. Those from Iraq have a reputation for being larger, but in recent years their cachet has fallen due to unverified suspicions that fallout from American weapons has contaminated them.

If the truffles are not dug up during the few weeks of winter rains, they pop up onto the surface and burst once the sand dries out, Mr. Abo el-Nil said, scattering millions of spores and starting the cycle again.

Desert tribesmen used to live off the truffles, making them extremely scarce, and they once could fetch up to \$100 per kilo. The famous medieval Arab traveler Ibn Battutah mentions feasting on them, and Crown Prince Abdullah of Saudi Arabia includes them in the spreads he serves to his guests during the season.

The Bedouins, eager to earn money, harvest more, creating a large supply, and the cheapest varieties are selling this year for as low as \$7 per kilo at the Damascus wholesale market. You take your chances with what you buy on the streets of the Syrian capital, though.

Nuha al-Radi, an Iraqi artist who lives in Beirut, recently received as a gift nearly two kilos of what she thought were prized brown

*Kabob-able desert truffles, a springtime delicacy in the Middle East, are sold at a traffic circle in Damascus.*



Mohamed El-Dakhkny for The New York Times

truffles from Damascus. A trip to the sink, however, proved that a batch of the cheaper white ones had been dipped repeatedly in deep chocolate-like mud that only came off with several soakings.

"Half of Syria came with them!" Ms. al-Radi said. "They look lovely and brown, and you think you have the real McCoy, and then it turns out there is a new way to cheat."

At Goodies supermarket, Beirut's answer to Zabar's (the lettuce is stacked in color-coordinated piles, and the dried fruits section has six kinds of figs), desert truffles sell for \$15 to \$30 per kilo. The store also sells a high-end variety of green olives preserved with truffle chunks, which have a sharp piquant flavor thanks to the olives.

Those buying the truffles mentioned various recipes, starting by either boiling or frying, then adding them to omelets, putting them on kabobs along with meat, or serving them alone with olive oil and coriander, as a salad.

## LICHEN THE CULPRIT IN WYOMING ELK DIE-OFF Theo Stein

*The Sporeprint,*  
Los Angeles Myco. Soc., April 2004

A lichen is to blame for the poisoning deaths of close to 300 elk in Wyoming's southern Red Desert this winter, state officials said Sunday.

The announcement ends a grim mystery that had baffled wildlife researchers across the continent since early February. But it raises new and potentially troubling challenges for biologists who will be studying the episode in the coming years.

"This lichen is all over the place out there," said Tom Reed, a spokesman for the Wyoming Game and Fish Department. "These elk were apparently turning to this because of the drought conditions, so we have to evaluate what steps we can take to prevent it from happening again if the drought continues."

Wildlife veterinarians had suspected the lichen played a role in the die-off when they discovered it in the stomachs of several of the 290 dead elk found spread across a 50-square-mile area southwest of Rawlins.

On Sunday, their suspicions were confirmed when a bull elk being fed a diet of only lichen at a research facility in Sybille collapsed and was unable to rise. A second elk, a cow, also began stumbling in an apparent reaction to poisoning by usnic acid, a toxic compound contained in the frail green desert plant. Researchers expect the third elk in the study to succumb quickly. All three will be euthanized.

"It's identical to what we're seeing in the field," said Walt Cook, the Wyoming Game and Fish Department veterinarian leading the inquiry. "He's bright and alert, but he just can't get up. They were watching when it happened and he just kind of stumbled and went to the ground."

Many of the stricken animals found in the Red Rim country south of Interstate 80 since February were alert and barked in alarm at the approach of people. Biologists euthanized about 200 elk to end their suffering. The rest died only after enduring days or weeks of exposure to the Wyoming winter.

The lichen, *Parmelia molliuscula*, is widespread across an area extending from North Dakota to the Rockies. But an elk kill of this magnitude not directly related to winter starvation has never before been documented.

*cont. on page 6*

## Lichen Kill Elk, cont. from page 5

Other herbivores, including cattle, horses, and pronghorn, shared the same ground as the elk this winter—apparently without ill effect.

Lichens are a symbiotic organism. Part algae and part fungus, lichens flourish in cold, dry habitats such as Arctic tundra or alpine summits that are too extreme for most other plants. But lichens contain compounds, such as the usnic acid in *Parmelia*, that can be difficult for some animals to digest.

Cook and other researchers theorize that a chain reaction of several factors combined to precipitate the die-off. However, it will take further research to test their ideas.

One of the first tasks will be to examine samples of muscle tissue from the three captive elk to see if they show the same damage seen in dead or dying elk found in the rolling steppe of the Red Desert. That is where coyote hunters first reported the elk were collapsing from an unknown ailment.

Researchers had noticed that both the wild elk and the research elk discharged red-colored urine, which Cook now suspects was caused by usnic acid eating away at the animals' muscles.

"Healthy muscle looks like red meat," said Cook. "What we were seeing is pale in color. It looks more like chicken or pork."

The long drought afflicting the region may have allowed usnic acid to build up to toxic levels in the region's lichen. Fifty years ago, during another long drought, agricultural researchers documented similar ailments among cattle and sheep in the state. Cook said more of the plants will be collected and analyzed to see if acid concentrations are higher than elsewhere.

Unlike livestock, which recovered from usnic acid poisoning in the 1950s study, the ailment was 100 percent fatal for elk stricken this winter.

Researchers may examine whether the sick elk, part of a herd of about 4,500 that summer in the Sierra Madre Mountains along the Colorado border, lacked the right kind of microorganisms in their stomachs to neutralize the acid. Biologists noted that another herd of desert-adapted elk wintering just north of 1-80 did not fall victim to lichen poisoning. Perhaps the desert elk to the north are avoiding the lichen or perhaps they are more tolerant of it, scientists speculate.

One result of the mass poisoning: The agency will cut back on the number of elk licenses to hunters for the areas where the Sierra Madre herd will be found this coming fall, Reed said. The band of 400 to 600 elk afflicted by lichen poisoning was made up mostly of cows, calves and yearling bulls. Biologists estimate that the lichen killed perhaps 5 percent of the herd's breeding females, a loss that will take more than a year to recoup.

Reed said the agency will have to consider other steps, such as improving the range conditions on the Red Rim Wildlife Management Area, to provide healthier forage in the coming years.

"If we have to chase those elk every time we see them chewing on lichen, it's going to get time consuming," Cook added.

State employees prepare an elk to be airlifted to a stock trailer.



## WHITEHEAD/MIT GENOME CENTER RESEARCHERS ASSEMBLE DRAFT SEQUENCE OF *ASPERGILLUS NIDULANS*

*The Sporeprint*, L.A. Myco. Soc., April 2004

Cambridge (March 27, 2003) - The Whitehead Institute/MIT Center for Genome Research this week announced the public release of a high quality draft genome sequence of *Aspergillus nidulans*, a mold, or filamentous fungus, commonly used in laboratory research to study important questions in genetics and cell biology. *A. nidulans* also is a close relative of a family of fungi that cause allergies in some individuals and life-threatening, opportunistic infections in patients with weakened immune systems. The *A. nidulans* sequence is Genome Initiative, freely available at <http://www-genome.wi.mit.edu/annotation/fungi/aspergillus/>. Availability of this sequence represents a significant step for biomedical research because it provides a key tool to better understand the molecular workings of a suite of related molds or fungi that have medical, agricultural, and biotechnology implications.

"*A. nidulans* sequence is expected to be a Rosetta stone, the key to understanding a large group of closely related fungi of great medical, commercial, and evolutionary importance. These include organisms that make penicillin, citric acid, soy sauce, sake, and cholesterol lowering drugs," says Dr. Ron Morris of the Robert Wood Johnson Medical School of the University of Medicine and Dentistry of New Jersey.

The sequencing of *Aspergillus nidulans* represents the first in a number of fungal sequencing projects supported by the National Human Genome Research Institute as part of the Fungal Genome Initiative, a comprehensive fungal sequencing program aimed at generating high-quality sequence for organisms spanning the fungal kingdom.

*A. nidulans* is a critical model system in genetics and cell biology. Unlike other *Aspergilli*, which are asexual, *A. nidulans* has a well-characterized, conventional genetic system, making it easier for scientists to study the role and function of genes. In addition, when genes from other *Aspergilli* as well as some genes from mammalian species are inserted into *A. nidulans*, they can function in *A. nidulans*, allowing researchers to study genes of fungi with medical and other applications. In addition to studying the *A. nidulans* genome, the Whitehead Institute/MIT Center for Genome Research and fungal biologists are especially excited about using comparative genomics to find insights into the biology of fungi in general. "Just as we are learning a great deal about the human genome by comparing it to the mouse genome sequences, we can understand the genes of *A. nidulans* better through comparison of the sequence to that of the other fungi being sequenced at the Center," says Bruce Birren, Director of the Sequencing Center at the Whitehead Institute. The genome sequence was produced and assembled at the Whitehead Institute/MIT Center for Genome Research, in collaboration with the Monsanto Company. The genome was sequenced using the Whole Genome Shotgun approach, in which sequence from the entire genome is generated and reassembled by recognizing identical segments using the ARACHNE assembler, a sequence assembly program developed at the Whitehead Institute/MIT Genome Center. The *A. nidulans* genome is approximately 31 million base pairs in size. The draft sequence shows the order of the DNA chemical bases A, T, C, and G along the fungus's eight chromosomes. It includes more than 95 percent of the genome with long, continuous stretches of overlapping DNA and represents 13-fold coverage of the genome. This means that the location of every base, or DNA letter, in the *A. nidulans* genome was determined an average of 13 times, a frequency that ensures a high degree of accuracy. Monsanto con-

tributed 3X shotgun sequence, which has been publicly available on the Whitehead Institute/NUT Genome Center website since January 2003.

Currently, approximately 40 laboratories worldwide focus on the genetics and molecular biology of *A. nidulans*. Nine of these laboratories—representing the United States, Australia, England, France, and Germany—are members of the Fungal Genome Initiative steering group to promote sequencing and annotation of the *A. nidulans* genome. ©Broad Institute, MIT

## SULFUR IN SHIITAKE

Michael J. Felton

*Modern Drug Discovery*, March 2004

Many plants and fungi are used in cooking and traditional medicine for their unique aromas, which are often due to sulfur compounds. Although garlic and onion, for example, have been well studied, this is not the case for the shiitake mushroom (*Lentinula edodes*). Graham George and colleagues at the Stanford Linear Accelerator Center, University of Saskatchewan, Exxon Mobil Research and Engineering, and the State University of New York at Albany applied sulfur K-edge X-ray absorption spectroscopy (XAS) to study the sulfur compounds in shiitake mushrooms (*J. Am. Chem. Soc.*, **126**, 458–459, 2004).

Previous methods applied to studying such compounds used GC-MS or LC-MS but required extensive sample preparation and depended on solvent extraction. In contrast, XAS can be used directly on homogenates made from samples as small as one cell. It can also be used on samples dipped in liquid nitrogen to halt reactions.

The researchers used XAS on intact (unhomogenized) samples of onion, garlic, Chinese chive, and shiitake mushrooms and found that they all contained  $\gamma$ -L-glutamyl-cysteine sulfoxide precursors, reduced sulfur compounds (thiols, disulfides, and sulfides), and small quantities of sulfate. Shiitake mushrooms contained an additional sulfur compound, sulfone.

The scientists then tested homogenized samples. In onion, garlic, and Chinese chive, the sulfoxide precursors are modified by enzymes when the cells are destroyed, forming their trademark aromas; however, the researchers discovered that the same process does not occur in shiitake mushrooms. The sulfoxide precursors remained in the mushroom, whereas they were converted to other compounds in the plant samples. The researchers also found that grinding, crushing, and cooking the mushrooms in a microwave caused no significant changes in the sulfur spectra.

George and coworkers suggest that the difference between sulfur production in the plants and shiitake mushrooms depends on the abundance of enzymes that break down sulfoxide precursors. They speculate that the plants produce abundant enzymes to make noxious sulfur compounds upon cell rupture, to deter animals from eating them. However, the sulfur compounds produced by the mushrooms are not noxious, and so the reason for their production is unknown; but they taste good.

## MUSHROOM BREAD PUDDING

Jarmila Hrbek

*Boston Mycological Club Bulletin*, March 2004

### Mushrooms

20 oz mushrooms	1 TBs fresh parsley, chopped
3 TBs oil and butter combined	1 TBs fresh basil, chopped
1 TBs garlic, chopped	3 TBs shallots, chopped
1 tsp dried sage	1 tsp dried thyme

### Pudding

5 large eggs	3/4 tsp salt, or to taste
2 cups whipping cream	1/2 tsp ground pepper
1 cup whole milk	6 cups 1-in. cubes crustless, day-old French bread for a smooth texture, or use the crust for a more textured pudding
1/4 cup plus 2 TBs freshly grated Parmesan cheese	

Preheat oven to 350°F. Lightly butter an 8-in. × 8-in. × 2-in. glass baking dish. Heat oil in heavy, large pot over medium-high heat, and sauté all mushrooms, garlic, shallots, and herbs until mushrooms are tender and brown, about 15 minutes. Remove pot from heat. Add salt and pepper to taste.

Whisk eggs, cream, milk, 1/4 cup Parmesan, salt, and pepper in a large bowl. Add bread cubes; toss to coat. Let stand 15 minutes or longer if crust is used. Stir in mushroom mixture. Transfer to prepared dish. Sprinkle on 2 TBs cheese and bake in center of oven about 1 hour. Serve warm. Makes 4 luncheon-size servings or 6 side-dish servings.

## IMPUDENT MUSHROOMS

Henk van der Gaag

*Mycelium*, The Mycological Society of Toronto,  
April–June 2004

You are probably all familiar with the Stinkhorn mushroom *Phallus impudicus*, smelly but also very interesting. I never really asked myself where that name *impudicus* came from. Now I realize it is of course derived from “impudic-”, meaning shameless or immodest.

But really is it fair to call stinkhorns impudent? Sure if we smelled like they do we would indeed be impudent. For a stinkhorn, however, it is a question of survival of the species. They use that smell to attract flies who will spread the spores contained in the dark slime on the cap. But there are other fungi that have fetid smells, as far as I can see for no good reason. Maybe we could label those impudent.

It was at the October foray in Durham County Forest last fall that a smelly small mushroom was found; coincidentally I found similar ones soon after at my cottage in Udora—actually I smelled something rotten and had to crawl under the low hanging branches of a large spruce tree to find the source of that smell. It turned out to be a group of small *Collybia*-type mushrooms. Here is a short description of them:

- Cap: 1–4 cm, convex to plane, becoming wrinkled and grooved (sulcate) at the margin; thin fleshed; pinkish brown with a darker chestnut centre.
- Stem: 3–4 × 0.3–0.4 cm, fairly tough, cylindrical often narrowed towards the base; entirely whitish, when dry, tomentose (velvety downy).
- Gills: fairly distant, free, pale pinkish white.
- Spores: white, 6.5–7 × 3.5  $\mu$ m.
- Smell: as rotten cabbage.
- Habitat: under spruce, on needles and cones.
- The main features are the distant gills, white tomentose stem, and small spores.

Having such a bad smell it should be easy to identify, I thought. Well I was wrong there. It turned out that there are quite a number of smelly *Collybia*-type mushrooms. First I had a look at the Microphales known to have a garlicky smell, but they are smaller and have dark brown stems. Then there is a *Marasmiellus*

## NO MORE NEED TO FORAGE FOR BLUES

Florence Fabricant

*The New York Times*, April 14, 2004

Blue foot mushrooms, named for the tender blue to violet tint on their stems and the tops of their beige caps, grow abundantly in North America and Europe from late summer through fall, when foragers search for them. But now cultivated blue foots from France and the Netherlands are being sold in the United States. The mushrooms, also called blewits, are not shy, tasting of earth and spice, and they never go limp in the pan. Sauté them in butter, dusting with curry powder as they cook, and finish the dish with a little heavy cream. The mushrooms keep their color better if they are simmered in vegetable stock for 10 minutes, then used in a soup or cooled and tossed in a salad. They are \$24 a pound at Dean & DeLuca, \$23 at Agata & Valentina, and \$32.50 at the Manhattan Fruit Exchange.



*Lepista nuda*,  
the Blewit

### Impudent Mushrooms, *cont. from page. 7*

*praeacutes* (formerly named *Collybia*). That one is also too small and has a brown cap that fades to white and a dark brown stem with a white base. Then I found the descriptions of six *Collybias* (recently assigned to *Gymnopus*) that have fetid smells. So let us see if one of these fits:

- *Collybia dysodes* grows on wood chips and has a dark reddish brown stem and  $8-9 \times 3-4 \mu\text{m}$  spores. All wrong.
- *C. polyphylla* grows on hard wood litter and has very crowded gills—hence poly (many) phyllia (gills). It is known from the Great Lakes area, but otherwise does not fit.

- *C. pinastris* is a North American species described by Kauffman and found in Quebec. It does grow on conifer needles, but the stem is not white tomentose and the spores are too large.
- *C. hariolorum* has the right size of cap and spores, but the gills are crowded.
- *C. porrea* is a European species, with a garlic smell, pale yellow gills, but no tomentose stem.
- *C. impudica* is... could that be the one? Yes, it has all the required features: distant gills, white tomentose stem, the right spore size, and a preference for spruce. Is it known from North America? Yes, Halling in his *Collybia* monograph does list it, but it is certainly not common. It is probably more prevalent in Europe, as it is described in most of the European guides I checked.

So if you smell something impudent, do not turn up your nose. Have a closer sniff and maybe you'll find one of those smelly *Collybias*. Let me know if you do.

### McGee, MS



Gloria Barber, © 2004

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