SPORE PRINTS

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44th Annual PSMS Survivor's Banquet - March 7, 2008 - South Seattle Community College

Spore Prints

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Annual dues $25; full-time students $15

CALENDAR

Apr. 6	Field Trip, Ostrom's (registrants only)
Apr. 8	Membership Meeting, 7:30 PM, CUH Photography Interest Group Meeting, 7:00 PM, CUH
Apr. 14	Board Meeting, 7:30 PM, CUH
Apr. 22	*Spore Prints* Deadline
Apr. 28	Master Gardeners' ID Clinic, 4:00 PM, CUH
May 4	Mushroom Maynia! Burke Museum, 10 AM–4 PM
May 5	Master Gardeners' ID Clinic 4:00 PM, CUH

BOARD NEWS — Dennis Oliver

The March board meeting is always bitter sweet, a time of the ending of the old board and the promise of spring and new beginnings. Doug Ward, Colleen Compton, and Marilyn Droege have reached the end of their term of office and we extend our gratitude and thanks for all their hard work and effort. The new board sees the return of officers Patrice Benson (president) and John Goldman (treasurer) and trustees Kevin Bernstein and Jamie Notman. Newly elected trustees Dennis Notman and Cathy and Don Lennebacker join them on the board. The survivor's banquet was a great success, with a hundred people in attendance and outstanding food prepared by Michael Blackwell and his helpers. Thanks to all who were instrumental in putting on the event. Mushroom Maynia at the Burke Museum will be May 4; planning for this event continues and details will be forthcoming. The field trip schedule has been set, and mushroom classes will begin soon. We will be starting our Monday mushroom identification with the master gardeners at the end of April. Flower buds are breaking, and the morels are just starting to wake up after the cold winter — ah spring.

MEMBERSHIP MEETING

Tuesday, April 8, 2008, at 7:30 PM at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle.

Welcome to spring! April's program features Dr. Nancy Smith Weber, well-known mycologist and morel expert from Oregon State University. The title of her presentation is "Observations on Local Cup Fungi and Their Relatives."

Nancy was graduated from the University of Michigan, where she studied the Michigan species of *Helvella* for her Ph.D. dissertation and met her husband. She was born into a mycological family and has written several books on mushrooms including four that she co-authored with one or both of her parents, Alexander and Helen Smith. She is affiliated with the Department of Forest Science at Oregon State University, where she has been studying morels, related cup fungi, and truffles of the western United States. The true and false morels hold a special interest for her. She is involved in several projects aimed at better understanding these fungi. In addition to her professional interests, she has been studying the growth, fruiting body longevity, and fruiting patterns of the macrofungi in her yard for over 10 years and has some interesting stories to tell. She will discuss some of her observations and will introduce individual populations of several species of macrofungi as dynamic, living individuals involved in, and affected by, their habitat and environment in various ways. Nancy is an excellent speaker, and relates well to the mushroom hobbyist and expert alike. Don't miss this timely program.

Would members with last names beginning with the letters L–Z please bring a dish of refreshments for the social hour.

VOLUNTEER OPPORTUNITY — Patrice Benson

Mushroom Maynia! May 4, 2008 10:00 AM to 4:00 PM

The Burke Museum, PSMS, and the Daniel E. Stuntz Memorial Foundation will host the first Mushroom Maynia Day, Sunday, May 4, at the University of Washington Burke Museum. This is a family-oriented event to raise awareness of the fungi in our lives and the world.

Volunteers are needed to assist with the displays and activities. These will include family-oriented cultivation workshops, art activities, and a mushroom-butter tasting. Volunteers with all levels of expertise are needed, including beginners. Please save the date and contact Joanne Young at jd2young@aol.com to join the fun.

The one-day event will include demonstrations of how to cultivate your own mushrooms, cook them, or use them in dyes and crayons, as well as other activities for children and adults. Dr. Steve Trudell will delight us with fungal ecology news in the Burke Room, where you will also be able to view some of the oldest mushroom specimens from the collection in the fungal herbarium. Microscopic wonders will be projected, and Brian Luther will host a mushrom ID table. Mycologist Dr. Joseph Ammirati will be available to answer questions about our fungus friends.

Mycology is intimately connected to the studies of forestry, botany, ecology, medicine, and the culinary arts. It is the goal of the Daniel E. Stuntz Memorial Foundation and PSMS to keep these connections alive by supporting the study of fungal systematics and the natural science of mushrooms.

Mushroom Maynia! is made possible by the Daniel E. Stuntz Memorial Foundation and the volunteers of the Puget Sound Mycological Society.

UG99, A FUNGAL DISASTER? various sources

Some of you undoubtedly read the article in the *Seattle Post-Intelligencer* on March 15 reporting that the cost of wheat has more than tripled in the past 10 months, escalating not only the price of bread but, experts predict, some 80% of all grocery prices. This is because wheat, along with other grains, is used to feed cattle, poultry, and dairy cows.

The *P.I.* attributes this increase to a combination of agricultural, financial, and energy issues: poor wheat harvests in Australia, parts of Europe, and the U.S., which have caused China and other Asian countries to buy up more American crops; the weak U.S. dollar, which makes such buy-ups especially attractive; and federal incentives to grow corn for ethanol, which encourages farmers to plant more corn and less wheat.

But things could get worse. Much worse.

Lurking around the corner is Ug99.

What you may ask is Ug99? Ug99 is a virulent strain of the black stem rust fungus *Puccinia graminis,* first discovered in Uganda in 1999. Rusts take their common name from the fact that they tend to have a vivid red or orange hue. At the end of a growing season, black-stem rusts produce dark spores that can survive over winter.

Wheat rusts have been around a long time. What makes Ug99 so alarming is its potency—in monitored test plots, Ug99 reduced yields of supposedly rust-resistant wheat by as much as 71%—and the fact that it is windborne.

Until a half-century ago, many popular wheat varieties were vulnerable to many variants of *P. graminis.* Then breeders began intense efforts to select and breed wheat lines with genes resistant to black-stem disease. The success of those breeding efforts "has led to complacency throughout the wheat community," observes Norman E. Borlaug, the 91-year-old Nobel prize winner credited with launching the "green revolution."

Ordinarily, stem-rust spores move only short distances, one stem infecting another as they brush together. However, Ug99 makes five distinct types of spores. Of these, the one known as the urediniospore is especially infectious and unique in its ability to ride air currents. Winds can carry these spores for hundreds or even thousands of miles.

Ug99 infection on wheat grains (above right) and stems (left).

Until recently, the threat of such long-range rust spread was largely discounted because scientists believed that ultraviolet light from the sun would kill spores that got swept into high-altitude wind currents and then hitchhiked there for days. To the contrary, recent studies have shown that fungal spores have survived wind transport from Africa to at least as far as the Caribbean.

When Tropical Cyclone Gonu swept through the Arabian Sea in June 2007, it blew Ug99 out of Africa toward the Asian breadbasket, speeding by an estimated two years the spread of the devastating crop disease.

Already in Iran, the fungus may also have reached Pakistan and the Punjab region considered the Asian breadbasket.

In an article in *New Scientist* on March 13, 2008, Debora MacKenzie reports, "Scientists met this week in Syria to decide on emergency measures to track Ug99's progress. They hope to slow its spread by spraying fungicide or even stopping farmers from planting wheat in the spores' path. "The only real remedy will be new wheat varieties that resist Ug99, and they may not be ready for five years. The fungus has just pulled ahead in the race."

LACCARIA BICOLOR GENOME india edunews.net

March 6, 2008

Trees grow better and faster when certain specialised micro-organisms interact with their roots. One of them is *Laccaria bicolor,* a soil fungus that draws on the sugars in the roots.

An international collaborative project, set up to characterise the genome of *Laccaria bicolor*, has now sequenced the DNA of the fungus.

Laccaria bicolor.

Its DNA analyses has resulted in new knowledge, including the discovery of an arsenal of small proteins, known as SSPs, secreted where the fungus and tree roots are in contact.

Now that the genome of the *Laccaria bicolor* as well as the poplar tree—with which it forms a relationship—have been fully sequenced, it is possible to find out exactly how tree and fungus cooperate and react to stress factors such as drought or extreme temperatures resulting from climate change.

This information could lead to concrete applications in which trees and fungi can be deployed to the benefit of both people and the environment.

DEADLY FUNGUS MIGRATES TO MAINLAND

Vancouver Sun, February 18, 2008

VANCOUVER - A microscopic deadly fungus that has made its home on Vancouver Island for almost a decade has now mutated and making its way to the Lower Mainland, according to new research.

New cases of people infected with *Cryptococcus gattii*, which was first diagnosed in 1999, have been found in people who have not lived on or traveled to Vancouver Island.

The deadly organism, which lives in trees and soil, gets into the air and lodges into one's throat, causing an infection. To date, 216 people have been infected with the disease. Eight have died.

PRESIDENT'S MESSAGE

Patrice Benson

Our banquet was quite a success; delicious, fun, bittersweet, and did I mention delicious?

Many thanks to Michael Blackwell for performing the lion's share of the work involved in putting on one of the best-tasting banquets ever! Thanks to chef Varin Keokitvons and his merry band of helpers for the fabulous and tasty mushroom-shaped dessert. Thanks also to the many folks who donated mushrooms for the appetizers and main course, and to Cynthia Nuzzi for taking on the task of registration and collecting payments. A special thank-you to the Essential Baking Company for donating the breads and rolls. Thank you Milton and Reba Tam for creating some of the appetizers and to Lynn Phillips for coordinating the flowers for the tables. Will the person who took the large Hawaiian flower arrangement please return the vase (Chihuly!!!) to the Lennebackers (425–678–8350).

It was a delight to present the Golden Mushroom service award to Colin Meyer, our Education Chairman and all around mushroom scientist and Web expert. He has done much to make our society a great experience for all.

It was with fond memories and old slides that we toasted Ben Woo at the first Survivor's Banquet that he has missed. Our thoughts are with his wife, Ruth, and the many relatives left behind to mind his mushroom spots. We will continue to toast his memory as long as there is red wine!

It is also with sadness that we say goodbye to Lorraine Dod, recipient of the 2007 Golden Mushroom award. Lorraine passed away a few months ago. Details are not known, and there was no service or newspaper announcement, apparently at her request.

Our thoughts will now turn to spring, our upcoming field trips, and Mushroom Maynia at the Burke Museum, which will be held on May 4th from 10 AM–4 PM. Please check out the article on page 2 to see how you can help with this fun event.

SCIENTIFIC STUDY PRODUCES TASTIEST MUSHROOMS

Jennifer Oldridge

Lawrence Journal World & News, March 20, 2008

As Bob Bruce says: "You are either a fungophile or you are not."

Bruce would know. He has been cultivating mushrooms at Wakarusa Valley Farm for the past three years.

Growing mushrooms is not an easy task. The average gardener cannot simply buy a packet of seeds or a spore-infested "pot" of mushrooms, dig a hole in the ground, and reap the rewards of its bounty. No, mushrooms are a complicated, intricate, study in science more than they are simple gardening.

In fact, it might be more useful to have a biology degree than a green thumb.

You need a sterile environment, which is why many mushroom lives begin in a laboratory. The spores (or natural seeds) of the mushroom are so minuscule that growers cannot physically handle them, which is why the spores are inoculated on cereal grains or another substance that can be handled.

Bruce explains the process.

"Mushrooms arise from, and are made of mycelium, a complex network of cells known as hyphae," he says. "Therefore, hyphae are the basic structural units of a mushroom. Growing mushrooms requires the expansion of the mycelial mass, first from cultured agar (via spores or tissue) then to grain. Colonized grain is known as 'spawn' and is the vector for inoculating various substrates including hardwoods and straw. Growth parameters for each is unique, but in general mushrooms fruit when they 'run out of food,' followed by an increase in moisture, and an increase in oxygen. The cycle ends/continues when mushrooms form and spores are forcibly propelled from the gills."

Got it?

Mushrooms need a sterile environment, grains to be inoculated onto, clean substrates like wood chips or straw, ventilation, healthy stock cultures, and a doctorate in fungal matter. Just kidding on that last one — but it certainly wouldn't hurt.

Bruce shares the most taxing part of growing mushrooms (as if the entire process is not demanding enough): "The most challenging part of growing mushrooms is knowing when and why they fruit. We've experimented with literally hundreds of 'recipes,' oftentimes without knowing what causes failure. Moisture content, wood type, particle size, supplements, containers, and intensity and duration of light are just a few factors to consider. Not to mention you're working with microorganisms whose biological competitors (contaminants) are impossible to see until it is too late and the bacteria have outsourced the fungi to the available food.

"I suppose the most difficult part is trying to understand something you cannot see."

Wakarusa Valley Farm, which is 7 miles southwest of Lawrence, Kansas, looks like a run-of-the-mill grower's paradise—lots of greenhouses, plenty of land, a few dogs and cats to greet visitors.

But when you take a closer inspection or go on a tour, this is quite different from other growing environments. First of all, you take off our street shoes and replace them with rubber shoes in many of the converted greenhouses for cleanliness purposes. Instead of rows of plants there are alien-like growth forms poking out of bags stuffed with straw and hanging from the ceiling or otherworldly creatures protruding from brick-like blocks of wood chips stacked on shelves.

Richard Gwin

Bob Bruce, 25, chief mushroom technician for Wakarusa Valley Farm, works on growing and harvesting mushrooms at the farm, which is southwest of Lawrence.

The atmosphere is damp and stinky and a little dark. The growing mushrooms vary from brown, tan, multi-colored to albino white and pink. They are universally soft to the touch, but their shapes and contorted growth patterns are all unique to each variety. Wakarusa Valley Farm cultivates morels, lion's mane, lobster, king oyster, wine cap, chanterelle, hedgehog, pom pom blanc, maitake and shiitake mushrooms, to name a few. A handful of local restaurants and the Rolling Prairie Alliance all are clamoring for these beautiful, odd, tasty, home-grown morsels.

So if you are feeling your life is lacking some spores, check out what Wakarusa Valley Farm is up to, check out their mushroom food pantry, and for goodness sakes, take a sunny Saturday to plod about the outskirts of Lawrence in a deep, dark deciduous forest and discover the wonderful world of mushrooms!

RETURN THOSE BOOKS! Kim Traverse

It's that time again: *time to return all checked out items to the PSMS library for inventory.* Please return all library materials to the library by the next membership meeting. Thank you.

WHY THAT SMELL? spectroscopyNOW.com

Wild mushrooms are used around the world in cooking. Now, Portuguese scientists have applied multivariate analysis to the gas chromatographs of volatiles from various species to build up a correlation pattern between the various compounds and the actual aroma. Such a correlation could be used by the food industry to verify product authenticity, allow flavor chemists to devise inexpensive additives that emulate the smell and taste of particular species, and enable biotechnologists to engineer new species with particular flavors.

Paula Andrade, P. Guedes de Pinho, Bárbara Ribeiro, Rui Gonçalves, Patrícia Valentão, and Rosa Seabra of the University of Porto, and Paula Baptista of the Polytechnic Institute of Bragança, Saint Apolónia Campus, describe their observations in the *Journal of Agricultural Food Chemistry*.

The researchers investigated the volatile and semivolatile components of 11 wild edible mushrooms: *Suillus bellini*, *S. luteus*, *S. granulatus*, *Tricholomopsis rutilans*, *Hygrophorus agathosmus*, *Amanita rubescens*, *Russula cyanoxantha*, *Boletus edulis*, *Tricholoma equestre*, *Fistulina hepatica*, and *Cantharellus cibarius*. These and many other species are found in the Trás-os-Montes region of northeastern Portugal, an area renowned as one of the richest regions in wild edible species.

Andrade and colleagues used headspace solid-phase microextraction (HS-SPME) and liquid extraction combined with gas chromatography/mass spectrometry (GC−MS) to identify 50 volatile and nonvolatile components formally. They also made a tentative identification of 13 other compounds.

Based on "sensorial analysis" (smell), the researchers applied descriptors to these compounds as "mushroom like," "farm-feed," "floral," "honey like," "hay-herb," and "nutty." With all compounds classified by their odor the team then applied multivariate analysis (principal component analysis and agglomerative hierarchic cluster analysis) to the data.

They were thus able to divide the edible mushrooms into three distinct groups. One group was rich in compounds containing eight carbon atoms, so-called C8 derivatives. These include the alcohols and ketones 3-octanol, *trans*-2-octen-1-ol, 3-octanone, 1-octen-3-one, and 1-octen-3-ol. This latter compound is best described as smelling of "raw mushroom" and having a "mushroom-like flavor" and inevitably is considered to be the main component responsible for the most dominant flavor of all edible mushroom species. The second group is rich in terpene-type volatile compounds, hydrocarbons built from isoprene units. The third group contains high levels of methional, a sulfur-containing aldehyde with a strong musty and vegetable odor. Other compounds identified included esters, sterols, lactones and terpenes, indole, and 3-chloroindole.

While 1-octen-3-ol seems to give all species their mushroom-like flavor, the researchers point out that the myriad other organic compounds produced by the different species gives rise to their specific characteristics. "The presence and contents of these compounds give a considerable contribution to the sensory characteristics of the analyzed species," the researchers explain.

Andrade and colleagues point out that the determination of volatile compounds and the building up of a characteristic profile for food stuffs using chemometrical comparisons of strains or species has become an essential part of the quality assessment process for checking the authenticity of commercially available flavoring substances and food products. The distinctive odors of mushroom species have also been used in taxonomy by mycologists hoping to identify and classify species. The researchers add that researchers in biotechnology have also screened several mushroom species in order to establish flavor profiles that might be engineered into novel species to give them particular flavor characteristics as well as allowing them to be cultivated commercially with ease.

"As far as we know, this work is the first approach to the volatile characterization of these edible mushroom species," the researchers conclude. Their use of two extraction techniques coupled with GC-MS allowed them to identify a wide variety of compounds in each mushroom species investigated. The HS-SPME approach was best suited to extracting the volatile compounds, they add, whereas dichloromethane extraction was useful for the semivolatile compounds.

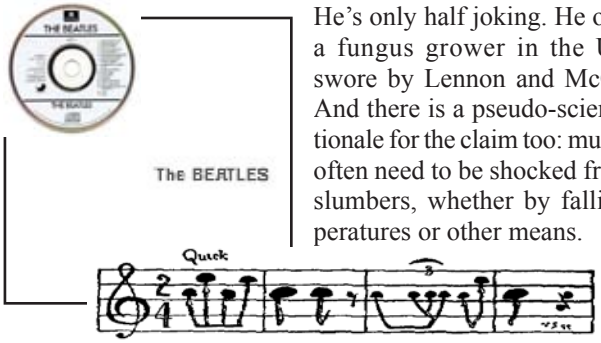
THE BEATLES GOOD FOR MUSHROOMS

Andrew Forgrave

*Daily Pos*t, March 13, 2008

Mushrooms, it is said, are famously temperamental. To fruit they require just the right temperature, a precise humidity, and the correct growing medium.

And if that doesn't work, you can always try giving them a blast of rock music. "Apparently 'The White Album' by The Beatles, works best," smiles Beddgelert grower Cynan Jones, 51.



He's only half joking. He once met a fungus grower in the US who swore by Lennon and McCartney. And there is a pseudo-scientific rationale for the claim too: mushrooms often need to be shocked from their slumbers, whether by falling temperatures or other means.

HISSING COCKROACHES HOST POTENT MOLD ALLERGENS *Science Daily*, March 18, 2008

Their gentle nature, large size, odd sounds, and low maintenance have made Madagascar hissing cockroaches (*Gromphadorhina portentosa*) popular educational tools and pets for years. But the giant insects also have one unfortunate characteristic: Their hard bodies and feces are home to many mold species that could be triggering allergies in the kids and adults who handle the bugs, according to a new study.

Researchers have identified 14 different kinds of mold on and around this species of cockroach, including several molds associated with allergies and others that can cause secondary infections if they enter the lungs or an open wound.

The mold genera most commonly found on the body surfaces of young and adult Madagascar hissing cockroaches were *Rhizopus*, *Penicillium*, *Mucor*, *Trichoderma*, and *Alternaria*, several of which are listed by the Centers for Disease Control and Prevention (CDC) as common indoor molds. Colonies of the mold species *Aspergillus niger*, a common contaminant of food, were particularly plentiful in the feces and external shells that had been discarded as the insects molted.

"This is mainly a point of public awareness," said Joshua Benoit, lead author of the study and a doctoral candidate in entomology at Ohio State University. "We are not criticizing their use. We are just saying that if you handle these cockroaches, you should wash your hands when you're done.


Ohio State University

"It's also best to maintain the cage. It's not a pet you can ignore," he said. "Without regular cleaning, feces will build up, and the old exoskeletons they shed will build up. And that's where a lot of the problems happen."

RUSSIAN SCIENTISTS DEVELOP SORBING AGENTS FROM FUNGAL CHITIN **Kizilova Anna**

Science and Technologies, Russia Info Center, Feb. 19, 2008

The ability of various fungi to absorb heavy metals is widely known. It is why even edible mushrooms which grow in non-healthy ecological areas can damage human health. This property has a simple explanation—all mushrooms contain chemical compounds which include chitin, a polysaccharide with effective sorbing properties. Russian scientists suggested using said compounds for "catching" heavy metals, thus purifying water and water solutions. The mushroom themselves can also be used as sorbents; however, using extracted compounds is much more effective.

Russian biologists found fungi with the needed components, extracted the components, identified them, and found out which fungi contained more substances of interest. Biologists started with collecting various types of mushrooms—higher fungi *Basidiomycetes* (fungi with many-celled mycelium, like honey agarics, paxils, champignons, and fly agarics) and Ascomycetes (cup fungi, like morels), drying, and mincing them. Then the fungal powder underwent successive extractions with sodium hydroxide, hydrochloric acid, and hydrogen peroxide solutions. The scientists extracted chitin complexes with other polymers: chitin-glucan complexes and chitin-glucan-melanin complexes. After that the mentioned compounds were identified, and their sorbing properties were studied on cadmium and nickel ions.

Some fungi showed weak sorbing properties despite being rich in chitin. The worst sorbents for cadmium were extracted from *Ramaria flava* (an edible mushroom, which looks like coral), and the worst for nickel from *Lactarius torminosus*.

Scientists are currently searching for a sorbing agent for another serious toxin—water-soluble lead compounds. At the same time they are studying the effects of dye sorption on these compounds. Of course, they do not forget about making an affordable product based on their fundamental research.

Scientists from other Russian regions are also racking their brains over new sorbents. By the end of 2008 researchers should be able to present an experimental industrial unit that absorbs carbon and makes possible the purification of industrial gases and liquids. These units will prevent industries based on ferrous and non-ferrous metallurgy from releasing fine particles into the atmosphere.

A brand-new carbon sorbent is being developed in Saint Petersburg, along with a new pack for this sorbent which provides perfect sterile conditions. The new sorbent, which is covered with fluorine, demonstrates a high sorption capacity and doesn't damage blood corpuscles. This useful substance is packed into a sterile column, preventing generation of dust while storing and transporting.

PREVIEW: "FUNGUS THE BOGEYMAN" **Charles Hutchinsony**

The Press, York, Yorkshire, March 14, 2008

Pilot Theatre, the resident company at York's Theatre Royal, has linked up with ArtsDepot for a collaborative production of Raymond Briggs's "Fungus The Bogeyman." Initially made as the Christmas show for ArtsDepot in North Finchley, the play takes over the Theatre Royal in Easter week, offering "repulsive yet compulsive holiday viewing."

Briggs's green-conscious story of Fungus and his recycling, composting family has been adapted for the stage by Pilot artistic director Marcus Romer.

"I did "The Twits" for the Bolton Octagon in 2005, and that was the same kind of territory as Fungus, and the reason that this show has followed the Roald Dahl piece is that we wanted to do something with a literary pedigree, rather than a show from the tinselly, glitzy end of the story world," he says. "Instead we wanted something at the itchy, slimy, pun addled, gross-out end of the market."

"Fungus The Bogeyman" leapt out as Romer's story of choice. "Shrek is the bastard child of Fungus: Fungus is the daddy of green characters," he says.

Marcus believes "Fungus The Bogeyman" has become ever more relevant in this ecologically aware age.

"In 1977, Fungus's family were the eco-warriors of their time; they were pre-Swampy. Look at their spiky hair; they were the punk Wombles, and so we've kept their Mohawks and their anarchy in our production."

Mushrooms

Overnight, very
Whitely, discreetly,
Very quietly

Our toes, our noses
Take hold on the loam,
Acquire the air.

Nobody sees us,
Stops us, betrays us;
The small grains make room.

Soft fists insist on
Heaving the needles,
The leafy bedding,

Even the paving.
Our hammers, our rams,
Earless and eyeless,

Perfectly voiceless,
Widen the crannies,
Shoulder through holes. We

Diet on water,
On crumbs of shadow,
Bland-mannered, asking

Little or nothing.
So many of us!
So many of us!

We are shelves, we are
Tables, we are meek,
We are edible,

Nudgers and shovers
In spite of ourselves.
Our kind multiplies:

We shall by morning
Inherit the earth.
Our foot's in the door.

- Sylvia Plath

INDIANA STUDENTS INVESTIGATE MYSTERIOUS BAT DEATHS

Jennifer Sicking

Tribune-Star, March 18, 2008

TERRE HAUTE, IND. - When Jonathan Storm and Justin Boyles journeyed to New York to investigate what is killing entire colonies of bats, the two Indiana State University doctoral students found bats in crisis.

Last year at four caves near Albany, NY, more than 10,000 bats died from a mysterious disease involving a white fungus, identified to the genus *Fusarium*, growing on some bats' noses, leading researchers to dub it "white-nose syndrome." *Fusarium* is a common and widespread genus usually associated with plants.

The mounting death toll stopped last year when spring arrived and the bats left the caves. But the deaths returned with a vengeance after the bats went into hibernation this winter. With 14 known caves infected across New York, Vermont, and Massachusetts, scientists estimate the syndrome may currently affect as many as 500,000 bats.

"Our only hope at this stage is we're not too far from the spring thaw," said Dale Sparks, assistant director of the Center for North American Bat Research and Conservation at Indiana State University.

Using a thermal imaging camera, Boyles and Storm entered caves in the Catskill Mountains of New York to record the hibernating animals' body temperatures during several days in February. The bats' body temperatures were "fairly normal" for hibernation at about 37ºF, they said.

However, "What we expected to find and what the bats were doing are two different things," said Boyles. Normally, the men said, when someone enters a cave, the bats' body temperatures rise, they arouse, and they begin flying around the cave. "We couldn't wake the bats up at all," Boyles said. "In one cave, we spent 10 hours and never saw a response." In some caves, bats managed to rouse themselves to hunt food, which is scarce in February.

"Probably the more depressing part was seeing all of the bats evacuating the caves," Boyles said. "You'd see bats everywhere trying to find food," Storm, from Earlham, Iowa, added. "There were many dead bats outside the caves. There will likely be more soon as more bats run out of fat reserves and leave the caves to find food."

What scientists don't know is whether the fungus itself or some other ailment is killing the bats. Some of the bats have had pneumonia, and they all are underweight.

"The bats are basically starving to death," said Storm. "They don't have any fat stores left to make it through winter."

While the little brown bat, a common species, has been hit the hardest, another species, the endangered Indiana bat, also has been infected.

The impact of the bats' deaths could be felt for centuries to come. "These bats reproduce very, very slowly," Boyles said. "Whatever happens now, it could take hundreds of years for the populations to bounce back." That in turn could impact crops and humans, as bats eat thousands of insects in one night of foraging.

Although the disease has not been found in bats hibernating in Indiana, Boyles, Sparks, and Storm urged spelunkers to take precautions after leaving a cave by washing their gear with bleach or rubbing alcohol.

U.S. Fish and Wildlife Service

Little Brown bats in a New York cave show signs of white nose syndrome.

MUSHROOM MISSIONARIES

On January 2, **Patrice Benson** spoke to the community and staff at Discovery Park during their benefit for the Discovery Park Environmental Education Scholarship Fund. On March 20, she spoke at the Kitsap Mycological Society's banquet on using mushrooms for color.

MUSHROOM AND CARAMELIZED ONION BRUSHETTA

Michael Blackwell

These crisp, tasty morsels were served at the PSMS Survivor's Banquet and annual meeting March 7, 2008.

1 loaf	Italian bread
2 oz.	Extra virgin olive oil
1	Clove garlic
2 each	Large onions, sliced
3 oz.	Oyster mushrooms
3 oz.	Shiitake mushrooms
3 oz.	Crimini mushrooms
3 oz.	Royal Trumpet mushrooms
2 oz.	Roasted red peppers
2 oz.	Red wine
1 oz.	Marinara sauce

As needed:

Fresh herb mixture (e.g., basil, oregano)
Extra virgin olive oil
Salt and pepper to taste
Reggiano Parmesan, grated

Preparing the Brushetta croutons:

Preheat oven to 350°F. Slice Italian bread on bias into 1-inch slices. Paint the bread with olive oil using a pastry brush. Sprinkle with fresh herbs, season with salt and pepper. Bake in oven for about 8 minutes until crisp and golden brown. Can be prepared 24 hours in advance and warmed for service.

Preparing the Mushroom Mixture:

In large sauté pan, sauté onions in extra virgin olive oil until caramelized, stir often (about 20 minutes). Add garlic and sauté until translucent. Add mushrooms and cook for 3–5 minutes. longer. Finish with roasted peppers, red wine, and tomato sauce; salt and pepper to taste. Can be prepared 24 hours in advance and warmed for service.

Combining:

Spoon warm mushroom mixture onto the baked croutons. Garnish with Parmesan cheese.

THANK YOU

Patrice Benson

I would like to acknowledge the following members for their donations to PSMS.

Keith Reher and Marianne Webster
Raul and Christine Mustelier
Leslie and Ed Sakai
Dick and Candy Barnes
Janice Humeniuk
Ben Sakamoto
Joanne Young
Brandon Matheny

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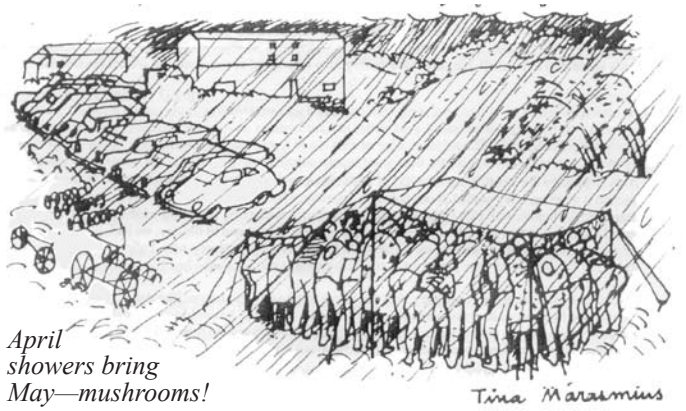

April showers bring May—mushrooms!

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