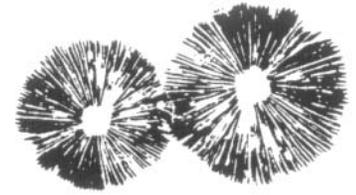


SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 436 November 2007



44TH ANNUAL WILD MUSHROOM SHOW - 2007



PRESIDENT'S MESSAGE

Patrice Benson

The Exhibit was magical this year! We had happy member volunteers and eager and interested attendees. The exhibit financial report will be revealed at the next membership meeting, but it seems that we have over 100 new members and had at least 1400 paid visitors. The return to CUH was viewed as a success, especially since we used the lobby and atrium for the art exhibit, cooking, and Fungi Perfecti's cultivation sales.

I would like to thank all of the chefs and prep cooks who participated in the fabulous cooking and tasting area; lots of good things passed the lips of many tasters!

I would like to especially welcome the new members to our volunteer organization and urge you to get involved in our many activities. Welcome also to our new membership chair, Jennifer Slack. We all hope that Bernice Velategui, who chaired the membership committee for many years, has a swift recovery and can join us at the meetings soon. Thank you, Bernice, for your many years of faithful service. Hurry back!

We are beginning the search for some new trustees with the annual establishment of a nominating committee. The committee will be

announced at the November meeting and the nominations will be open. Think about serving on the board; no experience necessary, just a willingness to pitch in and make things happen. Thanks to the board for all of the planning activities and tasks performed.

We have begun planning Mushroom Maynia at the Burke Museum. Reserve May 4, 2008, as a day to participate and enjoy this new event. It would be a great time for new members to volunteer to help with this informative event for families.

Thanks to Hildegard Hendrickson for sharing her expertise before the monthly membership meetings. Everyone benefits from her years of experience with mushrooms and hunting.

Our Monday ID sessions in the atrium of CUH, which coincide with the Master Gardener plant ID sessions, have been increasing in attendance and popularity. Anyone may bring specimens to be identified on Mondays at CUH from 4-7 PM. All of you intermediate identifiers think about volunteering with an "experienced" volunteer to learn more about mushroom ID.

A big thank you to Ron Post for chairing this year's exhibit. It was great!



Spore Prints

is published monthly, September through June by the

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MEMBERSHIP MEETING

Tuesday, November 13, 2007, at 7:30 PM at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle.



The speaker for November is Daniel Winkler, a member of PSMS since 1996. His talk is titled "Mush-Roaming in Tibet—Tibet's globally unique Mushroom Economy." Daniel will present findings from his fungal research along with highlights from his most recent "MushRoaming" expedition to Tibet (see www.mushroaming.com). Daniel has been traveling to Tibet for 20 years and since 1998 has been researching and tracking the local mushroom industry, an important source of income for the rural people.

While Tibet is world famous for its stunning mountain landscapes and complex ancient culture, a lesser-known activity is the economy built on the collection and trading of mushrooms. For example, the "Yartsa gunbu," or caterpillar fungus *Cordyceps sinensis*, a precious ingredient in traditional Chinese medicine, is rural Tibet's most important "cash crop." Each spring, Tibetans comb alpine grasslands for this fungus, while forests are searched for "gugu shamo," the "cuckoo mushroom" (morels). In summer, "beshing shamo," *Tricholoma matsutake*, are collected and flown to Japan. Many other mushrooms are also collected for markets, including *Amanita hemibapha*, *Hygrophorus russula*, *Rozites emodensis*, many boletes (including *Boletus* and *Leccinum* species), *Cantharellus*, and several species of *Sarcodon* and *Tricholoma*.

Daniel is a trained geographer and ecologist and works as a researcher and Non Government Organization consultant on environmental issues of the Tibetan Plateau and Himalayas. He has published on forest ecology, forestry, land use, and medicinal plants and fungi.

At 7 PM, before the membership meeting, Hildegard Hendrickson will present a 30-minute program for new members. She will offer tips on hunting and identifying mushrooms and answer questions.

Would people with last names beginning with the letters A–K please bring a plate of refreshments for the social hour?

CALENDAR

- Nov. 12 Master Gardeners' ID class, 4–7 PM, CUH atrium
- Nov. 13 Membership Meeting, 7:30 PM, CUH
Spore Prints deadline (early)
- Nov. 19 Master Gardeners' ID class, 4–7 PM, CUH atrium
PSMS Board Meeting, 7:30 PM, CUH
- Nov. 26 Master Gardeners' ID class, 4–7 PM, CUH atrium

SEPTEMBER BOARD NEWS

Dennis Oliver

Publicity for the joint PSMS/Master Gardeners' ID sessions on Mondays through November 26 will appear on the PSMS website, on the Master Gardeners' website, and in the CUH newsletter. The Deception Pass field trip has been changed from November 3 to October 27. We have been able to get hosts and identifiers for all the field trips.

Hildegard Hendrickson will continue to give short mini-classes before the monthly meeting. The first series of Fall ID classes begins the week of September 9; the second series will begin October 18.

Milton Tam has set speakers for the monthly meetings through December. Ron Post reports that all is going well on the annual mushroom show. We still need a ticket chair for the show. Mushroom day at the Burke Museum is set for May 4 from 10 AM–4 PM. A possible name is "Mushroom MAYnia at the Burke."

Bernice Velategui is recovering from surgery and has resigned as membership chair. Jennifer Slack will be the new chair.

A nominating committee has been formed for the 2008 election. It consists of Dennis Oliver, Lynn Phillips, Joanne Young, and Ron Post.

SQUIRE CREEK FIELD TRIP

Colleen Compton

Over 50 enthusiastic mushroom hunters signed in September 29 at this pleasant location on Squire Creek near Darrington for our first field trip of the season. It was a cool and drizzly day, but we had no downpours of rain. Harold Schnarre was able to keep a nice big bonfire blazing the whole time. I provided hot coffee and goodies for damp but eager participants, Harold generously ferried many new hunters to locations in the woods where they harvested mushrooms. Almost everyone came back with some chanterelles and a few with a basketful. Lobster mushrooms (*Hypomyces lactifluorum*) were found in abundance.

Josh Birkebak arrived early and was kept busy throughout the day identifying mushrooms. Thanks to Tamrah Birkebak for printing genus and species on cards all that chilly day. Patrice Benson joined in identifying for us and cooked and shared a lovely pan of chanterelles which she had harvested. Many participants brought food to share, and we held our potluck around 1 PM. At the end of the day, around 87 species were identified, and it was a very damp and happy trip.

CHATTER CREEK FIELD TRIP

Brian Luther

We were fortunate to have a lovely weekend October 6 for this field trip. En route, not far over Stevens Pass, I was rewarded with some breathtaking views of entire hillsides ablaze with a stunning assortment of brilliant fall rainbow colors on the vine maples. The early rains we got this year in late summer set the stage for a very productive mushroom season, and 16 miles up Icicle Creek Road we had no trouble seeing evidence of this climatic phenomenon.

Our friendly hosts were Jason Balsam and Thomas Pohle, and it was a pleasure to see these new members pitch right in and contribute. Jason and Tom had come over Friday and so were well prepared for the members arriving Saturday morning. Besides the usual hot coffee, snacks, and goodies, they already had a roaring fire in the fireplace of this old CCC shelter, and it was very welcome and relaxing. Unfortunately, sometime Saturday Tom's car broke down, and they had to have a tow truck come from Leavenworth. His car couldn't be fixed before Tuesday, so they ended up having an extended camping trip for a few more days. Sorry for your problems and thanks guys for doing a great job.

Mushrooms were only trickling in from the general area around the shelter (2,800 ft elev.) and group camp area we had reserved, but Josh Birkebak and his dad took a stroll down by the creek and came back with a bunch of good sized Matsutake (*Tricholoma magnivelare*), some being perfect buttons. That set the stage for mushrooms to start pouring in. Even though we had only 18 people registered, the shelter ledges and another picnic table were covered with collections. Seventy-six species were displayed, and I was pleased to have both Coleman Leuthy and Josh helping with ID. A peculiar species of *Lentinellus* was brought in that had broadly ellipsoid, amyloid spores lacking any ornamentation. Since spore ornamentation is a characteristic of this genus, it's a highly unusual find, requiring further study. Other interesting finds included *Cortinarius elegantior* var. *americanus* and a very large *Cortinarius* sp. (*variosimilis*?), which were plentiful right in the campground area, and several remarkable specimens of *Gomphus kauffmanii* with very pronounced, heavy scales in the cap funnel. The most odoriferous collection was *Marasmius prasiomus* with a super strong garlic odor; competing for the most colorful find of the day were the polypores *Pycnoporellus alboluteus* and *Laetiporus conifericola*, both with beautiful oranges and yellows. Really good edibles included some chanterelles, a single *Boletus edulis*, some Angel Wings (*Pleurocybella porrigens*), a couple of *Rozites caperata* (Gypsy Mushrooms), and the matsutakes I mentioned earlier.

Eight or ten people stayed for potluck, but there was plenty of satisfying food, and there were some lively conversations, especially after we all shared several bottles of fine red wine by the fire. If you didn't make it this weekend, you missed out on seeing some interesting fungi, and most everybody had a great time.



TWANOH STATE PARK FIELD TRIP

Brian Luther

For the past several years we've been really lucky and enjoyed beautiful sunny weather on this field trip, so it was no surprise when October 20 we got some drizzle and rain. But we can't complain because about noon it stopped coming down enough to allow me to build a big fire in the fire pit, and the weather improved

considerably as the day progressed. Just before potluck we were enjoying some actual sunshine.

I was fortunate to have the ID help of Larry Baxter for the day. He, his daughter Heather (14), and Lynne Elwell (in her RV) came over Friday and had dinner with us at our cabin just a mile from the park, and this gave us more time to get organized for the next day. As usual, Larry and I got to the shelter while it was still dark early Saturday morning to clean it out and arrange the display. No sooner had Larry just lit one of his bright lanterns so we could see what we were doing inside the shelter than park ranger Stacy Ruland showed up to turn the lights on for us (circuit breaker box is kept locked). She was instrumental in helping us plan for the use of the shelter and was my official contact at Twanoh State Park. Thanks, Stacy. As Larry and I did identification, our two hosts, Lynne Elwell and Tony Tschanz, got organized on all the food, coffee, and other hosting supplies. Lynne and Tony, you really helped make the day enjoyable for everyone—thank you.

People had collected a few things in their baskets to set out on the sorting tables, and I reviewed everything brought in before the morning meeting. At 10:00 AM I held a meeting where I introduced our hosts and gave a handout and brief lecture on collecting in Washington State Parks and collecting habits in general, and discussed the data-collection slips required for each collection made within the park. People seemed anxious and disappeared into the woods as soon as I finished my meeting.

Because of the so-so weather, we didn't think we'd get as large a turnout, but I'm pleased to report that a full 60 people signed in. This is the kind of enthusiasm we like to see, and most everybody was encouraged by the abundance of good edible fungi found right in the park.

Significant quantities of Pacific Golden Chanterelles (*Cantharellus formosus*) and White Chanterelles (*Cantharellus subalbidus*) were found, along with some Hedgehogs (*Dentinum/Hydnum repandum*), Orange-Caps (*Leccinum aurantiacum*), and Matsutake within the park. Some of the prettiest collections included the bright orange *Pholiota astragalina* and *Tricholomopsis rutilans* with its gorgeous purple-vinaceous scales over a yellow background. A nice diversity of around 130 different species of fungi were collected and spread out over several picnic tables. The display provided an excellent opportunity for everyone to study and learn some new fungi. Many interesting finds came in that I took with me for further study. Thanks to all participants for diligently completing the data-collection slips for fungi collected within the park, the information from which I must have to complete my final report and list that I submit to the Washington State Parks and Recreation Commission at the end of the year, allowing us to use these facilities in the future.

Extra special thanks to Lynne Elwell and Luis Felix, who prepared some delicious dishes for the cooking demo using the two gallons of gorgeous chanterelles that Lynne had collected and cleaned by herself earlier in the week. Probably around half of the group stayed for an informal potluck, sampling some tasty fare.

A warm thank you to all who contributed during the day and to those who helped with cleanup at the end of the day (too many to name). Most people found some good edibles, there was lots of hot coffee and goodies all day, the big camp fire allowed everybody to warm up a bit between the drizzly weather, getting out into the woods and the fresh air was invigorating, most everyone was eager to learn, and we ended up with a sunshine filled late afternoon—what more could you ask from a fall field trip?

**THE CHRISTMAS NAUCORIA:
A STORY OF SERENDIPITY, NETWORKING, MILITARY OBSTRUCTIONISM, AND THE BLIND EYES OF COSEWIC AND THE BC CDC** **Oluna Ceska**

The Victoria Naturalist, Vol. 64, issue 3, Nov./Dec. 2007

At the end of December 2001, when checking Macoun's meadowfoam populations at the base of Mary Hill, I collected a strange, small red fungus, an agaric that grew on a rotting stump of an arbutus. I identified it as *Naucoria vinicolor*, a mushroom that is, according to Arora's *Mushrooms Demystified*, "known only from California, but perhaps widely distributed." Arora "found it several times on oak in the fall and winter, but it is rare."



Adolf Ceska

Tubaria punicea
The Christmas Naucoria

I took the specimen to several meetings with Pacific Northwest mycologists, but none of them had seen this fungus before.

For several winters I searched for this mushroom, but all in vain. In 2005, when doing a survey of Miniskirt Mountain in Langford, I came across three arbutus trees that had several fruiting bodies of this mushroom. You can imagine how excited I was. It was shortly before Christmas and I sent an e-mail message to several mycological friends. Dr. Jim Ginns, a retired Curator of the National Mycological Herbarium in Ottawa, forwarded our photographs to Dr. Brandon Matheny, who happened to work on this group of fungi.

There are several species of deep red fungi that occur on wood chips or rotting wood, and our fungus chose eroded arbutus trees as its substrate. Brandon Matheny set up a team of mycologists who were collecting and comparing small red agarics from various substrates and even from far away continents, such as Australia. They had only about two old collections of the mushroom growing on arbutus. When Brandon received Jim Ginns' note about my find, he wanted more of our material: "The more the merrier, you know!"

This message, received on December 20, decided how we spent Christmas 2005. No traditional Czech carp on the Christmas Eve table, just a pair of jeans and piously going on our knees around those arbutus trees that had eroded bases. From our previous surveys of the Department of National Defense, we knew a lot of suitable arbutus trees on Mary Hill, Albert Head, Rocky Point, and Heals Rifle Range. Our search effort was successful. We received emergency permission to search some Department of National Defense lands in the Victoria-Metchosin area and we found two trees at Yew Point (DND), one tree in Albert Head (DND), two trees on Mary Hill (DND), two trees on Heals Rifle Range (DND), and one tree at Rocky Point (DND). In addition, we found two arbutus trees on Cobble Hill and two trees on Observatory Hill that also hosted this rare fungus.

We have never spent Christmas in a more enjoyable way. Fascinated by this small red critter, every find was the best Christmas present we were able to get. Within ten days, we sent plenty of collections to Brandon for his DNA study.

The DNA study showed that the arbutus fungus was a different species than what was known as *Naucoria vinicolor*. Professor Joseph Ammirati from the University of Washington in Seattle was responsible for investigating the type material of all possible red small mushrooms that would come to this complex. He found that our red mushroom from arbutus has been indeed described

as *Pholiota punicea* in 1968 by A.H. Smith & L.R. Hesler. I was invited to be one of the coauthors to a paper on this mushroom that was submitted to a mycological journal in fall 2006.

The publication process is slow; the reviewers have to read the manuscript and show their ego, and authors have to answer their questions and adjust their manuscript accordingly. While doing this, a new winter came and a new search for our "Christmas Naucoria." After our 2005 successful search, several friends, Victoria naturalists, saw our presentation and devoted their 2006 Christmas to the search on their own. This was a great help, since the Department of National Defense has virtually kept us out of their sites. We had to have a pricey \$2,000,000 liability insurance (each of our six visits cost us over \$140.00), and certain areas, namely Mary Hill in Metchosin, the best site for our mushroom, were strictly out of bounds. *Inter arma enim silent Musæ*. In the military, Muses are always silent. We were not able to monitor populations known to us in the Department of Defense properties, and we were not able to look there for more arbutus trees that would host this fungus.

Never mind. We showed our photos in various meetings with naturalists and amateur mycologists, and their search resulted in quite a few new sites. The most interesting was one that Teresa Klemm found in Errington near Parksville that extended the known range of this fungus farther northward on Vancouver Island. Christian Englestoft, Moralea Milne, and Christopher Pratt each found one or more arbutus trees with this fungus. We found several additional trees on Cobble Hill and on Observatory Hill. At the end, with the help of our friends, we ended up with about 40 trees that hosted this fungus. Unfortunately, the military areas were out of bounds for our search and we just can hope that the Environmental Science Advisory Committee (ESAC) will one day pay attention to this interesting fungus and permit a proper survey in the military areas. This way we would get a more complete picture about its distribution on southern Vancouver Island.

Arora pointed out that *Naucoria vinicolor*, a close relative of our fungus, "does not belong to the genus *Naucoria* in its modern sense." This is also true about our fungus that grows on arbutus. In our recently published article (Matheny *et al.* 2007), Brandon Matheny, Else Vellinga, and Joe Ammirati transferred all related small, red fungi into the genus *Tubaria*. Our fungus, growing on eroded bases of arbutus, was originally described as *Pholiota punicea*. After its transfer to the genus *Tubaria*, it will be known as *Tubaria punicea*. The closely related species, "*Naucoria vinicolor*" that is known from various garden wood chips (but NOT from arbutus trees) in California and Washington, will become *Tubaria vinicolor*. So far this particular species has not been found in Canada.

We currently know arbutus trees in about 11 different sites that host *Tubaria punicea*. Its distribution on Vancouver Island ranges from Rocky Point, Metchosin to Mill Hill, Observatory Hill, Heals Rifle Range, and Cobble Hill. The northernmost site is at Little Mountain in Errington, near Parksville. Considering how many arbutus trees we had to examine, this fungus is definitely rare, but neither COSEWIC (Committee on the Status of Endangered Wildlife in Canada) nor the British Columbia Conservation Data Centre (CDC) "track" mushrooms, in spite of the fact that Scott Redhead (1997) made a good start in listing about 65 species as rare or notable in British Columbia.

The ecology of *Tubaria punicea* is still to be studied. We found it mostly on eroded bases of living arbutus trees and, in only about two cases, it also grew in the hollows of dead arbutus trees. Is it a

benign saprophyte, living from the rotting arbutus wood, or is it a parasite that contributes to the demise of arbutus trees on which it lives? There are many unanswered questions that need to be followed and studied in the future. Nevertheless, we made the first step by finding what this fungus is and by finding trees where one can monitor its life cycle and learn more about its ecology.

References

Matheny, P. B., Vellinga, E., and Ammirati, J. 2007. Taxonomy of displaced species of *Tubaria*. *Mycologia* 99: 569–585.

Redhead, S. 1997. *Macrofungi of British Columbia: Requirements for Inventory*. British Columbia Ministry of Forests Research Program, Working Paper 28. 118 pp.

SCIENTIFIC CLASSIFICATION

Jim Sherry

Mycological Association of DC, June 2007

via *Mushroomer*, Snohomish Co. Myco. Soc., October 2007

Scientific classification of living things is referred to as “taxonomy.” It began with Aristotle, who divided all living things into plants and animals. Others made contributions down through the centuries, but it was Carolus Linnaeus, a Swedish botanist, who, in the 1750s, provided the system that is used today. Like Aristotle, he divided living organisms into two “kingdoms,” plants and animals, and then provided ranks for increasing smaller subgroups within each kingdom: phylum, class, order, family, genus and species. Today these ranks are referred to as taxa (singular, taxon). Since fungi did not move and had cell walls like plants, Linnaeus put fungi into the plant kingdom. After microscopes were invented, things for biologists were never the same. In 1860, Hogg and Haeckel proposed Protoctista as a third kingdom, which included fungi, algae, bacteria and protozoans. This was an ascan group whose members did not have much in common, and so no one was pleased with this kingdom. In 1938, Copeland took bacteria out of the third kingdom and placed it in a fourth kingdom, which he called monera.

Then, in 1969, Whittaker, at Columbia University, proposed that we put fungi into its own kingdom and this then made a fifth kingdom; he also proposed that the name Protoctista be changed to Protista. Most biology textbooks today still list Whittaker’s five kingdoms, but some biologists now say that there are six kingdoms and some say that there are eight. Most people don’t care because the organisms that are causing all the difficulty cannot be seen without a microscope. And this story is not done yet: In the past few years another proposal stated that there are three domains and that plants, animals, and fungi should be placed in one domain and that the other two domains should be composed largely of two types of bacteria. (The history that I just outlined will vary, depending on which author you read.) And still we are not done: The cladists want to put all of life into clades and then name the clades. They are not even interested in domains or kingdoms.

All of this demonstrates that science is a human endeavor and that organisms like fungi could care less, but then there’s the crowd that thinks that fungi might have some awareness—well Nicholas Money reported that he heard hyphae “screaming.”

Editor’s note: A clade is a taxonomic group of organisms comprising a single common ancestor and all the descendants of that ancestor. Any such group is considered to be a monophyletic group of organisms, and can be represented by both a phylogenetic

analysis, as in a tree diagram, and by a cladogram or simply as a taxonomic reference.

THE LICHEN / NONLICHEN CONNECTION

Else C. Vellinga

The Mushroom Log, Ohio Mushroom Soc., Sept./Oct. 2007

One thing we knew for certain about lichens: the fungal partner of the lichen symbiosis could not live its whole life cycle without a photosynthesizing slave providing sugars to the fungus. These enslaved, encapsulated algae or cyanobacteria (formerly known as blue algae) can live without the fungi, but the fungus had to find an algal or bacterial partner, the photobiont.

Now we have to rethink this certainty, as it was recently shown that the same fungal species can exist both with and without photobionts, and in each case the fungus forms fruit bodies and sexual spores. Both lifestyles were known: the surprise is in their identification. *Stictis* species were originally the ones without a partner, growing on branches stripped of bark. *Conotrema* was the name for a lichenized species, growing on the bark of trees. Now, there can only be one name, and this is *Stictis*, since it is the older name.

If a spore of the fungus lands on a bare branch, it will grow as a lonely fungus, as no algal cells are found in this habitat. If a spore lands on the bark of a tree, it will find an algal partner and go on as a lichen. This strategy of optional lichenization has many advantages in fast changing ecosystems experiencing disturbance or succession. Of course the finding that one and the same fungal species can live either as a fungus or as a lichen raises many new issues: how widespread is this phenomenon, where does the fungus find its carbon when it is living without photobionts, and what is the role of lichenization in the evolution of the fungi?

The *Stictis/Conotrema* connection was unraveled by researchers from Sweden who had extensively collected on *Populus tremula*, a trembling aspen species in the northern boreal region of Scandinavia. They show their surprise and enthusiasm for their discovery in the following paper: Sedin, M., H. Doring & G. Gilenstam, 2004. “Saprotrophy and lichenization as options for the same fungal species on different substrata: environmental plasticity and fungal lifestyles in the *Stictis Conotrema* complex,” *New Phytologist*, 164: 459–465.

CHRISTMAS GIFTS

Younghee Lee

Wondering what to give friends and relatives for Christmas? How about considering mushroom books, hiking books, and PSMS memberships? Look over our wide selection at the book sales table at the November meeting and pick your preference.



SICK CALL

Bernice Velategui is recovering from major surgery and has resigned as PSMS Membership Chair, a post she has held since 1989. Following her own advice to newcomers to “get involved,” she has also run book sales and served several times on the PSMS board. We hope you get well soon, Bernice. We miss you!

SUSTAINABILITY AND FUNGI: THE BIG PICTURE

Larry Evans

The Mycophile, Sept./Oct. 2007

Reflecting now on the frontiers of mushroom cultivation, it seems to me that we are on the edge of transforming the way we view agricultural and yard “waste,” carbon sequestration, and resource management. The only problem is that it challenges centuries of primitive habits.

Recently I have been advising people in their efforts to or investigations into transforming their litter piles into mushroom compost in Africa, South America, Fiji, Japan, and elsewhere around the world. A tropical pig farmer looks at how best to utilize tons of pig manure and tropical hardwood shavings. A Brazilian woman seeks to identify and preserve the fungi in her tiny Atlantic rainforest reserve. A man in Zimbabwe learns to grow oyster mushrooms on local agricultural wastes. A farmer in South Africa produces oyster mushrooms two months after getting spores, and a man in Tennessee relates his successful garden-propagation of his oyster mushroom years after buying a kit. A group of young women forms a mushroom cultivation study group in Bolivia. A young man in Bangladesh seeks support for the establishment of a mushroom farm he feels can feed thousands of people a diet higher in protein.

These are the sorts of things that the Internet has assisted me in doing through the Fungal Jungal website. These are the micro-stories that get lost among tales of giant puffballs and toxin-busting white rot fungi, but they show the importance of increasing awareness of fungi and the vital role they play in our planet’s life. But now they emerge as a factor in one of the biggest issues of our time: global climate change.

Carbon sequestration credits and the entire economy in carbon trading that they have spawned represent a potentially powerful tool in reducing the oxidation of carbon-hydrogen compounds that produce carbon dioxide and contribute to the widely discussed “greenhouse effect.” Schemes for carbon sequestration range from far-out (pumping carbo-dioxide gas into deep wells under high pressure) to pragmatic (planting more trees) and even commonsensical (improving vehicle efficiency, outlawing large personal vehicles) which would earn credits—and thereby money—from the fossil-fuel burning entities.

Yet, each year millions of tons of carbon are needlessly and wastefully burned off in slash pile burns, whether from logging, agriculture, or other land management operations. According to USFS estimates, 334 million metric tons, or 368 million dry tons, of this biomass is sitting out there waiting to be burned every year. Or not? Is this a waste product? Not yet! Carbon dioxide, the result of burning it, yes that is a waste product. But organic matter, reduced carbon, is not. The energy stored in such plant material is a valuable resource and should be managed as such.

[Larry Evans practices what he preaches: he sustainably harvests wild mushrooms from the Pacific Northwest for profit. The Fungal Jungal is operated by the Western Montana Mycological Association as a 501(c)3 educational nonprofit organization. Membership and donations may be sent to P.O. Box 7306, Missoula, MT 59807.

Sustainability is quickly becoming THE topic of discussion for mankind. Future articles are planned for The Mycophile, and the next issue of McIlvainea will feature several full-length research and review papers on the topic of sustainability and the important

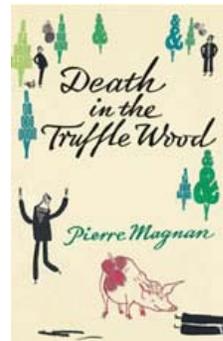
role fungi will play in the future of our planet. –Britt Bunyard, Mycophile editor]

TWO BLACK TRUFFLE MYSTERIES

Ursula Hoffmann

Mycophile, Sept./Oct. 2007

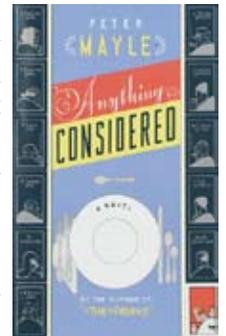
Now that the title has caught your attention, I can reveal that this is a review of two murder mysteries.



Pierre Magnan, *Death in the Truffle Wood* (St. Martin’s Press, 2007, translated from the French *Le commissaire dans la truffiere*, 1978, by Patricia Clancy). The inhabitants of a small village in Provence cultivate and harvest truffles, their main source of income. The season is November 15 to February 15; if lucky, a villager can collect four kilograms of truffles in one day and sell them for 300 francs a kilo. All the characters in this novel are crazy about truffles. Some store them for a couple of

days with eggs so that the truffles infuse their perfume into the eggs; some eat them right out of the basket, grit and all, the truffle juice running down their chins; one starts killing villagers for their blood to enhance the production of truffle trees... So, villagers disappear and Commissaire Laviolette, a favorite French fictional detective, is called in. Had he paid immediate attention to Roseline, the truffle pig and heroine of this very French charming novel, he could have solved the case right away.

Peter Mayle, *Anything Considered* (Vintage Books, 1997). An extremely wealthy money and truffle lover in France pays a research chemist to develop a formula for inoculating oak trees that will produce lots of truffles within two years! The finished formula and all research data are enclosed in a custom-made, custom-locked case. The secret leaks out, the chemist is murdered, and the case is stolen by a competitor who holds an auction Bidders are the French Government wanting to hold onto the franchise for Perigord truffles, the Italians who want to put the French truffle competitors out of business, the Japanese who love both truffles and money, other bidders for the millions they could make from this... Follow the case and enjoy this really witty novel.



CHEMICAL SECRETS OF THE MATSUTAKE MUSHROOM

William Wood

Mushroom hunters know how hard it is to find the elusive matsutake. They hide in the forest duff, just peaking out with a small portion of their cap or only showing as a hump in the ground cover. In spite of their secretive nature, they are actively sought out by amateur and commercial pickers because of their exquisite taste and high commercial value.

Because of its unique flavor, the matsutake has been revered for hundreds of years in Japan and has become deeply ingrained in the culture. In recent years, the harvest of the Japanese matsutake [*Tricholoma matsutake* (Ito et Imai) Sing.] has declined, and so the

American matsutake [*Tricholoma magnivelare* (Peck) Redhead] is imported to fill the gap.

The chemicals that make up the exquisite taste of this mushroom have been the focus of many scientific studies on the Japanese species. In fact, the very first studies as to the compounds responsible for odors in mushrooms were done on extracts of Japanese matsutake. In 1936 and 1938, the Japanese scientist S. Maruhashi isolated and identified two highly odoriferous compounds from matsutake extracts. The substance that is most characteristic of the distinctive odor of the matsutake is the ester, methyl cinnamate. Esters are pleasant smelling compounds and are found in many edible fruits. In this case the ester is related to the compounds that give cinnamon its spicy flavor, hence the origin of the name “cinnamate.”



American matsutake, Tricholoma magnivelare

The other compound that Maruhashi identified as being important to the flavor of the matsutake was an alcohol. This compound has been dubbed “mushroom alcohol” because it is found in many other mushroom species. The proper chemical name for this alcohol is 1-octen-3-ol, and it is responsible for the typical mushroom odor.

A recent scientific study explains why these two pleasant tasting compounds are found in the matsutake. In the September issue of *Biochemical Systematics and Ecology* [Vol. 35, 634–636, 2007], William Wood and Charles Lefevre report the production and function of these substances in the American matsutake. The spicy ester, methyl cinnamate, is a potent slug repellent. The matsutake uses this compound defensively to protect the sporocarp from being eaten by slugs before it can release its spores.

The second compound, the “mushroom alcohol,” is even more interesting. When Wood and Lefevre extracted mushrooms that were not cut up or crushed, they found this “mushroom alcohol” was absent. If they crushed the mushroom before their analysis, a large amount of this chemical was formed. This is a second and equally potent way the matsutake protects itself from slug predation. Previous research by William Wood has shown that “mushroom alcohol” is a potent banana slug repellent (*Biochem. Syst. Ecol.*, Vol. 29, 531–533, 2001). When a slug tries to eat a mushroom, the chewing causes this alcohol to be released, which repels the slug. It is interesting that these two chemicals, which humans find as flavorful, are in reality produced by the mushroom to protect them from slug predation.

Besides looking into the chemicals produced by the fruiting body or sporocarp, these researchers investigated the chemicals found in the mycelium of the American matsutake. This mushroom is mycorrhizal and only grows in association with the roots of trees. In this association, the trees exchange sugars produced in their leaves for nutrients collected by the mycelium from the soil surrounding the tree roots. Because of this special mutualistic or symbiotic arrangement these mushrooms cannot be artificially grown and harvested.

As part of his Ph.D. studies Charles Lefevre was able to culture American matsutake mycelium in the absence of the symbiotic tree roots. These cultures were slow growing, taking a number of months to grow to a reasonable size. When these cultures were analyzed by William Wood, the chemist on this study, he found to his surprise that the slug repellent chemicals observed in the sporocarp were absent in the mycelium. The secret chemical life of the matsutake continued to unravel.

The major chemicals Wood found in the mycelium were of a type rarely found in terrestrial plants or animals; they contained organic chlorine compounds. These types of compounds are best known as substances that humans have used as pesticides, such as the insecticide DDT or the herbicide 2,4-D. Why are these compounds being made by the mycelium? This is the question these researchers asked.

The mycelium is not under threat of being eaten by slugs since it is growing underground with the tree roots. However, at this stage of the matsutake’s life cycle, there is competition with other fungi for space on the tree roots. The chlorinated compounds found in the mycelium, 3,5-dichloro-4-methoxybenzaldehyde and 3,5-dichloro-4-methoxybenzyl alcohol, are known to stop important aspects of fungal metabolism. They inhibit an enzyme that produces cell walls in other fungal species. These compounds also halt the production of fungal melanin, a pigment that protects fungal hyphae by forming a physical barrier between the cell and its surroundings. Chemical warfare between different fungi for space on plant roots is not frequently observed, but must be an important aspect of fungal life.

To exclude the possibility that these chlorinated compounds were only produced in the artificial medium in which the mycelium was grown, these researchers analyzed soil containing matsutake mycelium. They identified the most abundant of the chlorinated compounds in the soil, so these compounds are not artifacts and are produced by free-living mycelia.

Thus, the matsutake uses defensive chemicals throughout its life cycle. When it is underground and associated with tree roots, it fights off other fungi’s mycelium with exotic chlorinated compounds. On fruiting, it protects the spores in the sporocarp with the volatile and spicy ester, methyl cinnamate. Furthermore, if slugs trying to eat this mushroom are not repelled by this potent ester, it releases large quantities of distasteful mushroom alcohol upon tissue disruption.

Haiku

*It is no dream!
Matsutake are growing
On the belly of the mountain!*



BROCCOLI WITH MUSHROOMS

Stacy Finz

San Francisco Chronicle, November 15, 2006

This vegetable dish is great for Thanksgiving, especially if you know of a local farm that grows broccoli or mushrooms. Chanterelles, portobello, oyster, or ordinary mushrooms all can work here. This dish can be partially prepared ahead and finished on the stovetop just before serving, leaving your oven free for bigger things. Serves 6–8.

Ingredients

- 1 to 1½ pounds broccoli
- ¼ to ½ pound mushrooms, wiped clean
- ¼ cup extra virgin olive oil
- 1 shallot, finely minced
- 1 garlic clove, minced fine
- ½ cup chicken broth or mushroom stock
- Salt and pepper to taste
- About 2 tablespoons unsalted butter or additional olive oil



Instructions

Start bringing 1½ quarts of salted water to a boil in a large saucepan. Prepare a bowl of ice water.

Peel the broccoli stalks, then cut them into bite-size pieces (you should have 8–10 cups). Add the broccoli to the boiling water. When the water returns to a boil, cook for 30 seconds to 1 minute, or until the broccoli turns emerald green and is fork-tender. Immediately drain the broccoli and plunge it into the ice water to stop the cooking. Then drain again and pat dry. You may prepare this the morning of the feast (cover and refrigerate).

Cut the mushrooms as desired.

Just before serving, heat the olive oil in a large skillet or wok. Add the shallot and sauté until it releases its aroma, then add the garlic. Add the mushrooms and sauté for 1 to 2 minutes. Add the broccoli and stir and toss.

Add the broth or stock, cover the pan, and bring to a boil. Uncover and season with salt and pepper. If necessary, cook, uncovered, to reduce the liquid. Stir in the butter or olive oil and serve immediately.

Per serving: 120 calories, 3 g protein, 6 g carbohydrate, 10 g fat (3 g saturated), 8 mg cholesterol, 25 mg sodium, 2 g fiber.

MAIDS AND MUSHROOMS

Abbie Fawell Brown

Oddly fashioned, quaintly dyed,
In the wood the mushrooms hide;
Rich and meaty, full of flavor,
Made for man's delicious savor.
But he shudders and he shrinks
At the piquant mauves and pinks.
Who is brave enough to dare
Curious shapes and colors rare,
Something sinister must be
In the strange variety.
It is better not to know;
Safer but to peer—and go,

So the mushrooms dry and fade,
Like full many a blooming maid,
With her dower of preciousness
Hid too well for men to guess.
But the toadstools bright and yellow
Tempt and poison many a fellow,
With their flaunting beauty bright,
The bold promise of delight.
Taste and suffer, ache and burn;
Generations do not learn!
Nay, a little mushroom study
Would not injure anybody.

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