SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
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48TH ANNUAL MUSHROOM SHOW Kim Traverse

I had a fabulous time and I think everyone else did too! A new location is always a risk, but we had extra volunteers for everything. We solved every challenge that came up on the fly, and the show went as smoothly as any I've been involved with. The experienced volunteers performed like well-oiled machines even in a new environment, and the new volunteers did everything asked of them and often more. A lot of what I love so much about the show is how rewarding it is to work with such great volunteers.

In spite of the new location, our attendance was almost the same as last year, and our dollar gross was a little higher. Our expenses—some due to the larger venue and some related to one time purchases the new location required—were also higher. As a result we had a show that, by the numbers, was very similar to last year's. But the numbers don't tell the story of what everyone recognized immediately as one of the most beautiful shows we've had since I got involved. The location really made a difference. The site is beautiful, and the extra space paid benefits in layout flexibility and improved crowd flow. The weather was pretty cooperative too!

Exhibit Pix

photos by A. Sieger & S. Maxwell

Spore Prints

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CALENDAR

Nov. 8 Membership Meeting, 7:30 pm, CUH

Nov. 15 *Spore Prints* deadline
Board Meeting, 7:30 pm, CUH

Dec. 6 Membership Meeting & Holiday "Cookie Bash" (early), 7:30 pm, CUH

MAGIC MUSHROOMS CAN MAKE LASTING PERSONALITY CHANGES, STUDY SAYS

Elizabeth Lopatto
http://www.businessweek.com/, Sept. 29, 2011

Bloomberg - Psilocybin, the active ingredient in "magic mushrooms, "can make people more open in their feelings and aesthetic sensibilities, conferring on them a lasting personality change, according to a study by Johns Hopkins researchers reported in the *Journal of Psychopharmacology*. .

"The remarkable piece is that psilocybin can facilitate experiences that change how people perceive themselves and their environment," said Roland Griffiths, a study author and professor of psychiatry and behavioral science at Johns Hopkins University of Medicine in Baltimore. "That's unprecedented."

Magic mushrooms, also known as "shrooms," are hallucinogens native to tropical and subtropical regions of South America, Mexico, and the U.S. The fungi were favored by former Harvard psychologist Timothy Leary, who founded the Harvard Psilocybin Project, and explored by '60s writer and anthropologist Carlos Castaneda. They are typically eaten but can also be dried and smoked or made into a tea.

Openness is one of five major personality factors known to be constant throughout multiple cultures, heritable in families, and largely unvarying throughout a person's lifetime. The other four factors—extroversion, neuroticism, agreeableness, and conscientiousness—were unchanged by being dosed with the hallucinogenic mushrooms, the study found. This is the first finding of a short-term intervention providing a long-term personality change, researchers said.

The 51 participants, who had an average age of 46, completed two to five eight-hour drug sessions at least three weeks apart. They were asked to lie down on a couch, use an eye mask, and listen to music on headphones while focusing on an inner experience. Their personalities were screened initially, one to two months after each drug session and about a year after the last trip.

In the test, 30 people had a mystical experience, as established by a set of psychological scales. On tests of major personality traits, their openness scores rose, suggesting a greater interest in imagination, aesthetics, feelings, ideas, and values. The 22 patients who didn't have a mystical experience showed no change.

MEMBERSHIP MEETING

Tuesday, November 8, 2011, at 7:30 pm at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle.

Dr. Denis Benjamin, physician, PSMS member, and now, as a second career, a frequent speaker on the fungus circuit will speak to us on "Medicinal Mushrooms—Facts, Fiction and Faith."

Denis grew up in South Africa and migrated to the Pacific Northwest in 1970. He became interested in mycology soon after his arrival in the United States and joined PSMS. He practiced pediatric pathology at children's hospitals in Seattle and Fort Worth, Texas, and has recently returned to Cle Elum, on the east slopes of the Cascades in Washington State, to continue his passion for mushrooms, the outdoors, and natural history. He was a consultant to the regional poison control center, a former member of the Board of Trustees of PSMS, and a past Chairman of the Toxicology Committee of NAMA. He frequently speaks at mushroom forays and to clubs and societies. In addition to his nearly 100 professional publications, he also contributes to the lay literature and mushroom magazines. He was chosen as a community Op/Ed writer for the Fort Worth *Star Telegram* and is author of the landmark book *Mushrooms: Poisons and Panaceas* on the health effects of mushrooms. He recently published a personal collection of anecdotes, lessons learned, and mushroom foraging essays in *Musings of a Mushroom Hunter: a Natural History of Foraging*.

Would members with last names beginning with the letters A–Z please bring a plate of refreshments to share after the meeting.

Doomsdayers are like mushrooms. They come out in the rain, and they die off when the sun comes out.

—Jack Bouroudjian

FIELD TRIP REPORT, September 23–25

Brian Luther

On Friday, September 23, I stopped in at the Group Camp on my way to Eagle Creek to check on my garden, and dropped off a load of firewood at about 3:00 pm, but no one had arrived yet. I came back at 8:00 am the next morning (Saturday) and was delighted to see numerous campers and a few RVs—members who had arrived later on Friday. It was going to be a hot day, but was cool in the morning so I started a big fire in the shelter fireplace, which I kept going for a few hours.

Teddy Basladynski was our host. As usual, he provided abundant hot coffee, goodies, and juices for our members. Thanks, Teddy, for taking the time to do such a good job !

I counted 50 on the sign-in sheet, and everybody was excited to get out for collecting. Unfortunately, the conditions were still quite dry, and we didn't see the diversity of fungi usually encountered. About 70 species were found and displayed, covering one whole picnic table. I found one fine collection of *Pleurotus dryinus* growing on a large downed Cottonwood, but nothing rare or unusual came in.

Although the diversity of fungi was not what we would have liked, after searching for hours many members found substantial collections of White Chanterelles. From those that I observed, they were in excellent condition—very firm with less moisture due to the dry conditions.

Around 4:00 pm Saturday we had a really good potluck with a great selection of tasty dishes—many cooked in crock pots all day.

I checked back at 2:00 pm on Sunday afternoon (our check-out time) to make sure everything was cleaned up and in order. Driving home Sunday it was raining over Stevens Pass and in western Washington, so it looks like the wet weather is arriving just in time—three full weeks before our Annual Exhibit, promising a really good year.

Adrian Lee and Teddy Basladynsky

FIELD TRIP REPORT, October 1

Brian Luther

I left early Friday morning from Seattle, taking Naches Pass instead of Chinook Pass. The blueberries were so abundant at higher elevations in pure old growth stands of true Fir that I had to tear myself away to continue on down the Little Naches to the field trip location. Friday evening, eight of us early arrivals had an excellent informal dinner together. I was awoken at about 4:17 am Saturday when it started raining, but it subsided and we ended up having a day of good weather for collecting

Our hosts on Saturday were Jon Hall and Sue Lynette, so the field trip started out right, for sure. Sue was very attentive and kept hot coffee flowing pretty much all day. Early on Jon and I went out to cut a big load of firewood for the shelter fireplace, and the subsequent fire that I made ended up being a major source of comfort and a meeting place for members all day and weekend long. Thanks so much Sue and Jon for providing such a welcome reception for all our members.

Forty-three members signed in. Everything was quite dry, and few fungi were apparent except in seepage areas. Nonetheless, 70 species of fungi were brought in, identified, and displayed in the shelter; however, this is far fewer than the average for this location. Despite the conditions, many people found small, but very nice collections of both Yellow and White Chanterelles. Unusual or rare species found included *Hygrophorus inocybiformis* and *Polypus dispansus* (formerly known as *Albatrellus dispansus*).

L. rubescens

Member Maria Gerace found what she hoped would be a true truffle, but it turned out to be a young specimen of the false truffle *Leucogaster rubescens*. The peridium (outer coat) of this little hypogeous (subterranean) fungus is pale yellowish-orange or ochraceous when it is young but becomes brick red at maturity, and the gleba (spore-bearing inner mass) contains small chambers filled with a white latex when cut open. At first it had a faint smell like warm sweet milk, but a day or so later it took on a distinct odor reminiscent of coconuts. The peculiar basidiospores are globose to subglobose and measured 13–16 µm, are ornamented with a distinct 4–6 sided reticulum, and are inamyloid, but curiously each is enclosed in a membrane that surrounds the spore. It is very similar to *L. citrinum*, but that species remains pale yellow and has smaller spores.

We had a truly fantastic potluck with lots of scrummy (scrumptious + yummy) dishes, after which many people again gathered around the fire for a few hours of friendly conversation. The fresh air was invigorating, the setting by the river was relaxing, and everybody seemed to enjoy this outing, even though mushrooms were not abundant. We'll do it again next fall.

FIELD TRIP REPORT, October 8

Marian Maxwell

Our field trip on October 8 was hosted by Trang Nguyen and Kitty Loceff, who did a great job. Thank you! Coffee was on when we got there, and they welcomed people as they arrived. Their excitement made for a cheerful field trip!

A large group of attendees took a walk together through the campground where fungi were just beginning to poke out. Tim Sage and I identified the fungi that were brought in. Tim did a great job of identifying and I really appreciated having him as an ID partner! He credits his ID skills as having been developed because of his faithful attendance at the ID clinics on Monday nights, where he has been helping to ID fungi for the past year. We carefully preserved all specimens that were brought in so that Sam and Shaya Romey from the South Snohomish Mycological Society could use them in their mushroom exhibit in Everett on Sunday.

Most people found at least several chanterelles. Our hosts encouraged people who found chanterelles to take those who hadn't back to the general area so that they could find them, too. Scott and I found a *Cordyceps* which I thought was *C. militaris*. He was careful to pick it so that we had the entire *Lepidoptera* larvae still attached. We also found a beautiful *Oligoporus*, possibly *O. fragilis*. We were all amazed that so few Russulas were found!

Our potluck was around 3 pm. Most people walked down to the creek during this time to see the pink salmon spawning there.

All in all it was a great afternoon!

RESUPINATE FUNGUS OF THE MONTH: The Genus *Tomentella* and the Tomentelloid Fungi

© Brian Luther

The genus *Tomentella* is characterized by a totally resupinate basidiocarp (fruiting body) that varies greatly from species to species. The texture of the fruiting body can be mealy, granular, powdery, cottony, or compact cottony owing to the combination of abundant spores and fairly loosely arranged hyphae. The hymenium (spore-bearing layer) varies from smooth to granulose (with minute grains or granules) to tuberculate (with small warts), to spinose (with tiny teeth visible under a dissecting microscope). The basidiocarp is often somewhat fragile and may or may not be easy to peel intact from the substrate without taking the substrate with it.

The basidiocarps also vary tremendously in color. Some are light, others are brightly colored, while still others are dull; many have dark or rusty hues. The mature, fertile hymenium may be a different color from both the tissue underneath it lying against the substrate (subiculum) and the growing edge, or margin.

Most species are monomitic, having only generative hyphae, but some are dimitic, having skeletal hyphae as well. Some have cordons (rope-like strands of parallel or intertwined hyphae) throughout the basidiocarp. Clamp connections may or may not be present, depending on the species. Some species have cystidia, but most do not. Some species have secondarily septate (partitioned) basidia or septate sterigmata.

Like the basidiocarps, the basidiospores are also highly variable. Frequently colored brownish or gray, they may be thin or thick walled, and vary from quite regular in outline to slightly angular to strongly angular-nodose (knobby). They may or may not have echinulations (spiny ornamentation) of various sizes, shapes, and arrangements or may have simple, less complex ornamentation. Variations in the fine details of spore ornamentation are important diagnostic characteristics. Because of these features, the genus is usually immediately recognizable microscopically, and often macroscopically as well, with some experience.

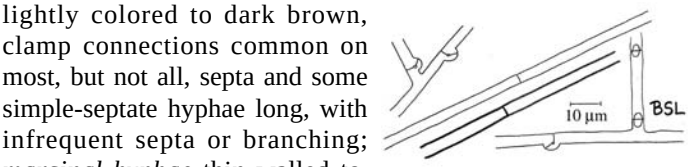
Description of Collection

B. Luther

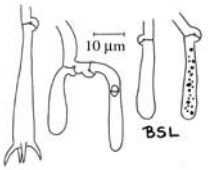
Tomentella ellisii (Sacc.) Julich & Stalpers
Brian S. Luther coll. # 2010-73-2
On the underside of dead Maple wood (three species of Maple in the area: *A. circinatum*, *Acer glabrum var. douglasii*, and *A. macrophyllum*), in deep forest litter in mixed Douglas Fir (*Pseudotsuga menziesii*) and Maple forest, Eagle Creek, outside of Leavenworth, Entiat Mountains, Chelan Co., WA. Elevation 1,800 ft, collected July 3, 2010.

Basidiocarp: Fully resupinate, covering a few square centimeters in area, fertile surface when fresh rugose (wrinkled) to smooth, becoming smooth upon drying, color "Amber Brown" to "Sudan Brown" to "Antique Brown," paler outward toward the margin, becoming "Wax Yellow," "Mustard Yellow" to "Maize Yellow"; *margin* normally dramatically paler than fertile areas, "Cream Color" or even lighter when fresh, flocculose-fibrillose (finely cottony with fibers), but sometimes with an abrupt edge where no active growth is taking place. Subiculum bright rusty orange and much lighter than the hymenial zone. Dried texture firmly compressed floccose (cottony), matlike and easily separable from the substrate as a layer; cordons clearly visible under a dissecting microscope. Colors in quotes are from Ridgway (1912). See color habitat photo in on-line *Spore Prints* at http://www.psms.org.

Microstructures: Hyphal system monomitic, hyphae 3–6 (10) µm wide; *hymenial and subhymenial hyphae* hyaline to subhyaline, thin-walled with clamp connections common, staining noticeably green in 3% KOH; *subicular hyphae* thin to slightly thick-walled, lightly colored to dark brown, clamp connections common on most, but not all, septa and some simple-septate hyphae long, with infrequent septa or branching; *marginal hyphae* thin walled to slightly thick walled, light brownish to pale golden, surface hyphae thinner walled and narrower, substrate hyphae thicker walled, up to 2 µm thick and occasionally seen up to 10 µm wide. *Cordons* common, up to 40 µm wide, composed of light brown, parallel or slightly interwoven hyphae up to 5 µm wide with little branching, clamps present but infrequent on the septa. *Basidia* 40–55 × 6–10 µm, clavate, contents dark blue-gray (amyloid–like) in zones when mounted in 3% NH_4OH, but becoming strikingly green when mounted in KOH solutions, with no color change in Melzer's reagent (inamyloid), basally clamped; sterigmata four, up to 7 µm long and 3 µm wide at the base, sometimes rather widely spreading. *Basidiospores* 7–9 × 6–8 µm (exclusive of ornamentation), irregular, angular, nodose or slightly to prominently lobed, some with an elongated axis but others rather globose in overall outline, some with a single guttule (oil drop), thick walled, grayish brown when mounted in 3% NH_4OH, and golden brown when mounted in 3% KOH, inamyloid, spinose to nodose-spinose (knobby-spiney); echinulations up to 1 µm long, isolated or in close groups of two or three, as viewed in optical section. Refer to photomicrograph and line drawings.



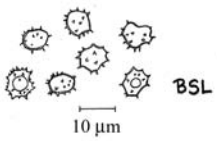
Thin and slightly thick walled hyphae, with and without clamps.



Mature and immature basidia.

B. Luther

Basidia stained green in 3% KOH, 400× .



Basidiospores.

The collection described here is very similar to *T. ellisii* except the mature fertile area is wrinkled when fresh, as viewed under a dissecting microscope, but appears mostly

smooth when dried, and the subicular layer is also a richer color, with the hyphae slightly more pigmented.

This species is treated by Burt (1916) as *Hypochnus sparsus*. However, he failed to observe any color change on either the basidiocarp or basidia in KOH and states "no noteworthy color change by KHO solution" (p. 225; he called KOH "KHO"). Bourdot & Galzin (1927) treat it under *Tomentella hydrophila*, Christiansen (1960) treats it as *T. luteomarginata*, and Larsen (1974) discusses it as *Tomentella ochracea*.

Distinguishing characteristics for this species are the brown, dark-brown to purplish-brown basidiocarp; both the actively growing margin and the subicular hyphal layer (beneath the hymenial layer) are much paler than the fertile areas, and the basidia, hymenial, and subhymenial hyphae become conspicuously green when treated with, or mounted in, KOH solutions. This last characteristic is diagnostic.

Related Genera

The genus *Amaurodon* has basidiocarps with a characteristic bluish color when fresh, but they turn greenish or yellow green upon drying, and the spores become violaceous or bluish when mounted in KOH. The genus *Pseudotomentella* is similar to *Tomentella* but often lacks clamp connections on the hyphae and has spores with bifurcate ornamentation. *Tomentellopsis* has unbranched spore warts, but the spores are hyaline (colorless); they may or may not have clamp connections, and the basidiocarps are normally light in color with a smooth hymenophore. These distinctions, however, can be somewhat fuzzy, as noted in the following paragraph.

In their keys to these genera and species Hansen & Knudsen (1997, p. 298) are inconsistent with their characteristics and distinguish *Tomentella* and *Pseudotomentella* by stating that "Warts on sp usually bifurcate. Hymenium greenish or grayish" in reference to *Pseudotomentella* and that *Tomentella* has "Warts and spines on sp unbranched. Hymenium variously coloured." Yet, in their key lead for *Tomentella crinalis* (p. 304) they state "Sp with many bifurcate warts."

The genera *Caldesiella*, *Kneiffiella*, *Lazulinospora*, *Tomentellastrum*, and *Tomentellina* are no longer recognized.

Comments

Treatments of these fungi are given by Bourdot & Galzin (1927), Litschauer (1941), Skovsted (1950), Christiansen (1960), Svrcek (1960), Wakefield (1960), Larsen (1968, 1974, 1981), Julich & Stalpers (1980), Stalpers (1993), Koljalg (1996), and Hansen & Knudsen (1997). You can access a website and key by Stalpers at http://www.cbs.knaw.nl/publications/1035/ content/txt_035.htm. You can view some SEM (scanning electron microscope) photomicrographs of the spores of some species of *Tomentella* there as well. Burt (1916) studied the species of *Tomentella* in North America, but treats them under the old, invalid genus *Hypochnus* (Wakefield, 1960), and does not use contemporary taxonomy or nomenclature. Larsen (as noted above) focuses on the North American species, and thus his works are useful starting places for the identification of the fungi found here.

Malencon (1959) discusses the development and morphology of *Tomentella* spores, and Larsen (1968, plate 1, p. 14) illustrates the distinct groupings of spore ornamentation types found in the genus. In a more recent monograph Larsen (1974, Fig. 7, p. 9) provides the same chart of variation in basidiospore shapes, but the arrangement has been totally reorganized. The line drawings provided by Larsen (1968) throughout this work are, in my opinion, far superior for identification purposes compared to the photomicrographs he uses in his 1974 treatment of the genus. I find the resolution of these photomicrographs to be rather poor and thus of little value for identification.

You can view the tremendous diversity of the colors and forms of these fungi by going to the MycoKey website and selecting these genera and a number of species.

I find these fungi regularly when out collecting resupinates, but they are never abundant.

Fifty-four species of *Tomentella* have been recorded from North America with 12 reported from Washington State: *T. avellanea*, *T. caerulea*, *T. calcicola*, *T. cinerascens*, *T. crinalis*, *T. ferruginea*, *T. fuscoferruginea*, *T. nitellina*, *T. pilosa*, *T. ramosissima*, *T. sublilacina*, and *T. subvinosa* (Ginns & Lefebvre, 1993; Ginns, 1998). However, these last mentioned authors also treat four species in *Tomentellastrum* and one in *Tomentellina*, both genera that are no longer recognized as distinct taxa. *T. fibrosa* is also known from Washington State. Thus according to the literature we have 59 species of *Tomentella* known from North America and 13 from Washington. Five species of *Tomentellopsis* are recorded from North America, with only *T. echinospora* having been found here in Washington. There are 14 species of *Pseudotomentella* known from N. America, with *P. humicola*, *P. longisterigmata*, *P. mucidula*, *P. tristis*, and *P. vepallidospora* known from Washington State (Ginns & Lefebvre, 1993; Ginns, 1998).

Ginns & Lefebvre (1993) document *Tomentella ellisii* as having been recorded from Idaho and British Columbia, but not Washington. My collection appears to represent a new record for Washington State.

The Mycorrhizal Connection

Any discussion of the genus *Tomentella* would be incomplete without mentioning that many are known to be mycorrhizal. This is unusual, but not unheard of, for resupinate fungi. Only a select few other genera of resupinates are known to be ectomycorrhizal. As a result, these fungi have a significant, and very positive impact on forest ecosystems world wide, and therefore are not just simple, lowly resupinates that have evolved merely to decompose woody debris for a living. Mycorrhizal hosts include a wide range of mostly autotrophic (photosynthetic) vascular plants, including conifers and angiosperms (flowering plants) but also include obligate mycoheterotrophs such as the orchid genus *Coralloriza* and others (Barrett et al., 2010).

Tomentella species apparently form very distinctive structures in association with vascular plant roots, making their mycorrhizae completely identifiable (Jakucs, 2008). *Tomentella crinalis* forms an important mycorrhizal relationship with Scotch Pine (*Pinus sylvestris*) as noted by Koljalg (1992). The magnitude of this cannot be overstated because Scotch Pine covers an unbelievably vast area of distribution from Scotland, through Europe, as far south as central Turkey and then easterly throughout much of Siberia and into China (Critchfield & Little, 1966).

Kennedy & Hill (2010) found four species of *Tomentella* and one of *Pseudotomentella* that formed mycorrhizae with Red Alder (*Alnus rubra*) in the Pacific Northwest, along with other species of fungi. These mycorrhizal symbionts significantly influence the ability of Alder to pioneer poor soils, along with the tree being able to fix atmospheric nitrogen. Other studies focusing on the mycorrhizal associations of *Tomentella* species include those by Agerer (1996) and Hynes et al. (2010), to mention just a few.

The following website provides a color photo of Alder mycorrhiza produced by my feature fungus, *Tomentella ellisii*: http://www.ymparisto.fi/download.asp?contentid=107077&lan=en .

Dr. Urmas Koljalg (Univ. of Tartu, Estonia) is probably the foremost authority on the genus *Tomentella* and its mycorrhizal associations and has published many papers on the subject, which are too numerous to mention here.

Classification Hierarchy

Traditionally treated in the Thelephoraceae, recent DNA studies confirm the following classification hierarchy (Larsson, Larsson & Koljalg, 2004; Hibbett, 2006; Larsson, 2007).

Kingdom Mycota
Division Basidiomycota
Subdivision Agaricomycotina
Class Agaricomycetes
Subclass Agaricomycetidae
Order Thelephorales
Family Thelephoraceae
Genus *Tomentella*
Species *ellisii*

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MUSHROOM ICE CREAM IS SURPRISE SUCCESS

www.iomtoday.co.im/news/isle-of-man-news/, Oct. 15, 2011

Mushrooms are a stalwart of soups and risottos, but they are now proving a hit in ice cream.

The discovery was made thanks to a partnership between Greeba Farm and Davison's Ice Cream at the Isle of Man Food and Drink Festival.

Now several restaurants are considering putting it on their menus, and Davison's is stocking its parlours with the unusual flavour.

Greeba Farm director Kathy Irwin said: "Visitors were flocking to our Manx Mushroom Experience tent demanding more ice cream. We ran out of supplies on Sunday afternoon, a staggering seven gallons having been consumed."

The idea started as a bit of a joke, but once a sample batch was whipped up, both food producers realised they were on to a winner.

Kathy said: "The final product was proof using top quality ingredients in innovative ways demonstrates their versatility. It was a subtle combination of flavors that many people commented should not have worked, but just did."

Kathy Irwin tucks into a surprisingly popular ice cream made with Greeba Farm mushrooms.

NEW HOBBY: MUSHROOMING IN THE PACIFIC NORTHWEST

Hanna Raskin

http://www.epicurious.com/, Sept. 30, 2011

An unusually dry summer has delayed the start of mushroom season, but a record number of foragers are readying to fill their wicker baskets with edible fungi.

While the number of mushroom hunters nationwide remains relatively small—hobbyists estimate about 5,000 Americans have joined mycological clubs—the pursuit is booming in the Pacific Northwest, a region long regarded as a mushroomer's paradise. Andrew MacMillen, board member and foray leader for the Kitsap Peninsula Mycological Society, says attendance at some mushroom shows has leapt 400 percent over the past decade.

Professional foragers say the spike is an offshoot of locavorism, bolstered by concerns about the industrial food supply chain, and increased interest in nutrition. But unlike canning beans and scrutinizing ingredient lists, mushroom hunting is tremendous fun.

"Especially in the Northwest, where we're already an outdoorsy crowd, mushrooming is just another way to spend a day in the woods," says Langdon Cook, the Seattle-based author of *Fat of the Land: Adventures of a 21st Century Forager*. "It's a treasure hunt in the woods."

"There's something unique about finding a particular mushroom," MacMillen agrees. "When I find a cauliflower mushroom, it makes my day for a year."

Cook and MacMillen recently led a group of a dozen first-time mushroom collectors on a chanterelle foray through a forest which I swore I wouldn't specify. Mushroomers are friendly folk—MacMillen says "there are no Jews, no Christians, no Republicans, and no Democrats" when foragers gather around a campfire with a bottle of wine to cook up the day's take—but they fiercely guard their favorite hunting grounds. That's because a motivated harvester can pick a patch clean in a single outing, forcing other foragers to wait for next year's crop.

"I have 12 patches, and six of them I'll never tell anyone but my closest friends or my daughter," MacMillen says. "I count on these spots for mushrooms to put down for food storage."

The culture of secrecy can make mushroom gathering seem mysterious, or even suspicious. MacMillen blames English folklore for propagating the myth that bad things befall those who eat what they find in the woods.

"Our mushroom culture is uniquely paranoid," he says. "The Germans and French love their mushrooms."

According to Cook, "The woods were thought of as deep and dark and scary. In the U.S., we have Italian-Americans who want to hunt porcinis and Japanese-Americans who want to hunt matsutakes. And all of that is helping to create a new mushroom culture, but it's a slow progression. The Anglo perspective is still prevalent."

Of the thousands of mushrooms that grow around the world, MacMillen says, "100 are edible, 10–15 are deadly, and about 100 will give you an illness. The vast, vast, vast majority down the middle are interesting at best."

Once mushroom hunters learn to identify their prey, the chances of their ingesting dangerous mushrooms are slight, MacMillen says, adding: "There are old mushroomers, and there are bold mushroomers, but there are no old, bold mushroomers." An experienced forager is no more likely to eat a mushroom just because he finds it in the woods than a home cook would drink a bottle of drain cleaner because he found it in the kitchen.

Certain mushrooms are so easy to spot that MacMillen can scout them from outer space. He uses Google Earth to locate chanterelles, a species that thrives in Washington's second-growth Douglas Fir forests. Chanterelles are so abundant in the state's northwest corner that one of the recent foray participants recalled coming across Washington State chanterelles in a market in Burgundy, France. Rather than buy them, she vowed to learn how to harvest them herself.

The first-timers scampered through the woods, flirting with what MacMillen says is the most serious danger associated with foraging: in the throes of "mushroom fever," hunters can wander miles from a trail, never lifting their eyes from the soil. That's why MacMillen insists participants in his forays always carry whistles.

After learning to recognize the wavy-capped, butterscotch-colored golden chanterelle and familiarizing themselves with its distinctive apricot aroma, the foragers pried hundreds of mushrooms out from under moss and fallen branches.

"For a lot of us, mushrooming is an intellectual challenge," Cook says. "It's like figuring out a puzzle. There's so much that goes into being a good mushroom hunter: You have to understand meteorology, botany, slope aspect, soil pH.

"There's a lot of enjoyment that comes from learning how to find a particular mushroom," he continues, "Some people like Sudoku. I like hunting mushrooms."

NOT JUST KINGDOMS BUT COMMUNITIES

condensed from musings by Susan Goldhor
Boston Myco. Club *Bulletin*, *66(2)*, 2011

When Linnaeus proposed a classification system in the 1700s, living organisms were grouped into two Kingdoms, Plantae and Animalia. Fungi were included as plants. In the late 1800s Protists were added as a third kingdom, Protista, and in 1956 Bacteria were separated from Protista into a kingdom of their own. In 1969 Fungi were separated from Plantae into a fifth kingdom, Fungi. In 1977, the Kingdom Bacteria was separated into Eubacteria and Archaebacteria, making six kingdoms that include all living organisms.

Moving from two kingdoms to five and, more recently, to six represents a big step forward in our knowledge of the Earth's biota. But recent advances in genetic analysis suggest that all living organisms except Archaebacteria are made up of not simply one but several kingdoms. Each human, for instance, is home to about 160 microbes, each of us with a somewhat different set of species. Humiliatingly, almost 99 percent of our genetic code turns out to consist of what used to be called "junk" DNA that is highly redundant and does not code for a protein that manufactures either a structure or an enzyme. And one of the most intriguing recent findings is that our DNA may be incomplete. That is, if you could make a human out of purely human DNA, that human would be unable to survive.

If you put each of us into a blender and reduced us to our component cells and then analyzed each cell, only about one in ten would have that much-hyped human genome. The other nine cells could be those of bacteria, fungi, mites, and other tiny cohabitants.

cont. on page 8

Kingdom or Community, *cont. from page 7*

So if only 10 percent of our cells are human, what are we? We're not simply humans. We're not just individuals. We're ecosystems. Just like the forest or the meadow, we're the sum of all the species that compose us. And like the forest or the meadow, we need almost all of them.

One of the most important of these components is mitochondria. Every cell in our body—and in the bodies of essentially all other eukaryotes, including plants and fungi as well as protists—contains copies of an endosymbiont called mitochondria. Mitochondria supply living cells with energy in small usable packets. Mitochondria are believed to have originated as bacteria. This is because (1) they contain their own DNA, which resembles that of bacteria; (2) they can only come from the division of other mitochondria; (3) they possess certain enzymes similar to those of bacteria, and (4) they have an innermost membrane that is strikingly similar to a bacterial cell wall (and not at all similar to an animal cell). Mitochondria have been with us so long now that neither of us could survive without the other. And if that makes you think of lichens, you're not the only one.

In addition, there are about 100,000 elements in the human genome that can be traced to a virus ancestor. They make up about 8 percent, all told, of our genome. All of the genes that encode proteins make up only 1.2 percent of our genome. So we're really more virus than human.

Superorganism. Chimera. Biome. Ecosystem. We may not be as clear inhabitants of the Kingdom Animalia as we used to think, but we live in bodies that are far more cosmopolitan and complicated than we ever dreamed. No longer can we regard bacteria or fungi or protists or viruses either as exotic and bizarre or as pure pathogens. They are in bodies. They are in our cells. They are in our chromosomes.

To paraphrase Pogo, "We have met the kingdoms and they are us."

"SPONGEBOB" MUSHROOM NAMED

Christine Dell'Amore

National Geographic News, June 16, 2011

The new species, *Spongiforma squarepantsii*—found in 2010 in Sarawak, Malaysia—has a spongy appearance that reminded scientists of TV's Spongebob Squarepants.

"It's just like a sponge with these big hollow holes," San Francisco State University's Dennis Desjardin said in a statement. "When it's wet and moist and fresh, you can wring water out of it and it will spring back to its original size. Most mushrooms don't do that."

There's only one other species known so far in the *Spongiforma* genus; it lives in central Thailand and has a different color and odor. *S. squarepantsii* has a bright orange hue and smells "vaguely fruity or strongly musty," according to the study, published in May in the journal *Mycologia*.

When Desjardin and colleagues looked at the new mushroom under a scanning electron microscope, they found even more spongy similarities—for instance, the spore-producing area of the fungus resembles a seafloor carpeted in tube sponges.

One thing's for certain—there are more, more weird fungi out there. Only five percent of Earth's fungi species have been found, and there may be up to three million still unknown.

Spongiforma squarepantsii

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