SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 493 June 2013

BASEBALL PLAYERS AMONG GROWING VALLEY FEVER VICTIMS

Brian Bienkowski

The Daily Climate, May 9, 2013

Fifteen Major League baseball teams bring about 1,000 ballplayers to Arizona for spring training every year. There the athletes are exposed to a lung disease called coccidioidomycosis, or Valley Fever.

Conor Jackson had a big bat and a bright future. But after he contracted the rare illness in 2009 while playing with the Arizona Diamondbacks he was never quite the same. Last year another major league baseball player—Ike Davis of the New York Mets—was diagnosed with the same thing.

What is Valley Fever?

Valley Fever is a lung disease caused by *Coccidioides*—a genus of imperfect fungi—that thrives in hot, dry areas such as the Southwestern U.S. People get the infection if they inhale fungus-released spores.

The illness isn't new to the region or limited to just ball players spending time in Arizona. Most people in the Southwest are exposed, and the fungus is often spread when desert soils are disturbed. It is prevalent among agriculture and construction workers.

For many of those infected, Valley Fever usually goes away without major problems. But in severe cases it can cause chronic pneumonia and infections in bones and joints. Pregnant women, the elderly, and people with weakened immune systems are at higher risk. Also, Asians and blacks are at a higher risk for reasons that are unclear, said Benjamin Parke, a medical officer with the U.S. Centers for Disease Control and Prevention.

Inmates Killed

California is investigating an outbreak that has sickened 28 workers at two large solar construction projects in the Carrizo Plain, and the CDC is probing outbreaks that killed more than three dozen inmates in two California prisons. The state is fighting a federal official's order to move 3,300 at-risk inmates out of those two prisons.

"Most people recover and everything's fine," said John Galgiani, director of the University of Arizona's Valley Fever Center for Excellence, adding that less than 1 percent of those infected by the fungus experience life-threatening impacts.

Jackson and Davis are the only two professional baseball players to have contracted the disease, said Major League Baseball Players Association spokesman Greg Bouris. He said the issue hasn't hit the radar screen of the players as a group yet.

But the athletes may be emblematic of a trend in the Southwest. Valley fever shot from about 2,265 reported cases in 1998 to about 22,000 in 2011, according to the Centers for Disease Control and Prevention.

A warming Southwest can't be blamed for all of that jump, experts caution.

Development and Growth

Development—"bulldoze change"—might contribute as much as climate change to the spread of Valley Fever in the region, said Andrew Comrie, a climatologist at the University of Arizona who studies Valley Fever. And the populations of Tucson and Phoenix, Arizona—two hot spots for Valley Fever—have grown by 8 percent and 11 percent over the past decade, according to the U.S. Census.

Arizona in 2009 also increased the sensitivity of its test for the disease, doubling the number of reported cases.

Still, the disease seems ideally suited to take advantage of Arizona's climate of the future. The Southwest is already the hottest, driest region in the country, and it is getting worse. The average temperature has increased about 1.5º Fahrenheit over the last century, compared to 1.3ºF for the rest of the mainland United States. The average annual Southwest temperature is projected to rise an additional 2.5ºF to 8ºF by the end of this century, according to federal estimates. The fungi's heat and drought tolerance allow them to live through conditions that kill other plants, Comrie said.

Grow and Blow

The fungus also relies on a moist winter, and that season is getting slightly wetter—ideal "grow and blow" conditions that researchers believe will make matters worse. Rain prompts fungal growth; heat lets it blow around months later.

The Valley Fever Center says most infections go unreported and estimates that the truer number of annual infections in the Southwest is closer to 150,000 cases. The United States has a "lion's share" of the total number of infections worldwide, Galgiani said, and 97 percent of all U.S. cases are in California and Arizona.

FDA MUSHROOM REGULATIONS

Under federal regulations, mass-produced foods are allowed to have a certain level of contamination. To be considered "adulterated," for example, mass produced mushrooms must exceed the following thresholds:

- **Maggots of any size:** an average of 20 or more per 100 grams (about 3.5 ounces) of drained mushrooms and proportionate liquid or 15 grams of dried mushrooms;
- **Maggots 2 mm or longer:** an average of 5 or more per 100 grams of drained mushrooms and proportionate liquid or 15 grams of dried mushrooms;
- **Mites:** an average of 75 per 100 grams of drained mushrooms and proportionate liquid or 15 grams of dried mushrooms *or*
- **Decomposure:** an average of more than 10 percent of the mushrooms.

Spore Prints

is published monthly, September through June by the

PUGET SOUND MYCOLOGICAL SOCIETY
Center for Urban Horticulture, Box 354115
University of Washington, Seattle, Washington 98195
(206) 522-6031 http://www.psms.org

OFFICERS: Marian Maxwell, President[2012–2015]
president@psms.org (425) 235-8557
Milton Tam, Vice President[2013–2014]
miltontan@aol.com (206) 525-9556
John Goldman, Treasurer[2012–2014]
treasurer@psms.org (206) 933-0838
Denise Banaszewski, Secretary[2013–2015]

TRUSTEES: 2013–2015:
Nick Herschberger, Larry Lee, Debra Lehrberger, Danny Miller, Ed Sakai
2012–2014:
Luise Asif, Teddy Basladynski, Jon Hall, Andrea Rose, Reba Tam

ALTERNATE: Brady Raymond

SCI. ADVISOR: Dr. Steve Trudell

EDITOR: Agnes A. Sieger, 271 Harmony Lane, Port Angeles, WA 98362
sieger@att.net

Annual dues: single or family **$30**; full-time students **$20**

CALENDAR

June 6	Field Trip (see website)
June 11	Membership Meeting, 7:30 pm, CUH
June 17	Board Meeting, 7:30 pm, CUH Board Room
Aug. 20	*Spore Prints* deadline

BOARD NEWS — Denise Banaszewski

Our 25-year agreement to lease office space at CUH expires in June of 2014. We have started negotiations with UW to renew our lease, and are also looking at other options. The UW is not willing to enter into another long-term lease. We would like to stay at UW, but that may not be possible long term.

We need some help. Remember that PSMS is completely run by volunteers, so we need everyone to contribute! We need someone to help sell books at some of our meetings, ideally someone who is familiar with the books we offer so they can help members decide on which book to buy. Please contact John Goldman if you are interested in doing this. We need someone to chair our Annual Fall Exhibit, and to chair a Vouchering Committee. Please contact a member of the board if you are interested in any of these positions.

We sold about $650 worth of books at Mushroom Maynia on May 11. It was not as well attended as it has been, in part due to the nice weather outside. We will have one more board meeting on June 17, and then take the summer off. Members are always welcome, so feel free to join us.

MEMBERSHIP MEETING

Tuesday, June 11, 2013, at 7:30 pm at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle

This month we welcome our recently appointed Scientific Advisor, **Dr. Steve Trudell**. The topic of his presentation is "Getting to Know the Genus Tricholoma." Most tricholomas are relatively large, showy forest mushrooms that attract the attention of mushroom hunters. Only a few are popular edibles, but tricholomas also have great ecological importance due to their mycorrhizal associations with many of the dominant temperate forest tree species. Unfortunately, when trying to identify *Tricholoma* species, probably every Northwest field mycologist has struggled. However, with the recent release of *Tricholomas of North America: A Mushroom Field Guide*, identifiers should have more success. Come meet Steve and learn what makes a *Tricholoma* a *Tricholoma*, learn why identification problems still exist, and meet a number of our Northwest species.

Steve is a forest ecologist and itinerant educator who has been hunting, photographing, and learning about mushrooms for over 35 years. He earned his Ph.D. from the UW's College of Forestry Sciences and has served as vice president of the North American Mycological Association (NAMA) and as president of the Pacific Northwest Key Council. Steve is the author of (and photographer for) *Mushrooms of the Pacific Northwest* (with Joe Ammirati), *Tricholomas of North America: A Mushroom Field Guide* (with Alan Bessette, Arleen Bessette, and Bill Roody), and *Mushrooms of Alaska's National Forests* (with Kate Mohatt and Karen Dillman) and has taught mycology, botany, and biology at the University of Washington, Evergreen State College, and Bastyr University, as well as workshops at many festivals, NAMA forays, and local mushroom club forays. His particular interest is in understanding why there is such a tremendous diversity of fungi that produce mushrooms and the roles that they play in forest carbon and nutrient cycling.

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

FIELD TRIP REPORT, APRIL 27 — Brian S. Luther

We had a very nice field trip day, with only an occasional sprinkle. Snohomish Co. Parks had turned on the power ahead for us (but not the lights, unfortunately), so we did have electricity to make coffee and heat water. Our hosts were Dory Maubach and Hildegard Hendrickson. They put out a very generous spread of yummy breakfast snacks, along with hot coffee. It was great!

Fifty-six signed in. Daniel Winkler, Adrian Lee, his dad, Larry Lee, and Danny Miller took groups out for a couple of hours, which was especially helpful since many attending were new members.

As expected, a smattering of different species came in, with unusual finds including a beautiful single specimen of *Rhodocollybia maculata* and the easily overlooked *Cudonia monticola*. A few *Verpa bohemica* were found, mostly past their prime, and several nice (and tasty) collections of *Pleurotus ostreatus* (Oyster Mushrooms) were found growing on Alder.

Only a dozen or so stayed for the potluck, but it was delightful, as always. Special thanks to our hosts and field trip guides for making the outing so enjoyable.

FIELD TRIP REPORT, MAY 11 — Brian S. Luther

We had a very successful outing to this location in the Wenatchee Mountains. Ninety-nine members signed in, and we had good conditions.

Our host for the day was Joann Ireland, assisted by her mom and son. She provided a wonderful selection of morning munchies, juice, and great hot coffee, besides bringing all the other PSMS gear like the camp stove and potluck supplies. Thank you, Joann, for an admirable job!

I arrived from Eagle Creek about 7:30 am with a load of firewood, but it ended up being too warm, so the fire never happened. Soon after arriving I decided impromptu to lead a large group out to one of the local burns, especially since there were many new members attending. The burn was about 33 miles from the field trip site, but well worth it. Looking back at the entourage of cars following me with their lights on, it looked like a funeral procession. We were early at the elevation I chose, but nonetheless most everybody found at least a few morels to perk their interest. Of course it'll do nothing but get better in the next few weeks, especially with some rain.

Back at the field trip site, a few members found some "natural morels" here and there. About 30 fungi were collected and displayed, all typical spring fungi.

Just before potluck Allan McFadden again treated us to a tasting of some early vintage wines he had brought (1970s and 80s). Thanks for sharing, Allan—they were delicious and what a treat. If you look back in the PSMS newsletter archives, you'll find that I reported that Allan came with a large selection of even earlier vintage wines to share with us at the same location, back in 2009 (*Spore Prints* 453 (June), on-line and in color at psms.org).

A fabulous potluck with lots of delicious food topped off the day. Well, what can I say—this was a great location with friends, good food, and mushrooms.

Brian S. Luther

Another delicious potluck.

MANSON WOMEN FOUND SAFE AFTER NIGHT IN FOREST — Michelle McNiel

http://www.wenatcheeworld.com/, May 20, 2013

MANSON - Two Manson women spent an unplanned night in the woods but were found safe Monday morning by one of their fathers.

Jennifer Harris, 33, and Angel Miller, 32, left home on Sunday to go mushroom picking in the Entiat Valley. They were expected home around 4 pm, but when they didn't return by 10 pm their families notified police.

Family members searched for the women, and a team of Chelan County sheriff's deputies and volunteers joined the effort this morning, said Undersheriff John Wisemore. The Forest Service was also notified of the missing women.

No one knew where the women planned to go looking for mushrooms, he said, so they focused their search in burned areas around Ardevoir.

Wisemore said that around 10:30 am today, his office was notified that the women were located at Silver Falls by one of their fathers and that they were able to hike out. He said neither woman was injured.

Harris posted on her Facebook page this afternoon, "I have been found. Thank you to all that joined the search party. Big thanks to Angel Miller for keeping me calm and her dad for finding us."

RARE MUSHROOMS DISCOVERED AFTER PRESCRIBED BURN — Rhiannon Thomas

The Spore Print, L.A. Myco. Soc., May 2013

U.S. Army Corps of Engineers botanists discovered a new site for the rare Pruitt's *Amanita* mushroom at Fern Ridge Reservoir west of Eugene, Ore., Nov. 20.

Rhiannon Thomas

Amanaita pruittii *found after prescribed burn near Eugene, Oregon.*

Soils and botany student intern Leanna Van Slambrook spotted some white mushrooms popping out of the charred, soggy ground on the southwest side of the reservoir after a prescribed burn and remembered that a rare *Amanita* had been found after a burn a few years back. She and Rhiannon Thomas, a botanist for the Corps' Willamette Valley Project, photographed and collected specimens for identification. *Amanita* experts confirmed the mushroom's identification a during a later site visit.

The Corps' Fern Ridge Project is the only known location for the mushroom outside of California.

Pruitt's *Amanita* was first discovered at Fern Ridge Reservoir in 1975 by Eugene naturalist Hal Pruitt. The mushrooms at the reservoir are unusual because they grow in seasonally flooded sites. On Pruitt's first visit to the site, he found hundreds of the mushrooms floating in the water. Pruitt's *Amanita* was seen at this site again in 1976 and 1977 but was not spotted again until 1998, when a Corps botanist discovered a new site about a mile away in native wet prairie.

A large fruiting was seen in another native wet prairie near the first site after a 2002 prescribed burn. This led to speculation that the species may fruit heavily after disturbance such as fire.

All three Oregon sites are on land already protected as a Research Natural Area by the Corps' Willamette Valley Project, in addition to being within the State of Oregon's Fern Ridge Wildlife Area.

Historically, Willamette Valley wet and upland prairie habitat was maintained by fire. Its suppression threatens prairies and many species dependent on them, including several listed under the

cont. on page 4

Pruitt's *Amanita*, *cont. from page 3*

Endangered Species Act. Scientific studies have demonstrated the benefits of prescribed burning to species like Bradshaw's lomatium, Kincaid's lupine, and Fender's blue butterfly.

The Corps' prescribed fire program at Fern Ridge Reservoir is intended to restore degraded ecosystems and aquatic health by returning fire to the prairie habitats we manage. Since 1988, the Corps and its partners—with the U.S. Bureau of Land Management's Eugene District as burn planner and leader—have executed 16 prescribed fires of up to 100 acres.

INVASIVE LADYBUGS: SECRETS OF THEIR SUCCESS

Alex Reshanov

http://earthsky.org/, May 20, 2013

Not everyone has what it takes to be a successful invader. Most species that find their way to foreign lands starve, get eaten, or otherwise fail to establish themselves in significant numbers. But every so often an organism thrives so well in its new terrain, that it ends up trampling much of the native flora and fauna. *Harmonia axyridis*—the harlequin ladybird—is one such formidable conqueror. Native to Asia, the ladybird (or ladybug if you prefer) was deliberately introduced into Europe and North America during the 20th Century as a form of chemical-free pest control. I'm sure it seemed like a great idea at the time; *Harmonia axyridis* are voracious consumers of plant-plaguing aphids, and they're darn cute by insect standards. What could possibly go wrong? Alas, as with many such introductions, the Asian ladybirds proved to be too much of a good thing, outcompeting equally adorable native ladybirds and then setting their sites on our fruit, including (gasp!) our wine grapes. Clearly, they're a menace. But an impressive menace nonetheless. What's their secret? Do they eat faster? Breed faster? Con the native ladybirds out of their lunch money?

One thing the harlequin ladybird has going for it is its ability to defend against a wide range of pathogenic microorganisms. This is useful when encountering unfamiliar microbes outside one's native range (when in Rome, it's best not to be too susceptible to Rome's germs). But a recent study in *Science* suggests that the invasive harlequins may also be aided by another species, a single-celled parasitic fungus that functions as a biological weapon against native ladybirds.

Something you should know about ladybirds in general—they often eat the eggs and larvae of competing ladybird species. For the harlequin ladybirds dining on native species' young, this serves as both a nourishing snack and a means of reducing future competitors. But for native species partaking of little harlequins, the meal can be fatal. It was previously thought that the invasive ladybirds infused their eggs with a toxin to protect against this kind of predation. The metabolite harmonine (unique to the harlequins, and a contributor to their microbial resistance) was the likely cause of such interspecies poisonings. But when the authors injected native species *Coccinella septempunctata* (aka the seven-spot ladybird) with synthetic harmonine nothing happened. So much for that idea.

While scrutinizing the harlequin hemolymph (bug blood) for other possible culprits, the researchers found that it was teeming with a parasitic fungus of the *Nosema* genus closely related to *Nosema thompsoni*. Hearty harlequins seemed unfazed by this fungus. It lounged around their blood in inactive spore form. But

etsy

Seven-spot ladybird.

the less well-protected seven-spot ladybirds were easily taken down by the microbe, at least in the laboratory. Those injected with fungus isolated from the harlequin blood died within two weeks, while ladybirds dosed with a cell-free version of the hemolymph (i.e., no fungus present) survived the ordeal unscathed.

If these latest findings accurately reflect what goes on in the wild, this could mean that the harlequin ladybird owes its dominance to the combination of harboring and yet being resistant to an otherwise deadly parasite. Haven't we seen this before somewhere? One obvious analogy is that of human invaders wiping out the locals by bringing along their homegrown germs. But for me the ladybirds brought to mind smaller organisms—bacteria. Soil-dwelling bacteria are the original manufacturers of antibiotic drugs, and they developed these chemical weapons to eliminate nearby competitors and thus secure their food supply. In order to deploy such weapons, the bacteria had to protect themselves against these same chemicals, and so we also got antibiotic resistance genes as part of the package (less ideal for our species, but it's working out quite well for the bacteria). Of course harlequin ladybirds aren't making their own fungus, but there is some evidence that the spores are transmitted from parent to egg, and the whole arrangement seems strangely symbiotic. (Disclaimer: this is purely my speculation, not anything actually proposed in the article.)

And, as with bacteria-borne antibiotics, there may be something useful for us in this too. While the authors note that harmonine may not be the specific agent keeping the harlequin's fungal residents in check, the compound has been shown to inhibit a variety of microbes, including those responsible for human ailments like tuberculosis and malaria. But if you're trying to get rid of aphids, you might want to stick with soapy water.

Entomart

The many faces of Harmonia axyridis, *commonly known as the harlequin ladybird because of its numerous color forms which range from yellow-orange to black. In North America, it is also known as the multicolored Asian lady beetle, and (because it invades homes in October in preparation for overwintering) as the Halloween lady beetle.*

PLANTS COMMUNICATE WITH HELP OF FUNGI

Dan Cossins

The Scientist, May 14, 2013

Plants can warn each other of insect attacks by communicating via the symbiotic fungi wrapped around their root systems, according to a study out this week (May 9) in *Ecology Letters*.

When aphids attack, bean plants (*Vicia faba*) release chemicals that repel the herbivorous insects and attract parasitoids that hunt the aphids. British researchers have now demonstrated that the same chemical responses are induced in bean plants that are not under direct aphid attack, but only if they are connected to aphid-infested bean plants by a network of thread-like mycorrhizal mycelia—symbiotic fungal structures known to help gather more nutrients for the plants.

The mechanism of communication is not clear, but the researchers suspect it is likely to be a chemical signal passed through this underground fungal network. The plants were covered with bags during the experiment to prevent airborne communication.

"In the past, we thought of [symbiotic fungi] making nutrients available from the [soil], but now we see another evolutionary role for them in which they pay the plant back by transmitting the signal efficiently," coauthor John Pickett of agricultural research institute Rothamsted Research in the U.K. told BBC News.

The findings could help researchers protect crops that suffer from aphid damage by introducing a plant that is particularly susceptible to aphid infestation into the field. When aphids attack, that plant would send an early warning signal to other plants through this underground fungal connection.

RAINFOREST FUNGUS EATS POLYURETHANE

Rebecca Boyle

Popular Science, www.popsci.com, 2/1/2012
via *Mushroomer*, Snohomish Co. Myco. Soc., summer 2013

To the multitude of arguments for protecting rainforest biodiversity, here's a new addition: An Amazonian fungus could eat our most durable landfill waste. A group of students from Yale found the fungus during an expedition to Ecuador and learned it breaks down polyurethane. This plastic is one of those modern chemical compounds found in so many products, it's pointless to count—from Spandex to garden hoses, for a start—and it is prized for both its flexibility and rigidity. The problem is that like many other polymers, it does not break down readily. This means it persists in landfills, as Fast Company points out. It burns pretty well, but that releases carbon monoxide and other gases into the atmosphere, so it's a nonstarter in most situations. Something that can degrade it naturally would be a better solution.

The fungus called *Pestalotiopsis microspora* can subsist on a diet of polyurethane alone, and do so in an anaerobic environment, according to the researchers who found it. The Yale team isolated the enzyme that enables this fungus to do its work and noted it could be used for bioremediation.

It's odd to think of a microorganism eating up a durable synthetic material, but this would not be a first, by a long shot; bacteria and fungi can break down lots of things. A bacterial species called *Halomonas titanicae* is eating the *RMS Titanic*, for instance. We just need to know where to find these hungry species—and the rainforest is a good place to look

MATSUTAKE INDICATOR: *ALLOTROPA VIRGATA*

MushRumors, Ore. Myco. Soc., May–June 2013

Nancy Cotner, USFS

In her March presentation, "Digging Up Dirt on Matsutake," Joyce Eberhardt referred to the "Matsiman" website (http:// www.matsiman.com/).

"Dedicated to supplying reliable information concerning fruit production of matsutake mycelia," the site offers a mini-course on matsutake (*Tricholoma magnivelare*).

Start with the link to "Introduction to Matsutake" and work your way through the rabbit-warren of links with additional information on finding and responsibly harvesting matsutake.

Of particular interest is the indication that "fruiting is not random, rather quite predictable" and that the candy cane or sugarstick plant, *Allotropa virgata*, indicates the presence of matsutake mycelia. *Allotropa virgata* flowers from early to mid-summer. The flower stalk is distinct with white and red or maroon stripes and tiny white flowers with red centers. The plant can be as tall as 3 feet. It is found in mature, moist, shaded oak, mixed, or coniferous forests from 2,000 to 10,000 feet. "It is rare to find mushrooms among *Allotropa virgata*," according to Matsiman. "Fruiting area associated is within 5 to 15 feet." Dark brown dead candy cane plants are still an indication of matsutake mycelium.

When you are out and about this summer, you can jump start your fall foraging by looking for *Allotropa virgata*. It can be found from British Columbia south to California and on both sides of the Cascades.

The U.S. Forest Service has information on mycotrophic wildflowers of the *Ericaceae* (Heath Family), including additional images of *Allotropa virgata* at www.fs.fed.us/wildflowers/interesting/mycotrophic.

Hank Shaw

THE MOREL OF THE STORY: HUNT, HUNT, HUNT

Gregg Rinkus

Mountain Home, The Magazine of the Pennsylvania Mountains and New York Finger Lakes, April 2013
via *Mycolog*, Humboldt Bay Myco. Soc., May 2013

My earliest recollections of wild mushrooms harken back to my boyhood growing up in a small, rural neighborhood in southwest Pennsylvania. Several houses down lived an old Frenchman named Emilie Coulange. He was a retired coal miner and part-time barber, kept a wonderful garden, and collected and ate wild mushrooms. It was mushroom hunting that made him suspect.

What normal man rises at the crack of dawn, carries a small peach basket on his forearm, and walks the neighborhood in search of fungi? What if he picked and ate a poisonous one? Worse yet, what if he enticed a neighborhood youngster to eat a mushroom and the boy or girl became deathly ill? My parents admonished my older brother and me never to eat mushrooms picked by Mr. Coulange. Oh, what fear ignorance can wreak!

One early May morning, I discovered some conspicuous tracks in the heavy dew of our backyard and decided to follow them. Like a hunting dog on scent, I followed them all over the local ball field,

cont. on page 6

Hunt, Hunt, Hunt, *cont. from page 5*

These gigantic morels were the find of a lifetime for the writer's friend, Ben Moyer.

past gardens, beneath apple, maple, and elm trees, in and around a horse pasture, past small ponds, along creek banks, and between the symmetrical rows of Christmas trees. As I rounded a large Colorado blue spruce, I suddenly came face-to-face with their maker—Mr. Coulange!

His weathered peach basket was cradled in the crook of his arm and he saw me eyeing it. Without a word, deliberately, he reached into the basket and withdrew one of the strangest-looking mushrooms I had ever seen. Raising it aloft, in his broken French-English accent, he declared, "Ah, my young friend, it is a morel—the crème-de-la-crème of wild mushrooms!" Because of his thick accent, inflections, and use of a French term, I wasn't quite certain what he meant. All I knew was that any mushroom that odd-looking just had to be poisonous. The broad smile on his face should have told me just the opposite.

Forty-some years later, what I wouldn't give to go back in time and let Mr. Coulange mentor me in the fine art of hunting edible wild mushrooms, especially the Holy Grail of the mushroom world—the fabulous morel.

Undoubtedly the reason that I consider the morel to be the Holy Grail of mushrooms is because of how few of them I have found. For years I hunted them with no success. When I finally did find one, it was a non-edible false morel. It wasn't until years later that I unexpectedly discovered my first true morel in, of all places, my father's front yard. Since then, each spring I have found enough of these incredibly tasty morsels to become enamored of their mystique and their unique flavor.

With triangular, honeycomb-like hooded tops, morels are among the most easily recognized mushrooms. They're also one of the most desirable in terms of flavor and texture. These mushrooms, from the *Morchella* genus, with their nutty, acorn flavor, are considered a delicacy, and even an addiction. Cooking and eating morels is a gastronomic delight, but first you must find them. Therein lies the challenge.

The life cycle of the morel involves a complex interrelationship among sclerotium, mycelium, and spores. Understanding these functions might increase your chances of finding morels; perhaps not. For the beginner, the best way to find morels is to accompany an accomplished mushroom hunter. Unfortunately, the odds of this happening are slim to none. Morel hotspots are among the most guarded of all outdoor secrets. Chances are you'll have to find your own treasure trove of fabulous fungi.

Three factors govern the growth of morels: time of year, weather, and location. For most of the U.S., the growing season ranges from mid-April through June. In our neck of the woods, the window of opportunity is very short—mid-April to mid-May. Most hunters will agree that weather, more than any other variable, has the greatest impact on the morel season. This includes air and ground temperatures along with moisture levels in the ground. Typical spring weather with daytime temperatures fluctuating between 60 and 70 degrees and nighttime lows of not less than the mid-40s is usually ideal. As for soil moisture, too much or too little rain both can have negative effects.

There are many rules-of-thumb about where morels can be found. The most prominent one is that they grow best around the bases of dead elm trees. Other favored locations include beneath old apple trees, in groves of poplar and aspen trees, in stands of mayapples, on south facing slopes, beneath crabapple trees, in hardwood forests, around pine trees, in open fields, in burned-over areas, in sunshine, in shade, along railroad tracks…I think you get the point. Morels can grow almost anywhere. They are exceedingly unpredictable.

To harvest a morel, many believe you should pinch and twist it off right at ground level. Typically, I use a pocket knife to cut them as close to the ground as possible. Either method will reduce the amount of dirt on your mushroom. Another reason for not pulling out the entire root—although this is only a theory—is that it's believed that by leaving the root, you are assuring that the patch will reproduce the next season.

As for cooking, slicing them lengthwise and sautéing them in real butter for three to five minutes is the simplest way to prepare morels. Frying them in bacon grease for six to eight minutes also brings out their rich flavor. I enjoy wood-grilled venison burgers topped with sautéed morels, and baked trout sandwiches topped with Havarti cheese and sautéed morels served on Kaiser rolls.

TRUFFLE OIL RARELY CONTAINS TRUFFLES

extracted from an article by Steve Gara
on http://www.examiner.com/, May 7, 2013

Chefs love to drizzle truffle oil over French fries, risotto, and macaroni and cheese. Its earthy smell is unmistakably intoxicating. And it's almost always chemically manufactured.

The aroma of real truffles is subtle, nuanced, and hard to capture. It doesn't infuse well into oils. But 2,4-dithiapentane—a chemical compound naturally produced by truffles and easily recreated in food-science laboratories—does, and much more cheaply. That is why most truffle oils sell for $1–$2 per ounce.

The chemical is often listed as "truffle aroma" or "truffle essence." When going out to a restaurant or taking a trip to the grocery store, it makes sense to read the labels.

"WHODUNNIT" OF IRISH POTATO FAMINE SOLVED

Science Daily, May 21, 2013

An international team of scientists reveals that a unique strain of potato blight they call HERB-1 triggered the Irish potato famine of the mid-nineteenth century.

It is the first time scientists have decoded the genome of a plant pathogen and its plant host from dried herbarium samples. This opens up a new area of research to understand how pathogens evolve and how human activity impacts the spread of plant disease.

Phytophthora infestans changed the course of history. Even today, the Irish population has still not recovered to pre-famine levels. "We have finally discovered the identity of the exact strain that caused all this havoc," says Hernán Burbano from the Max Planck Institute for Developmental Biology.

Marco Thines/Senckenberg Gesellschaft für Naturforschung

*A potato specimen from the Kew Garden herbarium, collected in 1847, during the height of the Irish famine. The legend reads "*Botrytis infestans*," because it was not known yet that* Phytophthora *does not belong to the mildew causing Botrytis fungi.*

For research to be published in *eLife*, a team of molecular biologists from Europe and the US reconstructed the spread of the potato blight pathogen from dried plants. Although these were 170 to 120 years old, they were found to have many intact pieces of DNA.

"Herbaria represent a rich and untapped source from which we can learn a tremendous amount about the historical distribution of plants and their pests—and also about the history of the people who grew these plants," according to Kentaro Yoshida from The Sainsbury Laboratory in Norwich.

The researchers examined the historical spread of the fungus-like oomycete *Phytophthora infestans*, known as the Irish potato famine pathogen. A strain called US-1 was long thought to have been the cause of the fatal outbreak. The current study concludes that a strain new to science was responsible. While more closely related to the US-1 strain than to other modern strains, it is unique. "Both strains seem to have separated from each other only years before the first major outbreak in Europe," says Burbano.

The researchers compared the historic samples with modern strains from Europe, Africa, and the Americas as well as two closely related *Phytophthora* species. The scientists were able to estimate with confidence when the various *Phytophthora* strains diverged from each other during evolutionary time. The HERB-1 strain of *Phytophthora infestans* likely emerged in the early 1800s and continued its global conquest throughout the 19th century. Only in the twentieth century, after new potato varieties were introduced, was HERB-1 replaced by another *Phytophthora infestans* strain, US-1.

The scientists found several connections with historic events. The first contact between Europeans and Americans in Mexico in the sixteenth century coincides with a remarkable increase in the genetic diversity of *Phytophthora*. The social upheaval during that time may have led to a spread of the pathogen from its center of origin in Toluca Valley, Mexico. This in turn would have accelerated its evolution.

The international team came to these conclusions after deciphering the entire genomes of 11 historical samples of *Phytophthora infestans* from potato leaves collected over more than 50 years. These came from Ireland, the UK, Europe, and North America and had been preserved in the herbaria of the Botanical State Collection Munich and the Kew Gardens in London.

GROWING A HOUSE

Pat Jeffries

The Oregonian, May 21, 2013

A company in Green Island, N.Y., says, "We're not just building a tiny house, we're growing it." Ecovative is using living mushroom mycelium in the wall cavities of the 12-by-7-foot house to grow into insulation.

The company sells a packaging product called Mushroom Insulation that uses mycelium "to bond together agricultural by-products like corn stalks into a material that can replace plastic foam" and is working to develop innovative new building products.

Here's how it works. Mushroom Insulation grows into wood forms over the course of a few days, forming an airtight seal. It dries over the next month (kind of like how concrete cures) and you are left with an airtight wall that is extremely strong. Best yet, it saves on material costs, as you don't need any studs in the wall, and it gives you great thermal performance since it's one continuous insulated wall assembly. The finished Mushroom Insulation is also fire resistant and very environmentally friendly.

Ecovative "window of truth."

As in straw bale homes, there's a "window of truth," with a view of the growing mycelium. "Every cubic inch of Mushroom Insulation has miles of these fibers all forming a tangled matrix that glues and ties all the loose particles into a rigid cohesive material," Ecovative says on its website. The company is hoping to complete the house in June.

COLORADO STUDENT NAKED, HIGH ON MUSHROOMS RESCUED FROM FLATIRONS

Mitchell Byars

http://www.dailycamera.com/, May 20, 2013

Boulder rangers rescued a University of Colorado student over the weekend after she got high on mushrooms and took off all her clothes while climbing the Third Flatiron, according to the Boulder County Sheriff's Office.

The student, 21-year-old Taylor Powers, was climbing with her roommates at around 5:24 pm Sunday when they called police saying Powers was high on mushrooms and in distress. Rescuers arrived and found Powers had removed all of her clothing and was being restrained by her roommates.

Rangers handcuffed her and were able to secure her. It took rescuers about an hour to get her to a nearby shelter. At 7:50 pm, Powers was transported to Boulder Community Hospital, where she was treated and released.

Powers was ticketed with unlawful consumption of a controlled substance. Officials indicated there could be additional charges filed against others involved in the incident.

MOREL MAJORITY

Sarah DiGregorio

The Wall Street Journal, April 19, 2013

Chefs across the country agree: To make the most of this seasonal mushroom, stuff it.

"They're little packets of goodness," said Miami chef Jeff McInnis. "It's an eyes-rolling-back-in-the-head kind of bite," said Atlanta chef Linton Hopkins. The food that inspires such rhapsody among chefs who have pretty much seen it all? Stuffed mushrooms.

But they're not talking about the "Mad Men"-era Velveeta-and-bacon-bits version. They're talking about something far more refined: the morel, that spring darling, with its earthy flavor and distinctively honeycombed head, filled with things like scallop mousse, fava beans and crawfish, and foie gras. Stuffing morels, it turns out, is a favorite springtime strategy among chefs.

cont. on page 8

Morel Majority, *cont. from page 7*

At his Restaurant Eugene in Atlanta, Hopkins tucks a velvety filling of chicken and sweetbreads into the mushrooms before glazing them with Armagnac. At Marea, in New York, chef Michael White stuffs morels with a shrimp and lardo purée reminiscent of the filling in Chinese har gow dumplings. "It's the perfect bite, very dumpling-esque," Mr. White said. He says that morels work particularly well because of their spongy texture: They soak up and amplify the flavors of whatever goes in them. McInnis, who has served foie-gras-stuffed morels at Miami's Yardbird, agrees: "The fattiness melts into the mushroom from the inside out."

Lamb-Sausage-Stuffed Morels

—Adapted from Marco Canora of Hearth, New York

16 morels (about 2 in. long)	½ tsp red pepper flakes
½ lb fatty ground lamb	1 large clove garlic, minced
½ tsp kosher salt	1 TBs plus olive oil
½ tsp freshly ground black pepper	2 tsp sherry vinegar
2 tsp minced fresh sage	salt and pepper

Preheat oven to 375 degrees. Thoroughly clean mushrooms with a soft brush. In a bowl, gently mix ground lamb, salt, black pepper, sage, red pepper flakes, and garlic. With kitchen shears, snip off each morel stem to widen the opening. Using your fingers, stuff each morel with sausage mixture. (A chopstick is helpful for packing the meat into the cavity.) Place stuffed morels on a baking sheet, drizzle with 1 TBs olive oil and season with salt and pepper. Roast until sausage is cooked through and morels are tender and browned, about 20 minutes. Toss morels with a little more olive oil and Sherry vinegar.

Active Time: 35 minutes, Total Time: 55 minutes, Serves: 4.

This will be the last Spore Prints *until September.*
Have a great summer!

Puget Sound Mycological Society
Center for Urban Horticulture
Box 354115, University of Washington
Seattle, Washington 98195

RETURN SERVICE REQUESTED

Non-Profit Org.
U.S. POSTAGE
PAID
SEATTLE, WA
PERMIT NO. 6545