SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 532 May 2017

THE WORLD'S MOST SPOKEN LANGUAGE IS... "TERPENE"

https://www.eurekalert.org/, April 13, 2017

Micro-organisms communicate with each other—and the rest of the world—through smells.

If you're small, smells are a good way to stand out. A team of researchers led by the Netherlands Institute of Ecology (NIOO-KNAW) has demonstrated for the first time that two different types of micro-organisms—bacteria and fungi— use fragrances, known as terpenes, to hold conversations. And that's not all. "We actually believe that terpenes are the most popular chemical medium on our planet to communicate through."

In only one gram of soil, billions of micro-organisms are thriving, so that makes many "speakers." On top of that: this "chemical communication" will probably work for a whole bunch of other life forms as well. This is what the research team relates in *Scientific Reports*, a relatively new journal from the *Nature* family.

A Firm Conversation

The researchers have demonstrated that bacteria and fungi do in fact respond to each other. In other words: they can hold conversations. Group leader Paolina Garbeva explains: "*Serratia*, a soil bacterium, can 'smell' the fragrant terpenes produced by *Fusarium*, a plant pathogenic fungus. It responds by becoming motile and producing a terpene of its own."

The researchers established this by studying which genes were switched "on" by the bacterium, which proteins it began to produce, and which fragrance. Or, in more fancy terms, by using transcriptomic, proteomic, and metabolomic techniques. "Such fragrances—or volatile organic compounds—are not just some waste product; they are instruments targeted specifically at long-distance communication between these minute fungi and bacteria."

But how widespread is this "language of smells"? Pathogenic soil fungi such as *Fusarium* also have an effect aboveground, where they make plants sick. Can they communicate with those plants? Garbeva: "We have known for some time that plants and insects use terpenes to communicate with each other. But we've only just begun to realize that it's actually much wider. There is a much larger group of 'Terpene-speakers': micro-organisms."

Fungi, protists, bacteria, and even higher animals. Terpenes act as pheromones—chemical signals used by animals—which makes them a regular ingredient of perfumes. So it's likely that the language of terpenes forms a vast chemical communications network indeed.

Multilingual

Terpenes are by no means the only volatile organic compounds that are in for a good chat. The researchers found others as well: in the soil, for instance. Garbeva's PhD student Ruth Schmidt, the first author of the article, adds: "Organisms are multilingual, but 'Terpene' is the one that's used most often."

Who knows, maybe without realizing it we are native speakers too?

FUNGAL DUO ISOLATED FROM TOXIC LAKE PRODUCE NOVEL ANTIBIOTIC

Melissae Fellet

Chemical Engineering & News, April 19, 2017

Two species of fungi isolated from an abandoned mining pit in Montana, when cultured together, produce a compound that kills four antibiotic-resistant strains of *Staphylococcus aureus* bacteria (J. Nat. Prod. 2017, DOI: 10.1021/acs.jnatprod. 7b00133). Although its structure resembles a known class of antibiotics, the compound appears to kill bacteria in a new way, the researchers say.

After companies suspended copper mining at the Berkeley Pit outside of Butte, Montana, in 1983, runoff and groundwater collected in the pit and created a lake. Oxidized rock exposed by mining acidified the water to pH 2.5, and heavy metals including iron, copper, arsenic, and cadmium leached into the water. The water is so toxic that last winter, several thousand snow geese died after waiting out a snowstorm in the pit during their annual migration.

Microbial life, however, finds the pit more hospitable. In extreme environments, such as acidic pH and high metal concentrations, microbes often produce molecules with interesting biological activity. For almost 20 years, Andrea A. Stierle and Donald B. Stierle, both natural products chemists at the University of Montana, have been studying compounds produced by individual fungi isolated from the water and sediment at the Berkeley Pit. They have found molecules that slow inflammation, cell death, and cancer metastasis. But until now, the researchers had not found antibiotics.

Shutterstock

Montana's Berkeley Pit, an abandoned mining site with pH 2.5 water, about the same acidity as a lemon.

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

OFFICERS: Kim Traverse, President[2017–2019]
president@psms.org (206) 380-3222
Daniel Winkler, Vice President[2016–2018]
me@danielwinkler.com
Donna Naruo, Treasurer[2016–2018]
treasurer@psms.org (206) 933-0838
Luise Asif, Secretary[2017–2019]
lasif@hotmail.com (206) 365-6741

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IM. PAST PRES: Marian Maxwell

SCI. ADVISOR: Dr. Steve Trudell

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

CALENDAR

May 9	Membership meeting, 7:30 pm, CUH
May 15	Board meeting, 7:30 pm, CUH board room
May 16	*Spore Prints* deadline (**early**)
May 19–21	Field trip (see PSMS website)
May 21	Mushroom Maynia, 10 am–4 pm, CUH
May 21	Bridle Trails Funga Study, early morning (ID session at Mushroom Mania)
May 26–29	Field trip (see PSMS website)
June 3	Field trip (see PSMS website)

BOARD NEWS

Luise Asif

Work continues on preparation for the Ben Woo Foray and PSMS Fall Show. The third Bridle Trails State Park Study survey will take place on Sunday, April 23. Recording and storage details are still being worked out. Mushroom Maynia is fast approaching, and Jamie Notman has exciting new events planned. We need more volunteers to ensure the success of this event. The board is reviewing PSMS' 5-year plan from 2012 to assess what has already been accomplished, what areas are no longer relevant, and what needs to be addressed. James "Animal" Nowak has agreed to chair the Conservation Committee to give PSMS a voice as regulations are being developed for our public lands.

MEMBERSHIP MEETING

Tuesday, May 9, 2017, at 7:30 pm at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle

Dr. Glew

Our speaker for May is Katherine Glew, who will enlighten us on the Fascinating World of Lichens. Lichens are a vital yet overlooked part of forest and urban ecology. They can tell us much about the health of our local environment, from the shores of Puget Sound and lakes to the alpine areas of the Cascade and Olympic Mountains. Lichens have been monitored by the forest service for evaluating forest health and air quality, and are now being considered for their importance in rangeland areas, along with other biotic crusts on soil. These symbiotic organisms play a major role in nitrogen and carbon fixation as well as mineral cycling. The ecological study of lichens is becoming more essential in our understanding of how to manage terrestrial ecosystems.

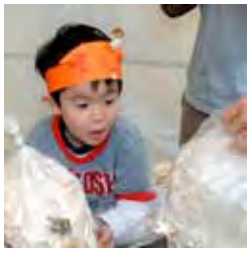
Dr. Glew will explain what they are, how they grow, and the common types found in our urban and wild habitats. Lichens, a relationship between fungi and green algae or blue-green bacteria, can help us evaluate the air quality of our environment and the health of our plants.

Katherine Glew is Associate Curator of lichens at the University of Washington Herbarium, where she curates historic collections and processes lichens collected from the Pacific Northwest, Europe, Japan, and the Russian Far East. Katherine has studied lichens in the Pacific Northwest and around the world for the past 40 years. Currently she is offering a lichen workshop at the Cedar River Watershed on June 11, 2017.

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

MUSHROOM MAYNIA

Jamie Notman



It's that time of year again. What time you ask? Why Mushroom Maynia time, the spring mushroom show. This year it is May 21 from 10 am–4 pm. It all takes place in the main meeting hall at CUH.

We try to create a carnival/circus atmosphere at the event as it is geared toward the younger generation to encourage new mushroom enthusiasts. The center of the room is where all of the children's activity takes place—painting, coloring books, face painting, hat making, and mushroom crimping. Around the perimeter of the room are educational exhibits, cultivation, tasting, lichens, and book sales. Outside we have a dying station where you can dye a scarf with the mushroom dye of your choice.

Mushroom Maynia, geared toward kids.

We need volunteers to make all these projects work. Please consider signing up at the next meeting. There will be sign-up sheets on the tables.

Berkeley Pit, *cont. from page 1*

The Stierles wondered whether culturing together two different species of *Penicillium*, *P. fuscum* and *P. camembertii/clavigerum*, originally isolated from the same sample, would produce new bioactive compounds that neither strain makes when grown by itself. They started growing one fungus in a liquid broth and introduced the other species a day later. After the two fungi grew together for six days, the researchers collected the organic molecules the cells produced, extracting them from the broth with chloroform. They used a protein inhibition test the team had developed previously to identify molecules with potential biological activity and then determined the structures of those molecules using various spectroscopic methods. The researchers found a variety of 16-membered macrolides—molecules with a lactone ring—that were not produced when either fungus was grown alone.

Because these structures resembled known antibiotics such as erythromycin, the Stierles and their colleagues tested several of the isolated compounds for antibiotic properties. One compound, Berkeleylactone A, was active against four strains of methicillin-resistant *S. aureus*.

Structural differences and biochemical tests indicate that this molecule could work differently than similar macrolide antibiotics, Andrea Stierle says. Berkeleylactone A lacks sugars or a double bond, two structural features thought to be important to the antibiotic properties of other 16-member macrolides isolated from bacteria or fungi. And although its exact method of action is unknown, it does not inhibit protein synthesis or stall ribosome activity as other macrolide antibiotics do.

Lesley-Ann Giddings, a natural products chemist at Middlebury College, thinks it's interesting to co-culture two fungi, because most researchers who have used this strategy to identify new molecules have grown a bacterium and a fungus simultaneously. Co-culturing microorganisms establishes a competition for resources that can trigger one microbe to express otherwise inactive genes and produce compounds that kill the other.

A MITEY-STRANGE MUSHROOM ENCOUNTER

Richard Summerbell

Mycelium, Myco. Soc. Toronto, Jan.-Mar. 2017

This is an excerpt from my draft memoir, tentatively called "Did That Really Happen?" Here you find me in my very first year in mycology: I started doing a fourth-year university project with Dr. Robert J. Bandoni in September 1978 at the University of British Columbia in Vancouver. The UBC Endowment Lands, mentioned here, consisted of a large chunk of forest on Point Grey, adjacent to the campus, that had been set aside for university expansion and research. Much of that land is now a public park.

Bandoni liked to take his students out on field excursions in the Endowment Lands where he'd point out different fungi. His interest in jelly fungi stemmed from a broader interest in anciently evolved fungi. There were some fungal groups that specialized in growing on ancient types of plants, like certain ferns, that still grow today but can also be seen in fossils formed before the dinosaurs came along. Bandoni could turn over fern leaves in the Endowment Lands and give you a guided tour to what was still with us from the Triassic era, the age of the cycads and pre-dinosaur archosaurs.

The walks were often jovial in tone. Once, for example, as we walked toward a trailhead, I came across a spectacular smooth, white mushroom looming out of the grass of the boulevard.

"That's *Conocybe lactea*," Dr. B. said, "so-called because the cap is the color of milk."

I felt a simmering of inspiration.

"What an amazing mushroom," I said, "I think I'm going to write a song about it." A tune was already running through my mind.

"Nobody cares about this mushroom," Bandoni told me, "you'd better write your song about *Psilocybe* instead. That one has a fan club."

That's the magic mushroom, needless to say.

I took his advice, but the lyrics remained unfinished, since I knew little about the topic of the song. That was to change, as you'll see. (But that's a later story, not included in this excerpt - RCS).

Bandoni had a love-hate relationship with mushrooms. One of the great plagues of his life, at this point in history, was that infinite numbers of hippies and freaks were on the lookout for an expert who would tell them, for free, whether the mushroom they'd just picked was magic or not. The Vancouver area is a hotspot for magic mushrooms: there are several species that seem to like a maritime climate, with a little salt in the air. At the time, picking your own magic mushrooms was legal in Canada; it seemed foolish to outlaw something that grew on everyone's front lawn in some towns, like ours. The lawn species, Stuntz's *Psilocybe*, was reputedly hardly worth picking—it had very little oomph. The magic-mushroom money-shot was the "liberty cap," *Psilocybe semilanceata*, which grew in longer field grass that was only cut occasionally. The place to find this was out in farmers' fields in the Fraser Valley south and east of Vancouver or, for the very best picking, the extensive marginal boulevards and border fields of Vancouver International Airport. For several years, if you drove out to the airport during any wet period in the summer or autumn, you'd see multicolored, shapeless cows grazing the boulevards. On closer inspection, the cows would turn out to be magic-mushroomers bending under plastic rain-capes while searching the grass in front of them for Liberty Caps. Finally, the government, beset by irate farmers and also by highly annoyed airport security people, made magic mushroom possession illegal.

What the *Psilocybe* craze meant in Dr. Bandoni's life was illustrated by an event that happened in the lab one day.

A bearded young chap had somehow tracked down our hut and made his way inside as if he was on business. He had a mushroom collecting basket.

"Do you guys know mushrooms?" he asked me and another student.

"Some," I said. I could tell from his appearance that we wouldn't need to be first-rate mushroom experts to answer his questions. Wild magic mushrooms are easy to recognize. They have purple-brown gills; they stain sky-blue when you run a fingernail along the stalk; and they have a little plasticky condom-kippah of membrane stretched over the top of the cap. The fellow dumped a

cont. on page 4

Mitey-Strange Encounter, *cont. from page 3*

vast number of small, mostly somewhat bluish mushrooms onto the lab countertop.

"Are any of these magic mushrooms?" he asked plaintively. It must have taken him all morning to collect them.

We picked through them. Lots of purplish *Mycena*. He must have been near some trees. Some *Panaeolus*, the haymaker's mushroom. Ubiquitous on lawns. And this, and that. Magic rating: 0.0.

"Sorry," we told him. He was crestfallen, and also slightly dubious, since how could he know we weren't plotting to misinform him and take the magic for ourselves?

Just then, Bandoni came back from teaching a class.

"What THE HELL are those BLOODY MUSHROOMS doing in my LAB????" he demanded. He had a characteristic upper lip quiver when he was absolutely furious, the sort of thing that, if you see it in a camel, you jump waaaaay back. "GET THOSE FILTHY THINGS OUT OF HERE!!" he ordered the young man, who was already hastening to comply. Man and 'shrooms vacated the premises on the double. Bandoni glowered at us. "Don't let people like that in here—ever!'" he instructed.

You might think that, since mushrooms are fungi, taking mushrooms into a fungus lab wouldn't be too controversial.

"Those filthy things are covered in mites," Bandoni explained to us. He liked mushrooms in principle, and had co-written a good handbook on the common mushrooms of British Columbia. The problem with bringing them into the lab was that they tended to carry small numbers of micro-critters that liked to eat fungi. These critters, called "cheese writer mites," had an uncanny ability to locate any and all fungi by smell. Some of them would fall off the mushrooms that the pickers brought in, and then they'd go searching for new food sources. Despite being so small that they could barely be seen with the naked eye, they could travel across up to two meters of countertop, all the while sniff-detecting, with deadly accuracy, the closest stack of Petri plates with your experimental fungi in them. Your plates might be sealed with plastic strips, but if there was any place in the seal where there was a micro-gap, odors would leak out that would unerringly inform the mite about how to climb in. These hungry Houdinis of the micro-world could clamber and squeeze into almost anything, and when they arrived, they would not only set about eating your fungi, but also track in bacteria and mold spores from their old mushroom home and the countertop, thus turning your formerly pure cultures into swampy, messy mixtures.

At this point, the party was just beginning for them. Craving company and feeling wealthy, they'd lay dozens of eggs, and soon your plates would be teeming with whiskery, feelery, messy micro-cows devouring everything you'd worked on, and spreading to every corner of the lab. Even the mites that dried up and blew away on the countertops would just drift to someplace that was damp and then revive, spreading their vegan orgy to yet another quadrant of your premises.

The name "cheese writers" for these mites, or tyroglyphids if you prefer to speak scientific slang, came from their habit of eating their way along the surfaces of special cheeses that are covered in edible fungal crust, like Brie and Camembert. Their grazing trails look as if someone has been scribbling tiny lines on the cheese crust. Needless to say, most cheese makers are very dedicated to keeping them and their graffiti off the merchandise. The cheeses are brushed to ensure that no one is walking on them. Contrastingly, one kind of special cheese from France, Mimolette, is allowed to become brimful of mites, which give it a special, "mitey strange" flavor.

The company I work for now serves some every year at the Christmas party, just to give our friends a real taste of microbial natural history. We don't, however, bring the Mimolette into our lab.

Mimolette is a cow's milk cheese from the north of France. Its cratered rind is evidence of cheese mites.

FUNGUS-DERIVED DRUG SHOWS PROMISE IN TREATING MESOTHELIOMA

Lauren Santye

https://www.specialtypharmacytimes.com, April 18, 2017

A relapsing-remitting multiple sclerosis (MS) drug shows promise in the treatment of mesothelioma, according to a preliminary study.

FTY720 (fingolimod) is a drug derived from the fungus *Iscaria sinclairii*. Prior research has shown its positive effects on other forms of cancer, but this is the first study to evaluate fingolimod in the treatment of malignant pleural mesothelioma.

For the study, published in the *Journal of Translational Medicine*, investigators treated a panel of mesothelioma cell lines and normal human mesothelial cells. The action of fingolimod was assessed by measuring the activity of phosphatase protein 2A (PP2A). Next, they evaluated the activation of apoptosis [programmed cell death].

Mouse models of human mesothelioma tumors were treated with fingolimod. The study authors found that the agent significantly suppressed the viability of mesothelioma cells without impacting normal mesothelial membrane cells.

"Our preclinical data indicate that FTY720 is a potentially promising therapeutic agent for malignant mesothelioma treatment," author Agata Szymiczek said in a release.

Fingolimod inhibited PP2A activity by displacing a protein that is overexpressed by mesothelioma cells. The findings showed an increased in apoptosis in the laboratory grown mesothelioma cells.

"Moreover, [fingolimod] administration *in vivo* effectively reduced tumor burden in mice without apparent toxicity," Szymiczek wrote.

The findings are significant because toxicity is a major challenge for patients with mesothelioma. They typically do not experience sustained results from standard chemotherapy, and if a patient received enough of the agents to permanently destroy the tumors, the adverse events would be lethal, according to the study.

"The fact that FTY720 was able to shrink mesothelioma tumors without toxic [adverse] events in this preclinical study is a hopeful sign, especially given the potential complications associated with other types of mesothelioma treatments," Alex Strauss, managing editor for *Surviving Mesothelioma*, said in a release.

MUSHROOMS MAY HOLD CLUES TO EFFECT OF CARBON DIOXIDE ON LAWNS

University of New Hampshire via
https://www.sciencedaily.com/, April 12, 2017

Since the Industrial Revolution, the amount of carbon dioxide in the atmosphere has rapidly increased. Researchers at the University of New Hampshire set out to determine how rising carbon dioxide concentrations and different climates may alter vegetation like forests, croplands, and 40 million acres of American lawns. They found that the clues may lie in an unexpected source, mushrooms.

The researchers focused on American lawns because they knew that grass can play a key role in the global carbon cycle because it pulls carbon out of the atmosphere during photosynthesis, the process used by plants to absorb and harness energy from sunlight and convert it into chemical energy. Most lawns across the United States are similar, but differ regionally in their relative proportions of two main types of grasses, C_3 grasses and C_4 grasses, which use different metabolic pathways for photosynthesis. However, unlike trees, which build rings year after year, grass leaves little behind to study, so researchers got creative, turning to mushrooms that feed on the carbon in lawns.

"We thought that mushrooms could be a valuable indicator of responses of lawns to carbon dioxide levels in ecosystems because they feed on the dead grass and debris, or carbon, that lawns or other plants put into the ground," said Erik Hobbie, research professor of terrestrial ecology at UNH and lead author on the study. "Since it is challenging to measure blades of grass from grassland ecosystems over decades, we turned to mushrooms, which are widely available through previous collected specimens in labs and museums."

In the study, published in the *Journal of Geophysical Research: Biogeosciences* and featured as an article in the American Geophysical Union's magazine *Eos*, Hobbie, UNH statistician Ernst Linder, and their colleagues looked at isotopic data from samples of the mushroom *Amanita thiersii* collected between 1982 and 2009 from 26 locations in the southeastern and south-central United States. The scientists combined these data with information on temperature, precipitation, and carbon dioxide concentrations over the same period to look at competition between the two kinds of grass, C_3 and C_4.

C_3 grasses, such as wheat, oats, and ryegrass, are called cool-season plants and thrive in a temperature range of 65–75°F. C_4 plants, which include corn, crabgrass, and bluestem grasses, flourish in warmer and drier environments. These warm-season plants are more efficient than C_3 plants at photosynthesis under low concentrations of carbon dioxide.

Researchers found that the mushrooms (*Amanita thiersii*) appeared to be good integrators of the carbon in lawn grasses. Temperature was the dominant climatic influence over C_3 versus C_4 grass distribution. As carbon dioxide in the atmosphere increased over those decades between 1982 and 2009 and temperatures rose, changes in grass competition and growth were reflected in the carbon of *Amanita thiersii*. With every 1°C increase in temperature, the proportion of carbon from C_3 grasses, as found in the *Amanita thiersii*, decreased by 12%. But researchers also found that the relative proportion of C_3 grasses increased by 18.5% in response to the increase in carbon dioxide concentrations from 341 to 387 parts per million. This suggests that rising carbon dioxide is already influencing plant competition on the American landscape and that preserved specimens of plants and mushrooms could be used more widely to examine current responses to global change.

Reference:

Erik A. Hobbie, Brian A. Schubert, Joseph M. Craine, Ernst Linder, Anne Pringle. Increased C_3 productivity in Midwestern lawns since 1982 revealed by carbon isotopes in *Amanita thiersii*. *Journal of Geophysical Research: Biogeosciences*, 2017; *122*(2): 280.

Michael Kuo

Amanita thiersii mushrooms. Scientists are measuring carbon isotopes in fungal tissues to learn more about the type of plants that decomposed and fed the mushrooms. How mushrooms change over time may directly reflect how rising carbon dioxide levels are affecting plant competition in forests, croplands, and lawns, researchers hypothesize.

NAKED HANOVER MAN ON MUSHROOMS CAUSES CAMPGROUND FRACAS

http://www.yorkdispatch.com/, April 11, 2017

HANOVER, Penn - An 18-year-old Hanover man is facing more than half a dozen charges after he allegedly ingested psychedelic mushrooms at an Adams County campground, stripped off his clothes, and attacked another camper with a rock.

Jordan Cullin Eckard is charged with aggravated assault, simple assault, harassment, disorderly conduct, public drunkenness, possessing drug paraphernalia, and indecent exposure for the incident Sunday at the Conewago Campground in Menallen Township.

State police in Gettysburg said a trooper was dispatched to the campground about 1:45 pm for a report of a naked man causing a disturbance.

The investigation revealed Eckard had taken psychedelic mushrooms, which caused him to take off his clothes, according to state police. He also was involved in a physical altercation with another man, during which the victim was struck in the head with a rock, and drug paraphernalia was found in Eckard's vehicle, police said.

The two victims were identified as a 54-year-old Gettysburg resident and a 62-year-old Hanover resident.

Eckard was in the Adams County jail Monday in lieu of $20,000 bail.

INDIANA TEEN FINDS "GINORMOUS": MOREL

FOX59 Web, April 17, 2017

GREENE COUNTY, Ind. - A young mushroom hunter hit the jackpot in Greene County Sunday.

Indiana's Department of Natural Resources shared photos of 13-year-old Kayden Graber and his "ginormous" morel mushroom on Facebook Monday. From the photos, it looks like Graber's find measures around 11 inches. DNR joked the mushroom could feed a whole family.

The common fungi are popular among Hoosiers because of their "nutty" and "meaty" taste. They're commonly eaten cooked or dried.

DNR

The mushrooms typically grow on the edge of forested areas, and they often grown around ash, aspen, elm, and oak trees. They thrive in moist soil around decayed vegetation. But it's important to make sure you are not trespassing on anyone's property while hunting for morels.

A BAD MONTH FOR UNWANTED "MOREL" FINDS

It's Spring, and mycophiles all over the country are headed out in search of the elusive morel. But this past month several unfortunate hunters found more than they bargained for.

Oklahoma Man Hunting for Mushrooms Stambles on Human Remains

Crystal Bonvillian

http://www.palmbeachpost.com, April 11, 2017

EUFAULA, Okla - An Oklahoma man searching for mushrooms on Sunday instead found human remains, according to police.

Eufaula police said the man was searching for morel mushrooms in a wooded area behind some businesses when he made the grisly discovery. News on 6 in Tulsa reported that the man went to police to report finding a bone.

Responding officers found additional bones scattered in the woods. An officer stayed overnight at the scene until the medical examiner and agents from the Oklahoma State Bureau of Investigation could respond Monday morning.

Eufaula police chief Don Murray said the skeletal remains appear to be those of a man. The chief said that he believes the person was likely a transient visiting Eufaula's lake. The chief said the discovery of the bones is being treated as a homicide investigation.

Missouri Mushroom Hunter Finds Human Skull

Robert Townsend

http://fox4kc.com/, April 7, 2017

CASS COUNTY, Mo. - A mushroom hunter who found human remains in some Cass County woods on Monday described the disturbing discovery to FOX 4 on Friday.

On Monday afternoon, the retired heavy equipment operator said he was out in the woods on Y Highway on what he thought would be just another routine search for mushrooms.

"Over there 15, 20 yards on the side of the fence was a skull," the man described, who said he knew what it was in an instant. "I was not scared, I was a bit more shocked than anything. I knew it was a big thing." His thoughts immediately went to Kara Kopetsky, missing for a decade.

Investigators say the skull the hunter found belongs to 21-year-old Jessica Runions, a Raymore woman who had been missing for seven months. Investigators returned on Friday to the site near East 233rd and Y Highway searching for new clues. Crime scene technicians and detectives combed through the woods for seven hours.

Investigators are now trying to identify a second person, whose remains were found in the same area, but have not yet confirmed that the other set of remains is Kara Kopetsky.

Ohio Mushroom Hunter Finds Human Skeletal Remains

Lima News, April 17, 2017

MCCONNELSVILLE, Ohio - Authorities are working to identify human skeletal remains found by a man searching for mushrooms in a wooded area of rural southeastern Ohio.

The Morgan County Sheriff's Office says the mushroom hunter found the bones Saturday in a recreation area near a campsite east of McConnelsville, roughly 70 miles east of Columbus.

The sheriff's office said the Licking County coroner's office would conduct an autopsy and try to help identify the remains.

The sheriff's office also says personal items were found with the remains, but authorities aren't releasing details about those.

Mushroom Hunter Finds Non-Live Gernade

http://www.theindychannel.com/, April 14, 2017

EDINBURGH, Ind. - A Johnson County explosive disposal crew was called to a wooded area Thursday after a somebody found a grenade. A person hunting mushrooms saw the grenade on the ground and didn't touch it, but instead called the police.

The Indiana Department of Natural Resources and a Johnson County Sheriff's Department Hazardous Devices Team responded to the Atterbury Fish and Wildlife area in Edinburgh, Indiana.

The county Explosive Ordinance Disposal team determined it wasn't live and was free of explosive contents.

THE MUSHROOM SUSTAINABILITY STORY

http://www.broadwayworld.com/, Mar. 16, 2017

The mighty mushroom not only is healthy on the plate, it's also gentle on the planet according to a new study measuring the water, energy, and carbon emissions required to grow and harvest fresh mushrooms in the United States.

The study finds production of a pound of mushrooms requires only 1.8 gallons of water and 1.0 kilowatt hours of energy, and generates only 0.7 pounds of CO_2 equivalent emissions. In addition, the annual average yield of mushrooms is 7.1 pounds per square foot, meaning up to 1 million pounds of mushrooms can be produced on just one acre.

Morels! Morels!
The musical sound
The more you look
The more will be found
The more you find
The better you feel
So eat more morels
In every meal.
— Eva Villanueva

RICOTTA GNOCCHI WITH ASPARAGUS, PEAS, AND MORELS

Bon Appétit
April 2014

Chef Nemo Bolin at Cook & Brown Public House in Providence, RI, turned us on to the technique for this streamlined, no-knead gnocchi dough. Makes four servings.


Bon Appétit

Ingredients

Gnocchi

- 4 cups ricotta (from two 16-oz. containers)
- 2 large eggs
- 1 cup finely grated Parmesan
- 2 tsp kosher salt
- Freshly ground black pepper
- 1 cup all-purpose flour

Vegetables and Assembly

- 1 bunch asparagus, trimmed
- Kosher salt
- 2 TBs olive oil, plus more
- ¼ lb fresh morel mushrooms
- 1 small shallot, finely chopped
- 1 cup shelled fresh peas (from about 1 pound pods) or frozen peas, thawed
- ¼ cup ((½ stick) unsalted butter
- Freshly ground black pepper
- Chopped fresh chives
- Finely grated Parmesan
- Finely grated lemon zest (for serving)

Preparation

For gnocchi

Line a baking dish with 3 layers of paper towels; spoon ricotta onto paper towels and let sit 20 minutes (if the ricotta is too wet, the dough won't hold together).

Combine ricotta, eggs, Parmesan, and salt in a food processor; season with pepper and process until smooth. Add flour and pulse just to combine (mixture should be smooth and fairly wet). Transfer gnocchi mixture to a pastry bag fitted with ½-in. round tip or a large resealable plastic bag.

DO AHEAD: Gnocchi mixture can be made 1 day ahead. Cover pastry tip and chill.

For Vegetables and Assembly

Cook asparagus in a large pot of boiling salted water until bright green and crisp-tender, about 1 minute. Using tongs or a mesh strainer, transfer to a bowl of ice water to cool; drain. Slice asparagus on the diagonal into bite-size pieces, leaving tips intact.

Reduce heat so water is simmering. If using a resealable plastic bag for gnocchi mixture, cut a ½-in. opening in bottom of bag. Working in 3 batches, pipe dough into pot, cutting off 1-in. lengths with a paring knife and letting dough drop into water. Cook until doubled in size, about 3 minutes. Using a slotted spoon, transfer gnocchi to a lightly oiled baking sheet. Reserve ¼ cup cooking liquid.

Heat 2 TBs oil in a large skillet over medium heat. Cook morels, tossing occasionally, until slightly softened, about 5 minutes. Add shallot and cook, tossing occasionally, until shallot and morels are soft, about 5 minutes; set aside.

Add gnocchi, asparagus, peas, butter, and reserved cooking liquid to skillet with morels. Cook, tossing gently, until vegetables are warm and sauce has thickened slightly, about 2 minutes; season with salt and pepper. Serve topped with chives, Parmesan, and lemon zest.

WHY DO MUSHROOM HUNTERS KEEP FINDING DEAD PEOPLE?

Lisa Gutierrez
http://www.kansascity.com/, April 20, 2017

It's happened twice this month — mushroom hunters found human remains in forested areas of Cass County.

Why do mushroom hunters find dead people?

"Friends and I have discussed before that we're surprised that we haven't stumbled upon (human remains) after all these years. I guess that's a good thing," says Ron Cook, the administrator of the Missouri Morel Hunting Facebook page.

"I think that mushroom hunters tend to find remains more than most because of how thoroughly we search an area looking for 'shrooms. We tend to venture deep into the woods looking under brush piles, ravines, thickets, etc., and hike into areas that others —such as deer hunters—wouldn't hike into."

Though Cook said the recent discoveries by local hunters haven't been discussed much on his Facebook page, a Reddit user named ActiveMeasures touched off a lengthy and still-growing discussion thread a few days ago by asking, "Why do mushroom hunters seem to frequently find human remains?

In response, mushroom hunters and others described how they walk through miles of woods, most often secluded.

While many hikers, joggers, campers, and casual users of the great outdoors tend to stick to safe and proven paths, mushroom foragers seek out places no one else has picked over. They avoid the beaten paths.

Mushroom hunters move slowly and methodically, much like a search party would, but they pay particular attention to the ground. Berry pickers and ginseng hunters have also found human remains.

"To find them [mushrooms], you have to go to heavily wooded/shaded areas....(in Missouri, where I'm from, that meant that heavy underbrushy stuff...we don't have big old wood forests) and very remote, yet accessible by foot. Thus, great places to place bodies.

"And yes, you're staring at the ground, looking for a specific shape. You find all SORTS of things mushroom hunting. (My

cont. on page 8

Why Do Hunters Find Dead People? *cont. from page 7*

uncle once found a desecrated grave site from the 18th century... and the tombstone had HIS name on it...so he booked it out of there really quick.)"

One Reddit user who said he works with cadaver dogs suggested that mushroom hunters can see things others cannot.

"Something that is often overlooked in these conversations is just how easy it is to miss human remains, even if you're looking for them. They can blend in remarkably well," wrote Hectorbaya.

"I have cadaver dogs and have had trouble spotting (skeletal) remains that my dog was actually alerting on, so I *knew* something was there. But since mushroom hunters are scrutinizing the ground in a way that very few others would, they're a lot more likely to notice remains that hikers would just walk by without even spotting."

One mushroom hunter referred to his "mushroom eyes."

"When I'm mushroom hunting I get what I call my 'mushroom vision' where I'm able to pick out anything out of the ordinary that stands out among the general forest floor, which can tend to look very samey unless you've got your 'mushroom eyes' on," wrote Reddit user corvus_coraxxx.

"I've found all sorts of stuff besides mushrooms, like old jewelry, wallets, old toys, animal bones. All things a casual hiker might miss because they aren't poking around and scrutinizing the underbrush for things that stand out.

"I actually have a cool collection of bones found while foraging, although thankfully nothing human. I'm terrified of finding a human body."

SUNFLOWER SEEDS FOUND AS SOURCE OF TOXIC MOLD, POTENT LIVER CARCINOGEN

April Stevens

WZZM, April 21, 2017

EAST LANSING, Mich. - Michigan State University researchers have found that sunflower seeds are frequently contaminated with a toxin produced by molds and pose an increased health risk in a number of low-income countries worldwide.

A team of scientists documented the frequent instances of a toxin called aflatoxin, produced by *Aspergillus* molds, found in sunflower seeds and their products. *Aspergillus* molds commonly infect corn, peanuts, pistachios and almonds.

This study, published in the current issue of *PLoS ONE*, is one of the first to associate the aflatoxin contamination with sunflower seeds. The study was conducted in Tanzania, but according to researchers, this is by no means an isolated issue. Chronic exposure to aflatoxin causes an estimated 25,000–155,000 deaths worldwide each year from just corn and peanuts alone.

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

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