SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 616 November 2025

HOW PSYCHEDELIC MUSHROOMS EVOLVED THEIR MAGIC

Rachel Nuwer

The New York Times, Oct. 18, 2025

No one knows why magic mushrooms evolved to produce psilocybin, a powerful psychedelic molecule. But this trait was apparently so beneficial for fungi that it independently evolved in two distantly related types of mushrooms.

An even greater surprise to biologists was that rather than arriving at the same solution for producing psilocybin, the two groups pursued completely different biochemical pathways, according to a study published last month in the journal *Angewandte Chemie International Edition*.

"This finding reminds us that nature finds more than one way to make important molecules," said Dr. Dirk Hoffmeister, a pharmaceutical microbiologist at Friedrich Schiller University Jena in Germany and an author of the study. He added that it was also evidence that mushrooms were "brilliant chemists."

Practically speaking, Hoffmeister said, the research also suggested a possible new path for synthesizing psilocybin for use in scientific research and therapies. "We can expand our toolbox," he said.

Psilocybe and *Inocybe* mushrooms occur in some of the same habitats, but they follow different lifestyles. *Psilocybe,* the group that includes what are traditionally called magic mushrooms, thrives on decaying material such as decomposing organic matter or cow dung. *Inocybe,* commonly known as fiber caps, are symbiotic organisms that form intimate, mutually beneficial relationships with trees.

Wisconsin Myco. Soc

Psilocybe cubensis, perhaps the most widely grown Magic Mushroom.

https://ultimate-mushroom.com

Inocybe aeruginascens, known for its hallucinogenic properties and psychoactive effects.

In 1958, Albert Hofmann, the Swiss chemist who discovered LSD, became the first researcher to isolate psilocybin from *Psilocybe* mushrooms. Some scientists later suspected that a few *Inocybe* mushrooms also produced the compound. Since then, psilocybin has been identified in around half a dozen *Inocybe* species. (The other species tend to produce a potent neurotoxin.)

Some researchers hypothesized, however, that the enzymatic formula magic mushrooms use to make psilocybin might not be the only way nature has found to create the molecule. The new study offers biochemical evidence supporting that hunch.

Hoffmeister and his colleagues produced and analyzed the enzymes responsible for psilocybin biosynthesis in both magic mushrooms and fiber caps. They used computer models to predict the molecular structures of new enzymes they found along the way.

When the researchers compared the two routes the fungi took to make psilocybin, they were surprised to see just how profoundly they diverged. "We definitely hadn't expected that the two pathways would be so radically different," Hoffmeister said.

Psilocybe and *Inocybe* both use the same amino acid starting point to produce psilocybin. But from there, the mushrooms follow separate road maps of genes and enzymes. Midway through, they meet at an intermediate molecular point before parting ways once again—only to converge on a shared end product.

"It's like meandering through New York City and taking different roads to get to the same destination," Hoffmeister said. "You can go this way or that way, but at a certain point, you meet at Central Park."

Jon Thorson, a chemist at the University of Kentucky who was not involved in the work, pointed out that psilocybin was already "a fairly simple molecule" to make.

But he added that the new study "expands our molecular level of understanding" of the biosynthetic steps involved in the process. He agreed that this could pave the way for new methods of producing psilocybin in more "user-friendly formats."

The findings did not bring evolutionary biologists much closer to explaining why some mushrooms evolved to produce psilocybin, said Jason Slot, a mycologist at Ohio State University who was not involved in the research. But he said the findings did add evidence for the belief that psilocybin was not an evolutionary accident, but rather a "solution to a particular challenge faced by mushroom-forming fungi" that helped them thrive.

"After having personally conducted over the last fifty years more than four thousand psychedelic sessions, I have developed great awe and respect for these compounds and their enormous potential, both positive and negative. They are powerful tools and, like any tool, they can be used skillfully, ineptly, or destructively. The result will be critically dependent on the set and setting."

—Stanislav Grof

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

CALENDAR

Nov. 2	Field trip (see PSMS website)
Nov. 3	Mushroom ID clinic, 4–7 pm
Nov. 13	Membership meeting, 7:30 pm, CUH (**Thursday**)
Nov. 17	Board meeting, 7:30 pm, CUH board room
Nov. 18	*Spore Prints* deadline
Dec. 9	December Holiday Special

BOARD NEWS

Valerie Costa

The board met in September to review finances, plan for upcoming events, and discuss organizational housekeeping and outreach efforts. The treasurer reported that the club is in solid financial shape. The treasurer's report and last month's meeting minutes were approved unanimously.

The board discussed the need for an office clean-up and reorganization. Peg Rutchik and Andy Iwata will convene regular users of the office to determine what stays, what gets stored, and how to make the space more functional.

Marian Maxwell reported that this year's Ben Woo Foray was a success, with 134 participants and plenty of help from both veteran and new volunteers. Attendees enjoyed well-received classes, accommodating food options, and a strong porcini harvest, along with some matsutake and chanterelles.

The board voted to increase its annual donation to the Washington Poison Center from $200 to $500, which will be matched. Going forward, the board approved making this a standing annual donation without requiring additional votes. Some members expressed interest in revisiting strategic planning to ensure donations and budgets align with long-term goals.

Shannon Adams brought up the PSMS Conservation Committee's efforts to assist in selecting a state mushroom. A survey has been circulated, and we await the results. We stressed the need to ensure collaboration with efforts already underway by other clubs and organizations.

Finally, PeiPei shared that PSMS has been invited to participate in the Explore the Outdoors Family Fair on February 8, 2026, as part of Out & Back with Alison Mariella Désir. PSMS will host a table and be listed on promotional materials.

MEMBERSHIP MEETING

Joseph Zapotosky


Tori Armbrust

Join us on **Thursday, Nov. 13th at 7:30 pm** at the Center for Urban Horticulture, University of Washington, for a special talk by **Tori Armbrust**, the first person licensed to legally grow psilocybin mushrooms in Oregon. Tori will share her insights into the emerging psilocybin therapy market, and discuss both the promise of this groundbreaking field and the unique challenges of being the first to navigate its legal and regulatory landscape.

The meeting will be in-person only. It will be recorded and posted on the PSMS website for 30 days only for PSMS members to look at.

The meeting is free and open to the public.
Note date change to Thursday!

BEN WOO FORAY 2025

Scott Maxwell, Marian Maxwell & Ron Post

This year's Ben Woo Foray, named for one of our founding members, Ben Woo, was attended by 125 PSMS members, many of whom were inspired newcomers to mycology. By any measure, the weekend was big success, full of interesting activities organized by James Nowak (Committee Chair), Marian Maxwell (Sign-ups and Workshops Coordinator), and Joe Zapotosky (Lecture Coordinator).

Workshops included Microscopy led by John Haines assisted by Dennis Oliver, both of whom studied under Dr. Daniel E. Stuntz; Dyeing Fabrics with Mushrooms led by Marion Richards assisted by Adam Young and Reba Tam; Mushroom Cultivation led by Milton Tam assisted by Andy and Irene Iwata and Ken Markaryan; a DNA Workshop led by Sigrid Jakob; and Mycophagy (cooking) led by Chad Hyatt and Rosa Fernandez. Participants reported that all of the workshops were outstanding, informative,

interactive, and fun. They also provided an environment for people to get to know each other.

All of the lectures were top notch, providing leading-edge mycological topics. Steve Trudell and Kate Mohatt focussed on their new book *Mushrooms of Alaska* which identifies many of the mushrooms that one might encounter in various parts of Alaska, expanding on the number of species that have been observed there prior to the survey performed by Steve, Kate, and Noah Siegel. Sigrid Jakob, a self-taught mycologist and previous president of the New York Mycological Society, discussed how to develop community science programs while contributing to the advancement of mycological data collection and species identification. Chad, a well-known chef from San Francisco, talked about his cook book *The Mushroom Hunter's Kitchen*. He emphasized the need for good mushroom ID skills and really expanded the categories of the culinary value of texture, color, smell, and taste while exploring ingredient pairings based on those qualities.

We would like to thank those people who made this foray a huge success including those mentioned above and the following individuals who stepped up and volunteered:

Field trip guides - Derek Hevel, Lifeng Jin, Colin Meyer, James Nowak, Sego Jackson, Joe Zapotosky, Wren Hudgins, Steve Trudell, Marian Maxwell, and Scott Maxwell.

Special Efforts (pitching in) - PeiPei Sung, Cindy Ide, and Ron Post

James Nowak: - Thank you for all of your efforts coordinating with the Cispus Learning Center, pre-scouting our field trip locations, and managing this event!

Wren Hudgins

Buyan and Erdene Buyanbadrakh show off their Sparassis.

Ron Post

A bonanza of boletes. Yum!

Ron Post

John Haines (standing) takes a question during the microscopy workshop.

Ron Post

Vice President Joe Zapotosky prepares a specimen for DNA sequencing.

FIELD TRIP REPORT, Sept. 27 — Brian S. Luther

We had great weather for our first fall field trip and no smoke at all from the Bear Gulch Fire further north on the Olympic Peninsula. Sixty-six members signed in, with 13 new members on their very first PSMS field trip.

Our intrepid morning hosts were Wuqi & Dave Weber, who provided us with a great selection of breakfast snacks and abundant hot coffee. Dave and Wuqi always host at least once on both our spring and fall field trips. Thank you, Dave & Wuqi, for your devotion and continued volunteering.

Andrew Graesser had lined up five field trip guides: Wren Hudgins, Dan Paull, Patrick Rice, Joe Zapotosky, and himself. It's unusual to have more than enough guides for those interested in a tour. Because each guide only had about three or four beginners, each group was very manageable.

I counted approximately 60 species of fungi collected, brought in, and displayed on the picnic tables. The really good news is that everyone found lots of Yellow Chanterelles (*Cantharellus formosus*) as well as a few White Chanterelles (*C. subalbidus*). Last year (2024) we had a bumper crop of chanterelles; generally a super good year is followed by a "so so" year, but that was not the case this year. Other edible species included a few specimens of the Lobster Mushroom (*Russula brevipes* parasitized by *Hypomyces lactifluorum*) and a couple of different *Suillus* (Slippery Jacks). What a great way for the beginners to start out on this field trip.

Most of the species found were what would be expected at this time of year, but we did get several collections of *Amanita farinosa*. This is an unusual species in that genus, very *un-Amanita* looking, being small in stature, lacking a partial veil (ring), and with a gray powdery-granular cap surface from a residual universal veil. It does,however, have a distinctly bulbous stem base with a very fine volva rim (you have to look closely) left from the remnants of the universal veil. As a button it actually looks more like a species of *Russula* at first glance.

The prettiest mushroom found was a single *Mycena oregonensis*, a tiny little bright yellow-orange species. A number of specimens of the robust, inedible fungus *Tapinella atrotomentosa* came in, and I demonstrated a macro-chemical test on one (using concentrated ammonia) to show a distinctive color reaction (see photo). Also, a large selection of *Phaeolus schweinitzii* (Dyer's Polypore) were collected, at various stages of development. This rather ugly species gives off some extraordinary colors when used for dying wool, based on the mordant used. Thanks to Wren Hudgins for assisting with ID.

Brian S. Luther

Tapinella atrotomentosa found on field trip. (*right*) *Untreated specimen and* (*left*) *the purple color reaction after applying a drop of concentrated ammonium hydroxide.*

We had a good turnout for our end-of-day potluck at 3:00 pm, with lots of tasty and satisfying food, including hearty hot soups. Those staying to the end did a great job cleaning up and putting tables back. When we left, it looked as if we hadn't even been there.

FIELD TRIP REPORT, Oct. 4 — Brian S. Luther

Fifty-seven members signed in at this, our second fall field trip. It had been very smoky and unhealthy in the area owing to large forest fires nearby, but we lucked out and conditions were totally clear and sunny. This was a joint venture with another non-profit organization which we do in both spring and fall every year. Special thanks to Virginia, our facility host, for her excellent hospitality.

Brian S. Luther

Morning meeting, Oct. 4, 2025.

Alina Boychenko & Ashur Warner volunteered to host for the first time, and did a great job providing everyone with morning snacks and hot coffee. Thank you, Ashur & Alina!

We had more than enough field trip guides—Patrick Rice, Ashley Laabs, Wren Hudgins, Julia Benson, Jamie Ardena, and Karen & Clay Dawson—so anyone who wanted to go with a group was able to.

Even though conditions had been very dry, a surprisingly large selection of fungi was brought in. I counted 81 species spread out on several tables. White Chanterelles (*Cantharellus subalbidus*) were found by many, and two different Yellow Chanterelles (*Cantharellus formosus* & *C. roseocanus*) came in, along with a couple of Matsutake buttons.

Fifteen species of boletes were collected, some edible and some poisonous, in various conditions; these included a few King Boletes (*Boletus edulis*), a single specimen of *Boletus fibrillosus*, and a couple of Birch Boletes (*Leccinum scabrum*), along with *Chalciporus piperatus*, *Caloboletus frustosus*, *C. rubripes,* and *Boletus smithii* as well as eight species of *Suillus*: *S. brevipes*, *S. granulatus*, *S. punctatipes*, *S. caerulescens*, *S. lakei*, *S. tomentosus*, *S. clintonianus*, *and S. ampliporus*.

A single stem (bulb only, no cap) of the deadly poisonous *Amanita smithiana* was found. The finder wanted to know if it was a Matsutake button. Good thing they brought it to me for ID, because making the incorrect assumption that it was a Matsutake would have put that person in the hospital, if consumed.

Many stayed for the end-of-day potluck, topping off an excellent and successful day of collecting and being out in the woods with friends.

"Good friends are like mushrooms...
the best ones are hard to find!"

FIELD TRIP REPORT, Oct. 11 — Brian S. Luther

The day ended up being pleasant, although a bit chilly, at this brand-new location. It was a struggle scheduling this site because both our first and second choices for a field trip that weekend were cancelled earlier by the USFS, owing to local fires. Both of those first two locations were group camps, allowing free camping for members, but unfortunately they just didn't work out. Because of the chance that Blewett Pass might still be closed because of the large forest fire there (it ended up opening in time), I reserved a motel in town near the field trip so I would be there very early to reserve the shelter Saturday morning, which is first come, first served.

We had 68 members sign in, with several being on their first field trip. Tom & Peg Rutchik were our morning hosts. Peg & Tom often volunteer to host, and we all benefit from that, with lots of morning snacks and plenty of hot coffee. Thank you, Tom & Peg, for your continued devotion to PSMS!

We had eight field trip guides, giving all new members the chance to be guided. Thanks to Patrick Rice & Melanie Vartanian (one team), Wren Hudgins, Kai Carpenter, Julia Benson, Megan & Cindy Brewster (one team), Andy Iwata, Lifeng Jin, and Pat Coddington.

Wren Hudgins, Julia Benson, and I got together on the Friday before and went scouting together in the nearby mountains. With few exceptions, most all the places we went to were very dry, with virtually no fungi fruiting. Nonetheless, whenever you get a big group out going to different locations, it's surprising what's found. I counted 93 different species displayed on the three 6-ft folding tables I'd brought for specimens.

Only a few good edible fungi came in, including some Bear's Head (*Hericium abietis*), King Boletes (*Boletus edulis*), *Suillus brevipes* (one of our Slippery Jacks), just a couple Chanterelles (*Cantharellus formosus*), and a single Hedgehog (either *Hydnum washingtonianum*, or *H. olympicum*).

Wren Hudgins

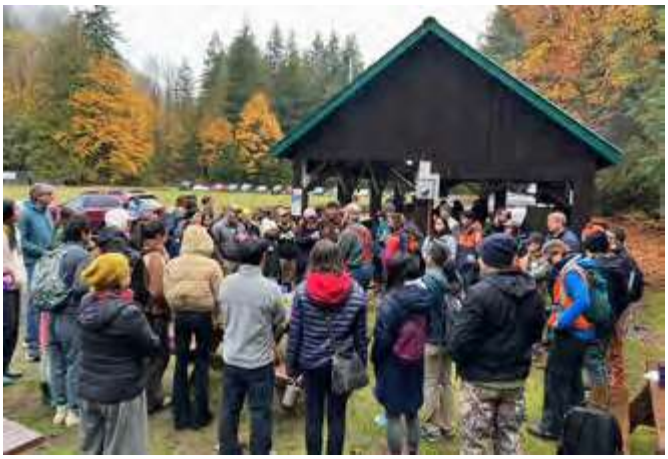
Hericium abietis found on Oct. 11.

Interesting fungi collected included a single *Gymnopilus luteofolius*, a psychoactive mushroom, and *Hygrophorus eburneus*, the first in that genus I've seen so far at any of the field trips this season.

As always, the end-of-day potluck was great, with plenty of tasty food. Those who stayed all helped to clean up the shelter, discard specimens, and clean and fold up the tables. I believe everybody left satisfied after a fun day out in the woods collecting and learning about our native mushrooms.

FIELD TRIP REPORT, Oct. 18 — Brian S. Luther

I was the first to arrive, with a load of firewood, just as it was getting light. I swept out the leaves in the shelter and made a fire. Some of our hosts followed closely behind. We lucked out because the rain didn't come until after potluck at this location; so although members got slightly drizzled on out in the woods, it was a very enjoyable day. We had 83 members sign in, with 30



Dave Weber

Morning meeting on Oct. 18.

being on their very first field trip. This was the 10th anniversary of us going to this fantastic location and facility.

We had an exceptional morning hosting crew of experienced volunteers, including Debbie Johnson (Hosting Co-Chair), Dave & Wuqi Weber, and Peg & Tom Rutchik. Thank you, as always, for your contributions providing members with morning snacks and hot coffee.

Field trip guides included Ashley Laab, Julia Benson, Peter Hasegawa, and Randy Richardson.

PSMS President Kelsey Hudson came, but had injured a knee recently, so he stuck around the inside of the shelter with me by the wood stove, and we had a delightful time chatting while members were out and about collecting.

I counted 100 species displayed on several picnic tables. Concerning good edibles, many found Yellow Chanterelles (*Cantharellus formosus*), Woodland Russulas (*Russula benwooii, & R. olympiana*), King Boletes (*Boletus edulis*), Winter Chanterelles (*Craterellus tubaeformis*), two Gypsy Mushrooms (*Cortinarius caperatus*), Hedgehogs (*Hydnum washingtonianum* or *H. olympicum*), some Delicious Milky Caps (*Lactarius deliciosus*), and a few Angel Wings (*Pleurocybella porrigens*), and Admirable Boletes (*Aureoboletus mirabilis*), as well as a single big clump of Bear's Head (*Hericium abietis*).

Brian S. Luther

King Bolete (left) and Hedgehog Mushrooms (right), both edible and choice.

The prettiest mushrooms included *Hygrocybe miniata* (bright red), *Atheniella aurantiidisca* (yellow & orange), *Mycena strobilinoides* (brilliant orange-red), *Chrysomphalina chrysophylla* (orange & yellow) and *Pyrrhulomyces astragalinus*, this last being the gorgeous color of ripe apricots.

Brian S. Luther

Pyrrhulomyces astragalinus.

A great potluck at 3:00 pm finished the day off, so nobody left hungry. Afterwards, many stayed to clean the shelter. When we left, it looked better than when we first arrived. Thanks to all who contributed.

ON EATING RAW MUSHROOMS — Wren Hudgins

Introductory courses in mushrooming often caution students against eating wild mushrooms raw. The usual reasons given for this advice are

1. Thorough cooking detoxifies some otherwise toxic mushrooms, e.g., morels.
2. Most mushrooms taste better cooked as opposed to raw.
3. Mushroom cell walls are made of chitin, which humans cannot digest, so there is little or no extraction of nutrition from eating raw mushrooms.

Otzi.

The practice of eating wild mushrooms has a very long history. Otzi, the "iceman," was found in 1991 in the Austrian Alps near the Italian border. His body was mummified and dated to between 3350 BC and 3105 BC. He had a few artifacts with him, including two fungi: *Fomitopsis betulina*, formerly *Piptoporus betulinus*), the "Birch Polypore," and *Fomes fomentarius* ("Horse Hoof Polypore"). The Birch Polypore is also known as the Tinder Fungus and has a reputation for facilitating the starting of fires, which would have been an extremely useful characteristic in 3000 BC, so Otzi probably carried it for that purpose. The Horse Hoof Polypore was also known to facilitate fire making but was believed to have medicinal properties as well. So we don't know if he carried it to start fires, to heal himself, or both.[1]

Fast forwarding a few millennia, Oyster mushrooms show up in Roman cookbooks as early as 1 AD. Perhaps the most famous mushroom known to be eaten raw then, and preferred that way, is *Amanita caesarea*, native to southern Europe and Northern Africa. This mushroom was considered a delicacy by Caesar (hence the name), but other early Roman rulers cherished it as well.

Amanita caesarea buttons.

We know that wild mushrooms were collected, traded, and consumed in medieval times, especially porcini and morels, but we have no information on cooking vs eating raw. Because morels can be toxic raw, we presume early consumers figured out fairly quickly that they had to cook their mushrooms. That lesson has probably needed re-learning over the centuries with the latest example being the 2023 poisoning incident at Dave's Sushi House in Bozeman, Montana, wherein 51 were sickened, three hospitalized, and two died from the consumption of raw or undercooked morels.[2]

Looking back at the three reasons above, we know No. 1 is true, with the incident at Dave's Sushi House being the most recent proof. Most people would agree No. 2 is true although that one is subjective. But there is some interesting new research on No. 3.

Digesting chitin usually requires the enzyme chitinase, which, as we have thought until recently, humans don't possess. However, a 2007 study by Paoletti et al.[3] found chitinase in several human tissues (lungs, stomach, and immune system) in 20 of 25 subjects, apparently associated with defense against parasitic in-

cont. on page 6

On Eating Raw Mushrooms, *cont. from page* 4

fections and some allergic reactions. It was found in an acid PH environment, so was named acidic mammalian chitinase (AMCase). A related enzyme, chitotriosidase, was also found that had some but limited ability to break down chitin. The stomach AMCase is in the gastric juice and has demonstrated a rather weak ability to break down chitin. The AMCase is aided, however, by gut bacteria such as *Bacteroides* and *Clostridium* which can partially digest chitin. But after all this, the chitin remains only partially digested; most of it passes through us in a way similar to dietary fiber.

So it is now looking like humans have SOME ability to break down and digest chitin, and that ability would result in SOME nutrition extracted from eating raw mushrooms. An additional benefit might come from the fiber-like effect of chitin passing through our system. Thus the blanket statement that humans can't digest chitin and therefore can't extract nutrition from eating raw mushrooms is not 100 percent true.

A good summary is provided by Valverde[4]: "The nutritive value of mushrooms is limited by the presence of chitin in their cell walls, which humans cannot digest. Chitin behaves as dietary fiber, although partial degradation may occur due to gastric chitinases and microbial fermentation."

As in so many things, the picture is more complicated than we might want it to be. We know cooking breaks down chitin so it remains true that if you want to maximize nutrition from eating mushrooms, cook them.

References

1. Peintner U. Pöder R. & Pümpel T. 1998. "The iceman's fungi," *Mycological Research*, Volume *102*(10), pp. 1153–1162, ISSN 0953-7562, https://doi.org/10.1017/S0953756298006546. (https://www.sciencedirect.com/science/article/pii/S0953756208610047)
2. Coveny, T. 2023. "Failure to Cook Morel Mushrooms May Have Led to Deaths in Dave's Sushi Outbreak: Final Report Published," *Food Poisoning News*, https://www.foodpoisoningnews.com/failure-to-cook-morel-mushrooms-may-have-led-to-deaths-in-daves-sushi-outbreak-final-report-published/
3. Paoletti M.G., Norberto L., Damini R. & Musumeci, S. 2007. "Human gastric juice contains chitinase that can degrade chitin." *Ann Nutr, Metab.*; *51*(3): pp. 244–51. doi: 10.1159/000104144. Epub 2007 Jun 18. PMID:17587796.
4. Valverde M.E., Hernández-Pérez T., Paredes-López O. 2015. "Edible mushrooms: improving human health and promoting quality life." *Int J Microbiol.* 2015 — open access review.

Voted for the Washington State official mushroom yet?

Scan the QR code with your phone app or copy and paste the link to access the survey.

httpsnyurl.com/yc5nwc24

SCIENTISTS WITNESS THE EVOLUTION OF FUNGI AS CHEESE STORED IN A DARK CAVE TURNS FROM GREEN TO WHITE **Simran Kumari**

https://www.greenmatters.com/, Oct. 14, 2025

Microbes are usually invisible to our naked eye, but they surprisingly play significant roles in shaping the world around us. These tiny organisms are known to adapt, mutate, and evolve in incredible ways. In some cases, they also prove how life can thrive even in the most unexpected places with extreme weather conditions. Recently, scientists were surprised to witness the evolution of microbes inside the samples of a cheese called Bayley Hazen Blue collected from Jasper Hill Farm in Greensboro, Vermont, in 2016. Benjamin Wolfe, a microbiome scientist at Tufts University, collected these samples when he accompanied his former advisor, Rachel Dutton, to the farm where her boyfriend was about to propose to her.

Benjamin Wolfe

The mold growing on batches of Bayley Hazen Blue cheese changed from green to white between 2016 and now.

The proposal went smoothly, as planned, and the biologist successfully collected a few scrapings from the rinds of Bayley Hazen Blue cheeses, storing them in a freezer for future study. Back then, the mold coating those wheels had a vivid green hue, like an avocado skin. But several years later, when a graduate student, Nicolas Louw, returned to the same farm, he noticed that the new cheese samples were not green, but white. Since the recipe was the same, and the caves were also the same, the researchers came up with an explanation that the mold might have evolved over the years, as reported by *Smithsonian Magazine*.

After conducting detailed research, scientists discovered that the cheese's unexpected color shift was caused by a mutation in a single gene—ALB1. This gene is commonly known to produce melanin, the same pigment that protects us from ultraviolet rays. The findings of this research were revealed in a study titled, "Long-term monitoring of a North American cheese cave reveals mechanisms and consequences of fungal adaptation,' which was published by the journal *Current Biology*. Explaining the changes, Louw stated that since the cheese was located inside a dark cave, it doesn't require melanin, which is why they might have lost the gene that makes it.

This isn't the only example; over generations, creatures that live entirely in dark areas—like a few fish species and worms—have stopped producing melanin altogether, gradually losing their body color, as reported by *The New York Times*. Louw said, "By breaking that pathway and going from green to white, the fungi are essentially saving energy to invest in other things for survival and growth." In one of his official statements, Wolfe also said, "This was really exciting, because we thought it could be an example of evolution happening right before our eyes."

The microbiome scientist added, "Microbes evolve. We know that from antibiotic resistance evolution [and] pathogen evolu-

tion, but we don't usually see it happening at a specific place over time in a natural setting." Another expert, a fungal genomicist, Sam O'Donnell, called the discovery a perfect example of evolution in action. Meanwhile, speaking about the future, Wolfe said, "Seeing wild molds evolve right before our eyes over a period of a few years helps us think that we can develop a robust domestication process, to create new genetic diversity and tap into that for cheesemaking."

HOW SCOTLAND COULD PRODUCE A SOUGHT-AFTER CONTINENTAL DELICACY, THANKS TO CLIMATE CHANGE **Elizabeth Hunter**

ww.msn.com/, Oct. 19, 2025

They are a much sought after delicacy that are normally found in the sunnier climes of Spain and Italy. But now, a black truffle has been cultivated on a Scottish isle in what is thought to be a first for a UK island.

Professor Paul W Thomas, an honorary professor at the University of Stirling, discovered the truffle on the Isle of Bute in the summer, five years after planting a small hedge of hazel trees inoculated with truffle fungus in his garden.

He said it was "massively exciting" to find the 4.45 gm delicacy on July 30, unearthing it without the help of a dog after signs of animal activity revealed the specimen breaking the surface of the soil. Larger and riper truffles are expected in the coming weeks, which will be located with the help of Rue, a trained truffle dog.

University of Stirling /PA Wire

Prof. Thomas and Rue with 4.45 gm truffle.

Thomas, founder of Mycorrhizal Systems Ltd, is running a truffle science project on the island and said growing them could open up new opportunities for land use, economic development, and tourism in coastal and rural areas.

He said: "This is a landmark moment—not just for science, but for the future of land use in the UK.

"Truffle farming offers a low-input, resilient crop that could bring real economic opportunities to island and rural communities.

"With the rise of food tourism, this could just as easily support a boutique agritourism industry as it could offer new income for landowners." He added: "This project isn't just about luxury produce; it's about sustainable innovation. Scotland's islands are uniquely placed to benefit from this type of crop.

"With the right support, truffle cultivation could become part of the rural economy—contributing to jobs, agritourism, and climate-smart farming."

University of Stirling / PA Wire

Truffle grown by Thomas.

It is thought the truffle unearthed on Bute is the first cultivated truffle recorded on a UK island. The cultivated species, *Tuber aestivum*, commonly known as the Summer truffle, is highly prized in gastronomy and can sell for up to £900 per kilogram.

The truffles were grown using a technique developed over two decades by Thomas, and now in conjunction with Professor Alistair Jump, Dean of the Faculty of Natural Sciences at the University of Stirling.

Their research, published in 2023, found that planting fungi with trees to create protein-rich mushrooms may sequester up to 3.5 tons of carbon per hectare annually and produce a nutritious food source for nearly 19 million people per year, when scaled up.

Researchers said that tree roots form a symbiotic relationship with fungi and the growing process requires no irrigation, chemical treatments, or fertilizer.

Professor Jump said: "This latest discovery supports a growing case for regenerative, sustainable land use, particularly in coastal and island locations traditionally overlooked for high-value cropping.

"Truffle orchards are long-term, low-maintenance systems that support biodiversity and soil health while offering economic return."

GUT FUNGUS IS FOUND TO DISRUPT BRAIN'S ALCOHOL REWARD PATHWAY **Rhonda Siciliano**

https://neurosciencenews.com/, Oct. 16, 2025

[Summary] Researchers at Tufts University School of Medicine and Tufts Graduate School of Biomedical Sciences have found a surprising connection between a fungus associated with alcohol use disorder and the brain's dopamine-reward pathway.

The new study reveals that an overgrowth of *Candida albicans*, a common gut fungus, may alter the brain's dopamine reward circuitry and influence alcohol consumption. Researchers found that as fungal populations increased, they triggered production of inflammatory molecules called PGE2, which crossed into the brain and changed dopamine signaling in the dorsal striatum.

Unexpectedly, mice with high fungal levels began avoiding alcohol, but when PGE2 activity was blocked, they resumed drinking. The findings highlight the surprising role of fungi in the gut-brain axis and open new avenues for treating alcohol use disorder. The study was published October 16 in the journal *mBio*.

JAPANESE MAN MAULED TO DEATH BY BEAR WHILE PICKING MUSHROOMS

https://krq.iheart.com/, Oct. 14, 2025

A tragic bear attack claimed the life of a 70-year-old man in Iwate Prefecture, Japan. The man, who went missing on Wednesday (October 8) while picking mushrooms, was found dead with his head and torso separated, according to local police and a report by Channel News Asia.

Authorities suspect the man was attacked by a bear. This incident is part of a worrying trend of bear encounters in Japan, with the official death toll from bear attacks reaching six for the fiscal year starting in April, matching a record high from 2023. In the past week alone, there have been three suspected fatal bear attacks, which could set a new annual record if confirmed.

CHOCOLATE PROTEIN BARS MADE OF PLASTIC-EATING MUSHROOMS

https://www.designboom.com/, Oct. 10, 2025

Odette Dierkx transforms waste-eating mushrooms that eat plastic into a powdered ingredient to make chocolate protein bars. Named Plastik Protein, the edible waste-eating product starts its process with mycoremediation, a biological method where fungi digest harmful materials and eat plastic waste such as PET bottles, polyurethane foam, and LDPE plastic bags. They then grow by using plastic as their food source, and during this stage, the mycelium breaks the plastic into smaller, harmless organic compounds.

Once the plastic is fully digested, the clean mycelium remains, which is then collected, dried, and turned into a protein-rich powder. The dried material contains amino acids, fiber, and nutrients that can be used as food ingredients. The protein powder is later formed into the edible chocolate Plastik Protein Bar, made from the mycelium of the mushrooms that once consumed a specific type of plastic. The concept project by Odette Dierkx trails behind the fungi-made prosthetic organ that extracts and breaks down microplastics inside human bodies.

Odette Dierkx

Plastic protein chocolate bar.

The concept product and project uses several species of mushrooms, each matched with a type of plastic: the Oyster Mushroom (*Pleurotus ostreatus*) digests PET plastic, often found in bottles and packaging; the Turkey Tail Mushroom (*Trametes versicolor*) eats LDPE plastic, commonly used in grocery bags; and the Split Gill Mushroom (*Schizophyllum commune*) dissolves PUR plastic, used in foams and coatings. These fungi convert plastic molecules into simple carbon-based compounds. After decomposition, they leave no toxic waste behind, and the result is clean, organic matter suitable for cultivation and food production. The chocolate Plastik Protein Bar made from plastic-eating mushrooms is designed as a functional food product.

Each bar is made from processed mycelium powder mixed with natural flavoring such as cocoa, nuts, or fruit extract, and its texture is dense and protein-rich, designed to provide energy and nutrients. The bar contains no remaining traces of plastic because the fungi completely digest the material before harvest.

The designer's foundation for the project stems from findings of the Yale University students back in 2011. In their study, they documented how they found out that a fungus called *Pestalotiopsis microspora*, discovered in the Amazon rainforest, could digest polyurethane plastic even without oxygen using the process known as mycoremediation. From here, Odette Dierkx expands the research by turning the biomaterial into a multipurpose and edible project.

In Germany, Amanita muscaria is known as Glückspilz (literally "lucky mushroom") and finding one has been a symbol of good fortune for centuries in Germany, Austria, and other parts of Europe.

SWEET SMELL OF DEATH FOR MOSQUITOES

https://scienceblog.com/, Oct. 24, 2025

Scientists have turned a fungus into a botanical con artist. The engineered microbe smells like a flower, lures mosquitoes looking for nectar, and kills them within days. It is a surprisingly simple trick that could save thousands of lives.

The approach takes advantage of a basic mosquito vulnerability: their need for flowers. While female mosquitoes are famous for drinking blood, both sexes rely on floral nectar as their primary food source. An international research team realized that if they could make a deadly fungus smell like dinner, mosquitoes would come willingly to their doom.

The researchers, led by Raymond St. Leger at the University of Maryland, built their trap around a strain of *Metarhizium* fungus. After observing that some wild fungi naturally emit a sweet-smelling compound called longifolene to attract insect prey, they engineered their fungus to crank up production of the same chemical. The result, published October 24 in *Nature Microbiology*, is essentially a perfume that mosquitoes cannot resist.

"After observing that some types of fungi could trick mosquitoes into thinking they were flowers, we realized we could turbo-charge the attraction by engineering fungi to produce more longifolene, a sweet-smelling compound that's already very common in nature."

What makes the strategy particularly clever is that longifolene was not previously known to attract mosquitoes. The team let nature provide the hint, then amplified it through genetic engineering.

In laboratory tests, the scented fungus killed 90 to 100 percent of mosquitoes, even when competing against the smell of real flowers and humans in a large room. The performance is impressive, but the safety profile may be even more striking. Longifolene is already a common ingredient in commercial perfumes and has a long track record of human safety. The fungus poses no threat to people, only to mosquitoes.

Bernice Lillian Velategui

September 10, 1922 – October 9, 2025

PSMS is sad to announce that long-time member Bernice Velategui passed away December 9, 2025, at 103 years of age. Bernice joined PSMS on January 1, 1970. She was an avid forager since childhood and became one of our most valuable volunteers. Bernice served on our Board of Trustees from April 1995–1999 and was our Membership Chair from 1990–2007 (17 years!). She received the PSMS Golden Mushroom Award in 2003. Bernice was an outstanding member of the community and was an active volunteer in many other organizations. Rest in Peace, Bernice. We will miss you.