SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 614 September 2025

2025 PSMS WILD MUSHROOM SHOW

Derek Hevel, Milton Tam & Marion Richards

As the show co-chairs for 2025, we are happy to announce the 2025 Wild Mushroom Show will be October 25th (12–6 pm) and 26th (10 am–5 pm), and we will return to Shoreline Community College, 16101 Greenwood Avenue North, Shoreline, WA. The show is our biggest event of the year, where we share with the general public our knowledge of and enthusiasm for the fungal kingdom.

We always need your help to make the show happen. Year after year, we put on one of the largest and best shows on the West Coast. Please volunteer to help with one or more tasks, including helping at the touch-and-feel table, cultivation, cooking and tasting, book sales, admissions, hospitality, and loading/unloading. Sign up online starting in mid-September at PSMS.org under "Events." Publicity posters and postcards will be distributed at our September meeting. As usual, as a volunteer, you get into the show for free, have access to that amazing potluck in the break room, and will be eligible to attend the volunteers-only Memorial Day field trip in 2026. A new thank-you event will make its debut in the week or two after the show this year, and everyone who volunteers at the show is welcome; stay tuned for more info on that.

We will also need YOUR mushroom specimens for our display tables. As always, the strength of the mushroom season has yet to reveal itself, but we have already seen a few folks finding the earliest chanterelles, lobsters, and porcini. We don't know when the rains will arrive, but we're all crossing our fingers for a well-timed fruiting in order to put on the best show. Come mid-October, we strongly encourage members to forage far and wide to collect specimens wherever they can be found. A month out, experts have suggested collecting display specimens in the foothills of Mount Rainier, the Olympic Peninsula, and the Washington Coast, but it is impossible to predict when and where our mushrooms will flush. This year we will organize collecting trips in the days before the show, so stay tuned for more information if you would like to join. Otherwise we encourage you to self-organize for collecting trips. We're counting on YOU to make the mushroom display happen.

THE OREGON BLACK TRUFFLE NOW HAS ITS OWN NAME—AND SCIENCE—TO BACK IT

Maddie Khaw

https://www.oregonlive.com/, Aug. 15, 2025

The rich, earthy Northwest mushroom known for adding a sublime finishing touch to a dollop of whipped cream, a bubbling dish of fondue, or a steaming plate of pasta just got a little fancier.

The Oregon black truffle—which can fetch up to $800 a pound—is now a unique species, further distinguishing the aromatic fungus from its European counterparts. Please call it *Leucangium cascadiense*—named for its now-proven Cascade roots.

The distinction is more than a pretty name. Before now, biologists believed the Oregon black truffle was the same as the *Leucangium carthusianum* grown in Poland, Greece, and Italy and originally found under pine trees in France.

A new study published in the scientific journal *Persoonia* found that not only does the Oregon black truffle grow exclusively in the Pacific Northwest, but it also grows specifically on Douglas fir trees—exciting news in the mycology community.

"I hope that people will appreciate more that there's a lot going on underground beneath their feet that we didn't really know about before," said fungal biologist Ben Lemmond, the study's lead author.

The findings help paint a clearer picture of the fungal family tree. Understanding how many different species exist, where they are, and how they function helps scientists understand how ecosystems work and how species interact, which can fuel conservation efforts, Lemmond and other researchers said.

Less clear is the impact the news could have on the culinary scene and the competitive truffle industry.

The Oregon black truffle is popular regionally, but trails in fame behind its old world French and Italian cousins. It's unlikely that the scientific findings will help the species break into fine-dining kitchens across the country, but it can't hurt to have a distinctive claim on a delicacy.

Heather Dawson

A Leucangium cascadiense, or Oregon black truffle.

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

CALENDAR

Sept. 9	Membership meeting, 7:30 pm, CUH, via Zoom and in person
Sept. 15	Board meeting, 7:30 pm, CUH board room
Sept. 23	*Spore Prints* deadline
Sept. 27	Field trip (see PSMS website)
Oct. 4	Field trip (see PSMS website)
Oct. 25–26	PSMS Annual Wild Mushroom Show, Shoreline Community College

BOARD NEWS

Valerie Costa

The board has been quite active over the summer. We decided to move ahead with a full website redesign. After reviewing options, the board approved working with Vieth Consulting on a package that includes migration of up to 50 pages, training for volunteers, and a mobile-responsive design. The new system will eliminate the need for manual coding, so content updates can be made by anyone on the team. Volunteer sign-up tools will be improved, and the existing site will stay live during the transition. Jim Skerritt is leading the work of reviewing and pruning content to prepare for migration, and the web team has authority to finalize remaining details.

The board also made an important change regarding vendors at the Wild Mushroom Show. Going forward, vendors will be required to carry liability insurance, something both our own insurance company and Shoreline Community College expect. Since this is a new and unexpected cost for many of the smaller vendors, the board voted to waive the first $50 of vendor donations this year to help offset the burden and will share resources to find affordable event insurance policies. After much discussion, this decision passed; it reflects the need to be inclusive while also protecting the organization and its assets.

Alongside these big items, planning for the fall show is well under way with improvements to signage, updates to the haunted house, and the release of a new poster. The Ben Woo Foray team has set pricing and workshops, including cooking, microscopy, and cultivation. The board also heard updates on the Burke Museum curator position, discussed how to fill open committee chair roles, and supported the Conservation and Ecology Committee in launching a statewide survey that could lead to the designation of a Washington State Mushroom.

MEMBERSHIP MEETING

Joseph Zapotosky

As we transition from Summer to Fall, most of us are anxiously awaiting the rains that come with the season. September's guest speaker, Daniel Winkler, will give us a preview of what we might find when we return to the woods this year. Here is his preview of his presentation.

Daniel Winkler

"Some of the best edible mushrooms in the world can be found in the Pacific Northwest. Fortunately, many of these choice edibles—like Porcini and other boletes, Chanterelles, Hedgehogs, Matsutake, Bear's Head/Lions mane, Cauliflower mushrooms, Oysters, and Saffron Milkcaps—are fairly easy to identify, helping one to overcome fungophobia and truly appreciate wild mushrooms.

Interestingly all these mushrooms are also collected and highly esteemed elsewhere, like in the Rocky Mountains, European Alps, and the Himalayas. And, yes there are many other good edible mushrooms out there much more difficult to identify.

Daniel's stunning images taken while mushrooming far and wide document the appreciation of these delicious mushrooms. In addition, Daniel will share his experience on how to forage, identify, process, and prepare these delectable mushrooms.

Key in finding prime mushrooms is getting to know their preferred habitat and their seasonality. Daniel will share lots of new insights from his book *Fruits of the Forest: Handbook to Edible Mushrooms of the Pacific Northwest*. In addition, he will be mixing in some fungal fun and facts from his ethno-mycological research and Mushroaming travels.

Daniel grew up collecting and eating wild mushrooms in the Alps and is sharing his enthusiasm as a mushroom educator, photog-

rapher, and guide. The Puget Sound Mycological Society, which he joined in 1996, was instrumental in exposing Daniel to mycology and inspiring him to bend his career toward mushrooms. Daniel served on the PSMS board, was vice-president, and is spearheading PSMS's Bridle Trails State Park Funga study.

Daniel published his *Fruits of the Forest: Field Guide to Pacific Northwest Edible Mushrooms* (available at mushroaming.com), a product of a life time of mushroom hunting, the last twenty-nine years in the PNW. Previously he published a series of fold-out field guides: *Edible Mushrooms of the PNW, Edibles of California* (both Harbour Publishing), *Amazon Mushrooms*, and *Medicinal Mushrooms of North America*, as well as MycoCards "Boletes of Western North America." As an ecologist and geographer Daniel focused on High Asia toward researching Tibet's enormous fungal economy. His ethno-mycological *Cordyceps* research has been featured in *National Geographic*, *The New York Times*, *The Economist*, NPR, BBC World Service, etc. In the past decade Daniel started exploring neotropical fungi. With his travel agency MushRoaming, Daniel has been organizing mushroom focused eco-adventures since 2007, current destinations are Bhutan and Colombia.

Please join us Tuesday evening, September 9th, to hear Daniel open the door to our season of fungal discovery here in the Pacific Northwest and beyond. This will be a "hybrid" meeting both in-person at the Center for Urban Horticulture and virtual on Zoom. Doors open at 7:00 pm. The lecture will start around 7:30 pm.

2025 GOLDEN MUSHROOM AWARDS

Marian Maxwell

Two members were awarded the Golden Mushroom Award this last June: Dennis Oliver and James Nowak.

Dennis Oliver

Dennis Oliver's contributions go back many years. Every year for decades he has helped at the annual show where he arrives early to assist with setup and with sorting the mushrooms. On Saturdays he takes the completed trays full of identified and labeled specimens to the display area and arranges them on display tables in order of spore color. During the show on both days he has staffed the lichen booth, educating attendees about lichens. After the show he stays late to mist specimens that might dry out overnight and then covers most displays with plastic to maintain humidity. Sunday morning he arrives early to remove the plastic and often to freshen up some displays by removing desiccated specimens and bringing in fresh ones. He also stays late to help with the show take-down.

Dennis also periodically comes to our PSMS Monday night ID clinic to help out. He has assisted Dr. Ammirati and Patrice Benson in planning and teaching Mushroom ID classes, as well as assisted Dr. Katherine Glew with lichen classes. Dennis served as PSMS secretary from October 2024 through March of 2009 and has served on the Board as a trustee, as well as served on the Nomination Committee. Thank you, Dennis, for your years of dedication and service to our club.

James Nowak

James Nowak (affectionately known as "Animal") joined PSMS in 2013 and jumped right in by serving two terms on the Board as a trustee from 2014–2018. James has chaired the very popular Ben Woo Foray in October for 10 years now. He has made sure that all attendees have a good time with his great organizational skills, enthusiasm, and warm personality. He has scouted out great places to hunt for the group ahead of the foray, coordinated with talented workshop teachers, and arranged for interesting presentations, all while keeping the cost down to make this event a great value. James has consistently put a lot of work into the foray on behalf of our PSMS members.

James has served many years as a co-chair for the PSMS cultivation Committee and continues to assist in mushroom cultivation classes.

James also volunteers at our annual Wild Mushroom Show. Thank you, James, for your years of dedication and service to our club.

NEW SPECIES NAMED IN HONOR OF PATRICE BENSON

Joshua Birkebak

Ramariopsis bensoniae Birkebak is a lovely little white, lignicolous *Ramariopsis* with strikingly large and spiny spores for the genus. The little thing even made the cover of the 2025 issue of *Mcilvainea*!

Sara Krstic/Mushroom Observer

Ramariopsis bensoniae Birkebak.

I have meant to get this species out for over a decade but better late than never I hope. It is named in honor of the late Patrice Benson, a kind, knowledgeable, wonderful person who, as president of the Puget Sound Mycological Society, encouraged and supported my early mycological endeavors. Patrice was a truly special person, which I don't need to tell any of you who had the pleasure and privilege to know her.

It has so far been confirmed only twice (once from Oregon and once from British Columbia), but I am sure it can be found around the Pacific Northwest with careful attention. Keep an eye out for it and let me know if you find anything like it.

A MUSHROOM BOOK FOR PACIFIC NORTHWEST FORAGERS

Dick Sieger

The species included in *Mushrooms of British Columbia* are pretty much the same as the ones we find in Washington, so this book will serve us nicely.

You'll find 350 species here, each on its own page with a large beautiful photo. Detailed descriptions include informative notes. For example, the Fairy Ring Mushroom page points out that one should be careful with this edible lawn mushroom because it may have picked up contaminating pesticides. It then warns

cont. on page 4

Mushrooms of British Columbia, *cont. from page 3*

about a *Collybia* that isn't a look-alike may but may grow in fairy rings too. We learn that the two parts of the scientific name, *Marasmius oreades*, refer to the mushroom's ability to recover after drying out and to the name of a Greek fairy. Then we're referred to a page containing an essay about fairy rings.

Essays are scattered throughout the book. One describes the Death Cap mushroom, *Amanita phalloides*. It tells the story about how this dangerously toxic mushroom came to North America and how it became a problem on several levels. And I hope beginners will read the essay about mushroom poisons. One learns that "edible" is true only under certain circumstances.

Rather than having identification keys, the book contains a guide to mushroom groups that includes sketches of those groups and page numbers on which they can be found. But you'll probably just leaf through the pictures trying to identify your mushroom. Most beginners do that. I use the book to tell me about a mushroom I've already identified and to determine if my ID is correct.

One of the authors teaches communication and that shows in the clear text. The book is flexible and has a convenient size so it can be kept handy.

We owe a great deal of thanks to the Royal BC Museum in Victoria for providing so many informative publications for reasonable prices.

Mushrooms of British Columbia, Andy MacKinnon and Kem Luther, Royal BC Museum, 2021, $29.95

2025 BEN WOO MEMORIAL FORAY

Marian Maxwell

One of our favorite PSMS events, the annual Ben Woo Memorial Foray, will once again be held at the Cispus Learning Center, 2142 Cispus River Road in Randle from Friday, October 17th, thru Sunday, October 19th. We still have spots available. The last day to register is September 17th. Total package is $230 per person. This includes Friday and Saturday nights accommodations, five meals, engaging presentations & workshops, guided forays, and a Saturday evening social gathering! We hope to see you there.

Surrounded by the magnificent Gifford Pinchot National Forest, it is the perfect location with unlimited habitat within easy driving distance and mushrooms just outside your door. Pre-registration and payment for each person is required to attend; there is no registration at the door. **All attendees must be PSMS members and be at least 12 yrs of age.** To find out more about this fun AND educational event check out the Event Registration page on our website:

https://mms.psms.org/members/evr/regmenu.php?orgcode=PSMS

CONGRATULATIONS, CALL FOR ART WINNERS!

Brenda Fong

Last spring's Call for Art contest closed on June 2, and the winners were announced on June 10th at the Survivors' Summer Social—too late to include them in the June *Spore Prints*. So here they are now!

1st Place:
Mushroom Forest - by Jarrod Taylor

2nd Place:
21 Mushrooms - by Sandra Ruffner

3rd Place (tie):
Mushroom Rainbow (series of 6) - by Katherine Turner
Mushroom ID Table and Potluck - by Karen Dawson

Honorable Mention:

Camilla - by Ezra Abrahms
Quiet Fruit / October - by Melinda Hurst Frye
Life after Death - by Evan Klingensmith
An Inky Dream - by Ava Schwesinger
High Morel Standards - by Claire Seaman

A big "thank you" to all of the artists who participated in our Call for Art last spring.

1st
Mushroom Forest

2nd
21 Mushrooms

3rd (tie)
Mushroom ID Table and Potluck

3rd (tie)
Mushroom Rainbow

An Inky Dream

Camilla

Quiet Fruit

Life After Death

High Morel Standards

CANDIDA AURIS CASES NEARLY TRIPLE AS DEADLY FUNGUS SPREADS TO NEW STATES, INCLUDING TENNESSEE AND KENTUCKY

Alix Martichoux

https://www.msn.com/, Aug. 22, 2025

(NEXSTAR) - The number of *Candida auris* infections reported to the Centers of Disease Control and Prevention this year has nearly tripled in the past three and a half months as health care providers struggle to contain the drug-resistant and deadly fungus.

At the end of April, the CDC had recorded 1,052 *Candida auris* cases. By Aug. 9, the last week of available data, the total number of cases had grown to 2,809 across 21 states, surpassing the number of cases we saw at this time last year.

Candida auris, also called *C. auris*, was first identified in the U.S. fewer than 10 years ago. Since then, the number of cases have increased every year. The CDC has considered the fungus "an urgent antimicrobial resistance threat" because it has developed ways to defeat the drugs that are designed to kill it.

In the past three months, Kansas, Kentucky, Mississippi, and Tennessee recorded their first cases, joining 17 other states that were already tracking the fungus' spread in 2025.

Of the roughly 2,800 cases reported so far this year, about a quarter (or 727 cases) were in Texas alone.

Some of the biggest spread was in the Midwest, where cases in a handful of states more than doubled since April. Illinois reported 362 cases, Michigan reported 342, Ohio had 291, and Indiana had 164.

Candida auris can be hard or impossible to treat because antifungal medications aren't effective. "If you get infected with this pathogen that's resistant to any treatment, there's no treatment we can give you to help combat it. You're all on your own," Melissa Nolan, an assistant professor of epidemiology and biostatistics at the University of South Carolina, told News 2's parent company, Nexstar.

People with a healthy immune system may be able to fight off infection on their own, but the fungus mainly spreads in health care settings, where people are sick and vulnerable.

The fungus can survive on surfaces like countertops, doorknobs, or even people's skin for a long time before spreading to vulnerable patients. People with catheters, breathing tubes, feeding tubes, and PICC lines are at the highest risk because the pathogen can enter the body through these types of devices.

A study published last month, which looked at patients with *Candida auris* primarily in Nevada and Florida, found more than half of patients required admission to the intensive care unit and more than one-third needed mechanical ventilation. More than half of patients, whose average age was between 60 and 64, also needed a blood transfusion.

In the past, the CDC estimated that "based on information from a limited number of patients, 30–60 percent of people with *C. auris* infections have died. However, many of these people had other serious illnesses that also increased their risk of death."

MICE LIVE LONGER ON MAGIC MUSHROOMS

https://themedicinemaker.com/, Aug. 22, 2025

Monthly administration of the psychedelic compound psilocybin was found to extend survival in aged mice and delay cellular senescence in human cells, according to a new study. The results support the "psilocybin-telomere hypothesis" and suggest the psychedelic compound may have geroprotective effects. [Psilocybin is a psychedelic ingredient in "magic mushrooms."]

Researchers treated 19-month-old female mice—thought to be equivalent to approximately 60–65 human years—with psilocybin over ten months. Mice receiving psilocybin showed an 80 percent survival rate compared with 50 percent in the control group, along with preserved fur pigmentation and coat quality.

In parallel in vitro studies, the team examined the effects of psilocin—the active metabolite of psilocybin—on human fibroblasts. In fetal lung fibroblasts, psilocin extended cellular lifespan by up to 57 percent. In adult skin fibroblasts, lifespan increased by 51 percent. Treated cells also showed reduced oxidative stress and delayed onset of cellular senescence, along with increased markers of proliferation such as sirtuin 1.

"Most cells in the body express serotonin receptors, and this study opens a new frontier for how psilocybin could influence systemic aging processes, particularly when administered later in life," wrote the senior author, Louise Hecker from Emory University.

The study also reported increased expression of antioxidant regulators such as nuclear factor erythroid 2-related factor 2 and decreased expression of Nox4, an enzyme associated with oxidative cellular damage. These molecular effects occurred without signs of oncogenic transformation—treated cells eventually reached replicative senescence.

While psilocybin is widely studied for its psychiatric effects, these findings suggest its pharmacological influence may extend well beyond the central nervous system—pointing to a possible role in aging and longevity research.

"This study provides strong preclinical evidence that psilocybin may contribute to healthier aging—not just a longer lifespan, but a better quality of life in later years," the researchers concluded.

COLORADO DISTILLERY LAUNCHES MUSHROOM-INFUSED ELIXIR **Tilray Brands, Inc.**

https://cbs4indy.com/, Aug. 21, 2025

BRECKENRIDGE, Colo. - Breckenridge Distillery, a subsidiary of Tilray Brands, is introducing Mountain Shot, a new elixir that combines whiskey and maitake mushrooms [*Grifola frondosa*]. Breckenridge claims that Mountain Shot enhances the whiskey shot experience by blending rich chocolate with cool, invigorating mint, and that the infusion of maitake mushrooms (also known as Hen of the Woods) adds a distinct mouthfeel, creating

cont. on page 6

Mushroom-Infused Spirits, *cont. from page 5*

a one-of-a-kind experience for your palate. The 69 proof whiskey-based Mountain Shot is available in 750-milliliter bottles, 1-liter bottles and 100-milliliter resealable pouches. A 100-milliliter malt-based pouch of Mountain Shot, produced at 30 Proof, will also be available at convenience stores.

Mountain Shots.

AUSTRALIAN WOMAN FOUND GUILTY OF KILLING IN-LAWS WITH POISONOUS MUSHROOMS IN BEEF WELLINGTON

Austin Williams

https://www.livenowfox.com/, July 8, 2025

An Australian woman has been found guilty of murdering three of her estranged husband's relatives by deliberately serving them a beef Wellington lunch laced with poisonous mushrooms.

A jury in the Supreme Court of Victoria returned the verdict after a closely watched nine-week trial. Erin Patterson, 50, now faces life in prison for the 2023 killings that shocked the country and ignited widespread media fascination.

She was also convicted of attempting to murder a fourth guest who survived the meal.

What Happened at the Fatal Mushroom Lunch?

In July 2023, Erin Patterson invited four people to her home in Leongatha, Australia, for lunch: her former in-laws Don and Gail Patterson, Gail's sister Heather Wilkinson, and Heather's husband Ian. She served individual beef Wellington pastries that prosecutors said contained Death Cap mushrooms—one of the world's most toxic fungi.

Three of the four guests—Don, Gail, and Heather—died in the hospital days later. Ian Wilkinson, a local pastor, was critically ill but survived. Patterson was unharmed.

Prosecutors alleged that the meal had been deliberately prepared to kill. The jury unanimously found that Patterson intentionally used poisonous mushrooms in the food.

What the Trial Revealed

While Patterson admitted to making the meal, the trial focused on whether she knew the mushrooms were deadly and if she intended to cause harm. Prosecutors said she prepared individual portions—rather than a family-style dish—so she could poison her guests without affecting herself.

They also noted her decision to send her children to the movies during the lunch and later dispose of a food dehydrator, which they argued was used to dry the mushrooms.

Patterson denied intentionally poisoning anyone and claimed she had mistakenly included foraged mushrooms, unaware they were Death Caps. She admitted to lying about never owning a dehydrator or collecting wild mushrooms, saying she panicked after realizing her guests were dying. She also told jurors she became ill after the meal due to an eating disorder, not the mushrooms.

The court found that Patterson had intentionally served a fatal meal and lied repeatedly during the investigation. No motive was officially offered, but prosecutors cited tension with her estranged husband and a complicated relationship with his family.

A sentencing date has not yet been set, but Patterson faces a potential life sentence. It's unknown whether Patterson will appeal the verdict.

Patterson's ex-husband, Simon, was invited to the lunch but did not attend.

Why This Case Captured Global Attention

The trial gripped Australia and drew international headlines for its strange and tragic details: a home-cooked meal gone fatally wrong, allegations of hidden resentment, and a courtroom drama filled with emotional testimony and forensic analysis.

Multiple podcasts followed the case daily, news outlets published live blogs, and TV networks are already planning dramatizations. Lines of spectators formed outside the rural courthouse in Morwell as the verdict was read.

The case sparked broader conversations in Australia about mushroom foraging, food safety, and how prosecutors handle murder trials with circumstantial evidence and no clear motive.

Supreme Court of Victoria/ via Storyful

Evidence photo of the beef Wellington dish served by Erin Patterson.

REVIVING 80-YEAR-OLD FUNGI OFFERS NEW CLUES FOR SUSTAINABLE AGRICULTURE

https://www.seedworld.com/, Aug. 13, 2025

In a major scientific breakthrough, researchers at the Hebrew University of Jerusalem have successfully revived fungal specimens collected over 80 years ago, shedding new light on how industrial agriculture has reshaped the microbial ecosystems that underpin global food production.

Published in *iScience*, the study was led by Dr. Dagan Sade under the supervision of Professor Gila Kahila of the Robert H. Smith Faculty of Agriculture, Food and Environment, in collaboration with Tel Aviv University, Ben-Gurion University, and Israel's Ministry of Agriculture and Rural Development. The focus: *Botrytis cinerea*, the plant pathogen behind gray mold disease, which affects more than 200 crop species and causes billions in annual agricultural losses, according to a press release.

To explore how this fungus has changed over time, the team revived two *B. cinerea* strains preserved since the early 1940s in the Hebrew University's National Natural History Collection—

well before the widespread use of synthetic fertilizers and fungicides that defined the Green Revolution.

Using state-of-the-art tools including whole-genome sequencing, transcriptomics (gene expression), and metabolomics (chemical profiling), researchers compared the revived strains with modern lab versions. The results were striking:

- Reduced signs of fungicide resistance, a feature that has become prominent in modern strains due to heavy chemical use;
- Differences in pathogenicity, with some traits suggesting the historical fungi were less specialized and aggressive than their contemporary counterparts;
- Adaptations to different environmental conditions, including pH tolerance and host specificity.

"These fungi have been quietly evolving in response to everything we've done in agriculture over the past 80 years," said the researchers. "By comparing ancient and modern strains, we can measure the biological cost of human intervention—and learn how to do better."

Botrytis on its host leaves collected in 1943.

A Window into the Agricultural Past—and Future

The research carries broad implications. As climate change, pesticide overuse, and soil degradation intensify, understanding how plant pathogens respond to human-driven change is essential for building more sustainable farming systems. Reviving historical microorganisms offers a critical baseline—helping scientists separate natural evolutionary shifts from those triggered by modern agricultural practices.

"Natural history collections have always been valuable for taxonomy and museum science," said the researchers. "But this work shows they are also dynamic resources for modern biology. They allow us to 'rewind' microbial evolution and anticipate future trends in plant disease."

The study also supports global efforts to predict and manage plant disease outbreaks. By uncovering how pathogens once adapted to environmental change, researchers can better model future risks and develop crop protection strategies that reduce dependence on chemical treatments—limiting ecological damage and slowing resistance.

Reviving More Than Specimens

This project reflects a growing scientific movement: using biological archives to tackle today's most urgent challenges. From climate change to antibiotic resistance and biodiversity loss, many modern problems demand historical perspective.

"This work is a perfect example of how past and future can intersect through science," said the researchers. "We brought something back to life not for nostalgia, but to help build a more sustainable agricultural system."

The project drew on expertise in genomics, microbiology, and metabolomics. The team hopes their findings will inspire other institutions to recognize the untapped potential in their biological collections—and embrace interdisciplinary approaches to solving global food and environmental crises.

THESE FAKE MUSHROOMS HELPED 19TH CENTURY FORAGERS AVOID REAL "DANGEREUX" FUNGI

Kristin Hunt

https://www.phillyvoice.com/, Aug. 25, 2025

[abridged] The Wagner Free Institute of Science in Philadelphia acquired its set of 28 mushrooms well over a century ago, but they haven't lost their color—and no, they don't stink. The collection is still in good shape despite its age and simple storage thanks to the fungi's unique matter: Each bulb is made of papier-mâché.

Kristin Hunt/PhillyVoice

Papier-mâché Amanita at the Wagner Free Institute of Science.

These hollow mushrooms were models designed to show foragers which species were safe to eat, and which ones would kill them. Dr. Louis Auzoux mass-produced them and papier-mâché replicas of beetles, horses, and human bodies in the 1800s at his factory in the tiny French village of Saint-Aubin-d'Ecrosville to provide a more effective and affordable teaching tool than wax models. It's especially fitting that a set of his landed at Philadelphia's Wagner Free Institute of Science, a monument to the natural world as 19th century audiences would've seen it.

Auzoux's papier-mâché mushrooms come apart at a spot marked with an illustrated pointing finger to reveal a cross-section of the mushroom's inner cap and stem. Many of the species are represented through two models: one a budding, young fungus and the other fully grown. They are each mounted on a wooden base the Wagner commissioned the last time the set was displayed a decade ago, as part of the bygone Philadelphia Science Festival.

Kristin Hunt/PhillyVoice

Bird's nest mushroom expanded to show. spores. The models come apart to reveal the inner features of each mushroom.

Each papier-mâché mushroom is labeled with one of three French words: comestible (edible), suspect (suspicious), or dangereux (dangerous). Altogether, the models served as a comprehensive visual aid to the person studying their spores—though they would eventually be supplanted by simpler, plaster sets.

COLORADO MAN PLEADS GUILTY TO DISTRIBUTING MUSHROOMS AFTER TEENAGER'S DEADLY FALL

Jennifer McRae

https://www.cbsnews.com/, Aug. 15, 2025

A Colorado man has pleaded guilty to his role in connection with a 15-year-old's death after a deadly fall from a construction crane in Boulder last year. Benjamin Harmon pleaded guilty on Friday to two counts of distribution of a controlled substance to a minor—schedule I or II, sexual exploitation of a child, and criminal attempt to commit money laundering.

Investigators said the 15-year-old fell from the crane at a construction site at the University of Colorado Boulder campus on June 20, 2024, while "experiencing strong hallucinogenic effects" of psilocybin mushrooms purchased from Harmon three days earlier, according to a grand jury indictment against Harmon.

THERE'S FUNGUS AMONG US. BUT WHERE EXACTLY?

Emily Anthes

https://www.nytimes.com/, July 23, 2025

The world's biological riches are not evenly distributed. Instead, much of Earth's plant and animal life is concentrated in a small number of biodiversity hotspots—from the tropical rainforests of the Amazon to the alpine meadows of the Himalayas—that have earned enormous scientific and conservation attention.

Now, new research suggests that more of these critical hotspots could be hiding beneath our feet—undocumented and largely unprotected.

On Wednesday, an international team of scientists unveiled a global underground atlas mapping the biodiversity of organisms known as mycorrhizal fungi. The fungi, which live in and on plant roots, form vast underground networks and perform critical ecosystem services, transporting nutrients to plants, storing carbon, bolstering soil health, and helping crops survive environmental shocks and stresses.

Using machine learning models, the scientists predicted that rich reservoirs of these fungi lie hidden in some unexpected places, including the Alaskan tundra and Mediterranean woodlands and scrublands. The dense Amazonian jungle did not stand out as a fungal biodiversity hotspot, but the neighboring savanna, the Brazilian Cerrado, did.

"The Amazon of the underground is not actually in the Amazon rainforest," said Michael Van Nuland, the lead data scientist at the Society for the Protection of Underground Networks (SPUR), a research organization that led the mapping effort. "These patterns of diversity that we're seeing are unique."

Alarmingly, they found, relatively few of these critical hotspots are in ecologically protected areas.

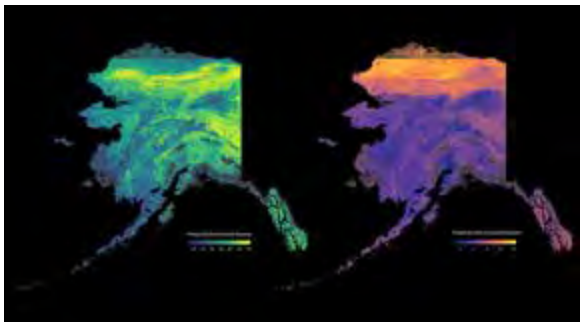
The scientists say that more work is needed to confirm their predictions, which were published in the journal *Nature*, and to elucidate how these fungi function. But the scientists hope that the findings will usher in a more expansive view of biodiversity and conservation.

"This paper is wildly exciting," said Rebecca Shaw, the chief scientist at the World Wildlife Fund, who was not an author of the study. "We've been studying aboveground biodiversity and its functioning for things that we care about—like water retention, carbon sequestration, productivity—for five decades. But we've made very little progress doing the same thing with belowground biodiversity."

She added, "I'll be looking to this group in the future to help me better understand, What do we protect?"

More than 80 percent of the world's plants form symbiotic relationships with mycorrhizal fungi, which entwine themselves in the plants' roots and spread thin filaments underground. But the fungi, which are often invisible to the naked eye, have not traditionally been well studied.

"We really had this aboveground bias, I think, as a society," said Toby Kiers, an evolutionary biologist at the Free University of Amsterdam who co-founded SPUN and serves as its executive director. "How do we protect what we can't see?"



An example from SPUN's Underground Atlas showing predicted patterns of ectomycorrhizal biodiversity (left) and endemism (right) across underground ecosystems. Bright colors indicate higher richness and endemism.

Genomic sequencing has provided a new tool, allowing scientists to identify mycorrhizal fungi by sequencing the DNA present in soil samples collected across the world.

In the new study, the researchers mined several large global repositories of this fungal data, pulling together more than 2.8 billion fungal DNA sequences from 25,000 soil samples collected in 130 countries. They built machine-learning models to analyze these data, alongside a variety of environmental variables, such as the climate and elevation at each collection site.

The models then made predictions about fungal biodiversity across the entire planet, estimating both richness—how many species were present at a given location—and rarity, or how unique those fungi were.

"If we go to a place like Mongolia, are there really unique fungi that have unique traits that could be very helpful in the future?" Dr. Kiers said. "Are there fungi that have evolved a very high tolerance to salt or to drought?"

Some of the findings mirror other well-documented biodiversity trends. For instance, the map predicts that the biodiversity of one major subgroup of mycorrhizal fungi associated with grasses, crops, and many species of trees—is greatest near the Equator, a pattern that holds for many plants and animals. (Specific hotspots for these fungi included the Brazilian savanna and tropical forests in Southeast Asia and West Africa.)

But the opposite was true for another subgroup of mycorrhizal fungi that is associated with a select group of trees, including pines, spruces, and oaks. The richness of these mycorrhizal fungi was highest closer to the poles, with hotspots that included forests in Siberia, Canada, and the United States. And tundras—cold, dry habitats—were brimming with rare species of these fungi.

Indeed, extreme climates and isolated habitats like mountaintops seem to harbor more rare fungi, Kiers said. Preliminary data suggest that deserts may also serve as these kinds of hotspots, she added.

The researchers also found that just 10 percent of the predicted richness hotspots, and 23 percent of the rarity ones, were located in protected areas, potentially leaving them at risk. "It puts a number to what we've been saying for a while—that these are underappreciated systems or underappreciated organisms on the planet," Van Nuland said.