

SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 605 October 2024



WILD MUSHROOM SHOW

Derek Hevel, Marion Richards & Milton Tam

Here's a reminder that our 61st Annual Wild Mushroom Show is on Saturday October 19 (noon–6pm) and Sunday October 20 (10 am–5 pm) in the student union at Shoreline Community College, 16101 Greenwood Avenue North in Shoreline.

The show is a fund-raiser, a classroom, an eatery, a boutique, a garden, a laboratory, and a crafts project! Lots of different activities will recharge your interest in mushrooms. There will be lectures on a variety of mushroom topics, mushroom cooking/tasting, photos of mushrooms, commercial vendors, arts and crafts, and a cultivation table where you can make your own oyster-mushroom growing kits. Check out the fluorescent mushrooms in the spooky glowing haunted house this year. All these activities help us introduce the public to the incredible diversity of mushrooms and other fungi.

To get more information about the show, go to the show page at psms.org and download the show PDF, which includes all the info you need to attend. We will post the PDF about two weeks before the show. Highlights of the PDF will be directions to SCC, parking info, admissions fees, lecture times, activities, and a feedback form.

Volunteering

A huge THANK YOU to all the wonderful people who have already signed up to volunteer to help with the show! You still have an opportunity to sign up to help. Register on the psms.org member's page under "Event Registration" or email volunteers@psms.com for help registering. Volunteer shift options are organized by committee first, then by activity, and then by day and time. We can't have the Wild Mushroom Show without your help, so please volunteer generously!

Collecting for the Show

The primary feature of the show is our wild mushroom display, which includes hundreds of mushroom species in as many shapes, sizes, scents, and colors as you can imagine. In order to create our display, we need everyone to get into the woods and bring back prime specimens of as many mushroom species as possible. If you hadn't noticed yet, the fall mushrooms are starting to pop. Beginning the week of October 14, please collect and bring in every mushroom you can find. Here are some guidelines for doing that:

Where to Collect: Find mushrooms on your own OR join an organized collecting group on Friday October 18 (details on how to join a group to follow). Either way, if you collect mushrooms, forest duff, or moss for the show, you can get into the show for free, so please register on the website in the "Collecting" categories at the bottom of the list of committees. We strongly encourage members to forage far and wide to collect wherever mushrooms can be found. In early October, experts have suggested collecting in the foothills of Mount Rainier, the Olympic Peninsula, and the Washington Coast, but it is impossible to predict when and where our show mushrooms will flush. Also, don't forget those urban mushrooms! Look in lawns, gardens, and landscaping. Don't forget to pay special attention to fluorescent mushroom species for the glowing haunted house; species include *Hypholoma fasciculare*, *Phaeolus schweinitzii*, *Cortinarius clandestinus*, and some *Gymnopilus* species. We're counting on YOU to make the display happen!

How to Collect: Before you go, stock up on plastic containers, foil, and wax paper bags to hold your specimens. Bring a garden trowel to dig if necessary to remove the entire mushroom intact, including underground structures. Then wrap each collection individually and put them in bigger cardboard boxes. Care for them all the way to the show because they must stay fresh and intact through Sunday. Store smaller specimens separately in their own container with moss or duff and mist (but not soak) them to keep them fresh and colorful. For geotropic mushrooms (those that quickly reorient their gills toward the ground), including amanitas, stand them upright in empty milk cartons so their stalks don't bend. Also, don't forget the little ones and the most common mushrooms, since everyone assumes someone else will bring them in. Better to have too many than none at all. Delicate inky caps should be collected on Friday or Saturday morning since they dissolve to ink quickly. For the naturalistic displays, please also bring organic matter like duff, grass, leaves, bark, and moss. Include a few leaves from the nearest trees or grass for the grass-inhabiting varieties, both for ID and for display.

Record Collection Details: Put all your finds from one location in one container and add a paper label with your name, phone number, and location. A slip of paper is enough! You can keep your secret edible locations to yourself since we are trying to feed science, not our stomachs. We ask for your name and phone number on the chance that a researcher may request further info, but the written location alone is invaluable.

Drop Off Your Mushrooms: Show receiving is on Friday evening October 18 after 4 pm and Saturday morning outside the student union at Shoreline Community College (enter the campus at the main southeast entrance and look for the PSMS signs). The receiving area will be clearly identified once you enter the campus. We'll be waiting for your mushroom deliveries!



Spore Prints

is published monthly, September through June by the
PUGET SOUND MYCOLOGICAL SOCIETY

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

OFFICERS: Colin Meyer, President^{2023–2025}
president@psms.org
Joe Zapotosky, Vice President^{2024–2026}
vicepresident@psms.org
Cindy Brewster, Treasurer^{2024–2026}
treasurer@psms.org
Carolina Kohler, Secretary^{2023–2025}
secretary@psms.org

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Shaojun Wang

IM. PAST PRES: Randy Richardson

SCI. ADVISOR: Dr. Steve Trudell

EDITOR: Agnes A. Sieger,
sieger@att.net

provide PSMS more square footage with the advantage of being close to our current show venue. We are thrilled to see how this will streamline the set-up and tear-down work for our show in just a couple of weeks.

Derek and Marion Richards also updated the board on the show preparations and shared that Peg Rutchik has stepped up to fill in as volunteer coordinator this year (You rock, Peg!). There are still other lead positions to be filled, as well as plenty of volunteer shifts. They range from overseeing kids activities to checking hand stamps at the theater entrance, so it is not too late to sign up and become a part of this much-beloved event!

Megan Brewster did a follow-up on the budget analysis and projection she presented at our last meeting. These discussions are providing insightful information as to where our funds are
cont. on page 4

MEMBERSHIP MEETING

Joseph Zapotosky

Have you ever wondered, “How do I make a collection that could be used for further research (DNA sequencing/herbarium vouchered collections)?” or “What information should I include when asking another myco-enthusiast an identification question?”

If so, please join us at the general membership meeting October 8 when Matthew Koons (current recipient of a Ben Woo scholarship grant) will help answer some of these questions—and more. His talk is entitled “Community Science in Mycology: Vouchering, Observations, and Genetic Sequencing.” The talk will be centered around documenting biodiversity on the iNaturalist platform and includes how to make high quality observations, photography techniques, vouchering fungal collections, and how to select specimens for genetic bar coding. It will also touch on recent genetic discoveries in the region, sequencing technologies, how to have your own discoveries bar coded, and how you can contribute to community science.



Matthew Koons.

Matthew Koons is an amateur mycologist who is an active field surveyor and fungal genetic researcher out of a home lab in Seattle, Washington (supported in part by a PSMS Ben Woo scholarship grant). While primarily focused on fungi, he is also interested in broader biodiversity—particularly native plants, arthropods, and intertidal organisms.

We hope you will join us for this meeting, as it is closely followed by our annual Wild Mushroom Exhibit October 19–20, and details of how you might participate in that exciting show will be discussed.

The membership meeting on October 8, 2024, will be a “hybrid” meeting both in-person at the Center for Urban Horticulture and virtual on Zoom. We will start letting people into the CUH meeting hall at about 7:00 pm and into the Zoom meeting at about 7:15. The lecture will begin at approximately 7:30 pm. The Zoom link is

[https://zoom.us/j/92440399273?](https://zoom.us/j/92440399273?pwd=KLjUdE2p8FASSHZtFqci3lwgVQe2tg.1)

[pwd=KLjUdE2p8FASSHZtFqci3lwgVQe2tg.1](https://zoom.us/j/92440399273?pwd=KLjUdE2p8FASSHZtFqci3lwgVQe2tg.1)

Programing note: The speaker at next month’s meeting will be Dr. Britt Bunyard.

CALENDAR

- Oct. 5 Field trip (see PSMS website)
- Oct. 8 Membership meeting, 7:30 pm, CUH
- Oct. 12 Field trip (see PSMS website)
- Oct. 14 Board meeting, 7:30 pm, CUH board room
- Oct. 19–20 PSMS Annual Wild Mushroom Exhibit
- Oct. 22 *Spore Prints* deadline
- Oct. 25 Field trip (see PSMS website)
- Oct. 25–27 Ben Woo Memorial Foray, Cispus
- Nov. 2 Field trip (see PSMS website)

BOARD NEWS

Carolina Kohler

Greetings from the board, fellow PSMS members. The rains are here, and things are getting busy! Not only are we all but settled into our new, roomier and airier space at CUH, but we will soon be moving into a new storage space as well.

After the usual approval of the Minutes and the Treasurer’s Report at our board meeting September 16, Derek Hevel presented his three top picks to replace our current shed space, which will need to be vacated soon. The board signed off on one that will

“WORLD CHANGING” IMPACT OF DROPPED CHEETOS BAG AT CARLSBAD CAVERNS

Akash Upadhyay

<https://www.cgwall.com/>, Sept. 11, 2024

Carlsbad Caverns in New Mexico is known for its stunning underground formations and rich natural beauty. But recently, a bag of Cheetos was dropped in the cave, and it has turned into a major issue.

What Happened

Caves like Carlsbad Caverns are usually cool and humid. This environment is perfect for certain types of microbes and fungi to thrive. The dropped Cheetos became a breeding ground for these microorganisms. The processed corn in the snacks softened due to the humidity, creating an ideal setting for the growth of mold and other fungi.

The abandoned Cheetos did not go unnoticed. Soon, cave crickets, mites, spiders, and flies found the snacks. These creatures began feeding on the Cheetos, forming a small but active food web. This new web involved various organisms, all thriving on the nutrients from the Cheetos.



Carlsbad Caverns National Park via AP

Bag of Cheetos that was dropped off trail by a visitor in the Big Room of Carlsbad Caverns National Park near Carlsbad, NM.

As these insects and microbes fed on the Cheetos, they spread the nutrients throughout the cave. This led to the growth of more molds and fungi, which climbed higher up the cave’s surfaces. The cycle continued as the mold spread and rotted, creating a significant odor and further altering the cave’s environment.

While this temporary food web might seem like a small matter, it has disrupted the cave’s natural balance. Many of the creatures attracted by the Cheetos are not native to the cave environment. Their presence has disturbed the cave’s existing ecosystem.

The introduction of non-native species can lead to big problems. These new arrivals might compete with or prey on the cave’s native species, causing imbalances in the natural processes. Over time, this can harm the cave’s ecosystem and affect the health of its native inhabitants.

Park officials have pointed out that what seems like a minor mistake—a dropped snack bag—can have far-reaching consequences. The “world changing” impact of the Cheetos bag highlights the importance of being careful with waste in natural areas.

The incident serves as a reminder that even small human actions can have significant effects on the environment. It shows how easily our waste can alter delicate ecosystems and disrupt the natural balance.

Why It Matters

This incident at Carlsbad Caverns underscores the need for responsible behavior in natural settings. When we visit places like national parks and caves, we must be mindful of our impact. Properly disposing of trash and avoiding littering are simple steps that can help protect these beautiful and delicate environments.

The Carlsbad Caverns situation also teaches us about the interconnectedness of nature. The effects of a single dropped snack bag have shown how human activities can trigger changes in complex ecosystems. This emphasizes the importance of environmental stewardship and the need to preserve our natural habitats.

Conclusion

The dropped Cheetos bag at Carlsbad Caverns has highlighted an unexpected and significant environmental issue. What seemed like a small act has had a “world changing” impact on the cave’s ecosystem. This incident serves as a powerful reminder of the importance of being responsible with our waste and understanding the far-reaching effects of our actions on the natural world. By learning from this situation, we can help ensure that such beautiful and delicate environments remain intact for future generations to enjoy.

DID RENOWNED INDIAN RESTAURANT REPLACE PRICEY MORELS WITH CHEAPER MUSHROOMS?

HT Trending Desk

<https://www.hindustantimes.com/>, Sept. 11, 2024



Dr. Ambarish Satwik, the director of hybrid vascular suites at Sir Ganga Ram Hospital in Delhi, India, has called out Indian Accent, a renowned fine-dining restaurant in the capital, for allegedly serving him the commonly available button mushrooms instead of the exquisite morel mushrooms that were promised in a particular dish.

Satwik took to X (formerly Twitter) on Monday to slam Indian Accent for what he described as a “deliberate act of chicanery” and a “culinary sleight of hand.”

Sharing two photos—one of the chef’s tasting menu and the other of the said mushroom dish—Satwik alleged that the dish had button mushrooms instead of the morel variety.

“What arrived under the dosa cone was not the morel but a drab cluster of the most ordinary button mushrooms, the kind one might expect in a roadside stir-fry, the fungal equivalent of a counterfeit handbag,” Satwik said. “If you’re going to list morels on the menu, then there better be morels on the plate, not the fungal detritus scraped from the bottom of a vegetable box.”

When summoned, the chef apologized, claiming he would ‘fix it in under two minutes. And he did.

Indian Accent took to X on Tuesday afternoon to respond to the surgeon’s post, saying there was no attempt was cost cutting and termed the episode as a case of “simple misunderstanding.” The famous restaurant said that [besides] replacing the dish, it also offered the customer extra desserts.



Board News, cont. from page 2

coming from and going to, and will inform PSMS's strategic planning looking forward.

One vital undertaking that could be part of this is the revamping of our website to make it more user-friendly, resilient, and accessible to all. Vice President Joe Zapotosky will be spear-heading a team that will start looking into this by the end of the year.

The PSMS calendar is very busy indeed, with field trips, ID clinics, the Annual Wild Mushroom Show, and our Ben Woo Foray—not to mention events and activities by fellow organizations, like the NAMA Foray.

We hope you all have a wonderful fall, making the most of these opportunities!

MUSHROOM HALLOWEEN DECOR IS THIS YEAR'S HOTTEST HOLIDAY TREND

Sophie Flaxman

Better Homes & Gardens, Sept. 15, 2024

Mushrooms have been sprouting up everywhere in home decor and fashion this year, and the experts say the trend is creeping into Halloween decor, too. According to Dayna Isom Johnson, Etsy's trend expert, this fungi fad stems from a longing for design elements rooted in the natural world.



“With the incredible versatility, charm, and personality mushroom motifs bring to a space, I'm not surprised we're seeing this trend maintain popularity,” she says. “We've seen a 71 percent increase in searches compared to last year for mushroom Halloween items on Etsy, as we see mushroom motifs evolve to become a Halloween staple this season.”



What better motif for Halloween than something as fantastical as a mushroom that thrives in dark, isolated places? They're the perfect nod to nostalgia and the mystical narratives of witchcraft and wizardry. So, with Halloween fast approaching, it's time to get foraging for mushroom decor. Here are a few easy Halloween decor ideas to help you incorporate the mushroom trend into your holiday displays.

- **Fungi-Inspired Artwork and Décor** - Decorate your walls with Halloween-inspired mushroom artwork. From spooky mushroom ghost paintings to toadstool prints, they make the perfect decorative accessory, propped up on a mantelpiece or hung in the hallway. Give them an extra haunted-house feel by framing them in a vintage gilt frame and draping them with cobwebs. For a more 3-D effect, look for mushroom decor pieces to display on a fall tabletop or Halloween mantel.
- **Mushroom-Shaped Lighting** - Give your front yard an enchanting look for Halloween with solar mushroom

lights. Condense them along the path edge and let them gradually disperse across the lawn or amongst the flower beds for a magical look. Strings of mushrooms lights are just as effective at conjuring a mystical setting wrapped around porch railings and columns or carefully strung overhead.

- **Carved Pumpkins** - For a classic take on this trend, carve a collection of mushroom motifs into your front porch pumpkins. With our free pumpkin stencils, you can create a whole mushroom-inspired display out of any color pumpkin you like.
- **Mushroom Candles** - Conjure a low-lit, mystical ambiance as soon as the sun sets on Halloween by lighting your space with mushroom candles. On this day, candles take on a more potent significance beyond their traditional use for atmospheric lighting and emitting relaxing aromas. Ancient rituals saw some candles lit around the house to ward off evil and malignant spirits and others to guide the spirits of loved ones and ancestors home.
- **Mushroom-Inspired Glassware** - Make your Halloween party the talk of the town by serving your spooky season cocktails in mushroom glassware. Just to be clear, we're not talking about mushroom-printed glasses. No, we're talking about something 100 times better: Actual toadstool-shaped vessels! And yes, they're as whimsical and enchanting as they sound. The magic lies in attention to detail.
- **Mushroom Garlands** - Another great way to dress your mantel for Halloween is with mushroom garlands. The trend is spreading fast, and it won't take long before you start to notice felt and crochet mushrooms cropping up everywhere. If you're a dab hand at crochet or arts and crafts, this could be the perfect opportunity to showcase your artistic talents. String your Halloween garland across the mantelpiece for everyone to admire.

Mushroom Ornaments - Are you looking for a way to bring a fresh touch to your Halloween decor this year? Pick up some vintage mushroom ornaments. Artfully incorporate them into your spooky mantel arrangement or place them on the dining table to set the mood for your Halloween feast. If you're lucky enough to stumble across big mushroom sculptures on your forage, place them by your front door to give your guests a fantastical welcome.



*Alice Algae took a lichen
To Freddy Fungus
And now their relationship is
on the rocks
And they are living in
"Sin"biosis!
—Colorado Myco. Soc., August 2017*

AFLATOXIN IN MAIZE KILLS HUNDREDS OF DOGS IN MALAWI

Voice of America

<https://www.observer.ug>, Sept. 12, 2024

Malawi has recently recorded the sudden deaths of dogs that consumed meals prepared from maize husks contaminated with aflatoxins. Veterinary experts say the country has recorded 450 dog deaths since April, when the first cases were identified in Malawi's commercial city, Blantyre.

Aflatoxins are toxic substances produced by fungi that grow on pet food ingredients like peanuts, corn, and other grains. Experts warn that the accumulation of those toxins in an animal's body can lead to liver damage, blood clotting, and, in severe cases, death.

Timothy Banda is the veterinary clinic manager at the Blantyre Society for the Protection and Care of Animals, which has been testing the dogs. He told VOA that symptoms include a yellowish tint on the dog's skin, hemorrhagic [or bloody] diarrhea, and sometimes vomiting.

"For the past two, three weeks, we haven't received any death from the problem," he said. "But from the time it started somewhere around April up to somewhere around early August, the estimations could be somewhere around 450 dogs so far have died." He said the aflatoxin contamination was suspected after it was observed that the dogs were not responding to treatment.

"Under normal circumstances, once we started the right treatment, we could get good results, but in this scenario, they were all dying despite whatever treatment was given. Nothing could work out," Banda said.

Banda said the affected dogs were fed with nsima, a thick porridge prepared from maize or maize husks.

Alfred Manda, a resident of Chirimba township, said that he lost three dogs in August. "The kind of food I mostly give out to my dogs is nsima flour made from leftover maize called madeya," he said. "To me, I thought it was a healthy diet. I wish I knew earlier. I could have done things better to save my dogs, but unfortunately, this is the sad reality that I have faced."



Lameck Masina/VOA

Dogs eating maize nsima in Malawi.

In Zambia, media reports indicate over 400 dogs died in July after consuming maize meal contaminated with aflatoxins. Malawi authorities are advising dog owners to switch to alternative foods, such as rice, until the problem is contained.

GALACTIC SLIME

Mark Popinchalk

Scientific American, Sept. 2024

Over billions of years gravity has pulled the universe's matter into a chaotic netting of filaments, tendrils, and voids known as the cosmic web. Galaxies are strewn along these strands like beads on a string, and New Mexico State University astronomer Farhanul Hasan and his colleagues wondered how environments created by the filaments affect galaxies' evolution. "I like to call them galactic ecosystems," he says.

To find out, the researchers needed to accurately map the cosmic web over time. But the mixture of gas, galaxies, and dark matter that constitutes the web makes this task challenging, because although the stars in the galaxies are easy to see, the rest is not.

To connect the dots in a computer simulation of the universe, Hasan and his colleagues brought in a special "collaborator": a species of the humble slime mold. These single-celled organisms are experts at exploring the space around them. Their membranes push outward in a synchronized wave in every direction. When they find a food source, nearby membranes relax, allowing subsequent pushes to send more material to that region.

Scientists have used slime molds' exploration prowess to solve mazes and logic puzzles, to re-create transportation systems, and to inspire efficient computer algorithms. "It's a really good mapping algorithm because it's not really biased by the first direction you decide to look in; [it's] capable of exploring everything at once," says New Jersey Institute of Technology slime mold specialist Simon Garnier.

Hasan and his team gave a slime mold-based algorithm a set of galaxies' positions as "food" and let it map connections across the simulated universe at various time points. The slime-mold map created a cleaner filament structure than any human-designed algorithm they had tried; it was also sensitive to smaller features and traced dark matter more easily. The researchers found that neither the proximity nor the thickness of the universe's filaments seemed to affect the galaxies early on, but as the universe matured, things changed: material pulled into the web eventually disrupted star formation in galaxies that were too close.

"The crucial difficulty in using the cosmic web to constrain galaxy formation is in describing it with the accuracy needed to observe its effect," says New York City College of Technology astrophysicist Ari Maller. "The use of the slime-mold algorithm seems to have accomplished that goal."

The study's results, appearing in the *Astrophysical Journal*, are just the beginning. New surveys are stretching observations even further back in time. Conclusions from the simulated universe eventually can be tested against older glimpses of the real cosmic web—and the slime-mold algorithm is poised to map them all.



Toby Schrapel/Beaker Street Photography Prize

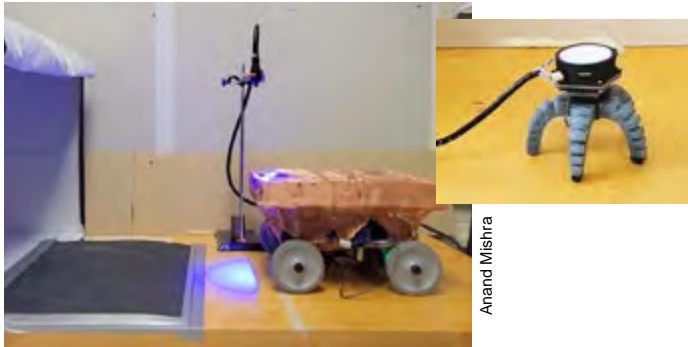
*Stunning image of a luminescent frog perched on a rare, glowing ghost mushroom. In the photo, a blue light reflects off the eyes and skin of a biofluorescent brown tree frog (*Litoria ewingii*) as it sits on a funnel-shaped ghost fungus (*Omphalotus nidiformis*), named after its eerie bioluminescent glow during the night.*

ROBOT CONTROLLED BY A KING OYSTER MUSHROOM BLENDS LIVING ORGANISMS AND MACHINES

Katie Hunt

<https://www.cnn.com/>, Sept. 4, 2024

A wheeled bot rolls across the floor. A soft-bodied robotic star bends its five legs, moving with an awkward shuffle.



A wheeled robot controlled by fungal mycelia responds to light and rolls across a surface.

Powered by conventional electricity via plug or battery, these simple robotic creations would be unremarkable, but what sets these two robots apart is that they are controlled by a living entity: a king oyster mushroom.

By growing the mushroom's mycelium, or root like threads, into the robot's hardware, a team led by Cornell University researchers has engineered two types of robots that sense and respond to the environment by harnessing electrical signals made by the fungus and its sensitivity to light.

The robots are the latest accomplishment of scientists in a field known as biohybrid robotics, who seek to combine biological, living materials such as plant and animal cells or insects with synthetic components to make partly living and partly engineered entities.

Biohybrid robots have yet to venture beyond the lab, but researchers hope one day robot jellyfish may explore oceans, sperm-powered bots may be able to deliver fertility treatments, and cyborg cockroaches could search for survivors in the wake of an earthquake.

"Mechanisms, including computing, understanding, and acting in response, are done in the biological world and in the artificial world that humans have created, and biology most of the time is better at it than our artificial systems are," said Robert Shepherd, a senior author of a study detailing the robots published August 28 in the journal *Science Robotics*.

"Biohybridization is an attempt to find components in the biological world that we can harness, understand, and control to help our artificial systems work better," added Shepherd, a professor of mechanical and aerospace engineering at Cornell University who leads the institution's Organic Robotics Lab.

Part Fungus, Part Machine

The team began by growing king oyster mushrooms (*Pleurotus eryngii*) in the lab from a simple kit ordered online. The researchers chose this species of mushroom because it grows easily and quickly.

They cultivated the mushroom's threadlike structures, or mycelium, which can form networks that, according to the study, can sense, communicate and transport nutrients—functioning a little like neurons in a brain. (Alas, it's not strictly accurate to call the creations shroom bots. The mushroom is the fruit of the fungi—the robots are powered by the root like mycelium.)

The mycelium produces small electrical signals and can be connected to electrodes. Andrew Adamatzky, a professor of unconventional computing at the University of the West of England in Bristol who builds fungal computers, said it isn't clear how fungi produce electrical signals.

"No one knows for sure," said Adamatzky, who wasn't involved in the research but reviewed it before publication.

"Essentially, all living cells produce action-potential-like spikes, and fungi are no exception."

The study team found it challenging to engineer a system that could detect and use the small electrical signals from the mycelium to command the robot. "You have to make sure that your electrode touches in the right position because the mycelia are very thin. There is not a lot of biomass there," said lead author Anand Mishra, a postdoctoral research associate in Cornell's Organic Robotics Lab. "Then you culture them, and when the mycelia start growing, they wrap around the electrode."

Mishra engineered an electrical interface that accurately reads the mycelia's raw electrical activity, then processes and converts it into digital information that can activate the robot's actuators or moving parts.

The robots were able to walk and roll as a response to the electrical spikes generated by the mycelia, and when Mishra and his colleagues stimulated the robots with ultraviolet light, they changed their gait and trajectory, showing that they were able to respond to their environment.

"Mushrooms don't really like light," Shepherd said. "Based on the difference in the intensities (of the light) you can get different functions of the robot. It will move faster or move away from the light."

"Exciting" Work

"It's exciting to see more work in biohybrid robotics that moves beyond human, animal and insect tissues," said Victoria Webster-Wood, an associate professor at Carnegie Mellon University's Biohybrid and Organic Robotics Group in Pittsburgh.

"Fungi may have advantages over other biohybrid approaches in terms of the conditions required to keep them alive," said Webster-Wood, who wasn't involved in the research.

"If they are more robust to environmental conditions this could make them an excellent candidate for biohybrid robots for applications in agriculture and marine monitoring or exploration."

COLLAPSE OF BAT POPULATIONS INCREASED INFANT MORTALITY RATE, STUDY FINDS

<https://news.uchicago.edu/>, Sept. 13, 2024

Bats are considered a natural pesticide, widely relied on by farmers as an alternative to chemical pesticides to protect their

crops from insects. But since 2006, many bat populations have collapsed in ... North America because of white-nose syndrome, a disease caused by an invasive fungus called *Pseudogymnoascus destructans* found in the caves that bats use.

A new study [reported] in *Science* uses their sudden collapse to explore whether farmers turned to chemical pesticides and whether doing so impacted human health. It found that farmers did increase their pesticide use, leading to more than 1,000 infant deaths.

“Bats have gained a bad reputation as being something to fear, especially after reports of a possible linkage with the origins of COVID-19,” said study author Eyal Frank, an assistant professor at the Harris School of Public Policy. “But bats do add value to society in their role as natural pesticides, and this study shows that their decline can be harmful to humans.”

NYSDEC/Nancy Heeslip



Bats showing the classic signs of white-nose syndrome.

Frank compared the effect of bat die-offs due to white-nose syndrome with pesticide use in counties that experienced bat population declines to counties that were likely unaffected by the disease. He found that when the bat populations declined, farmers increased their use of pesticides by about 31 percent.

Because pesticides have been linked to negative health impacts, Frank next tested to see if the increased use of pesticides corresponded with an increase in infant mortality—a common marker to study the health impacts of environmental pollution. When farmers increased their use of pesticides, the infant mortality rate rose by almost 8 percent. This corresponds to an additional 1,334 infant deaths. Or, for every 1 percent increase in pesticides, there was a 0.25 percent increase in the infant mortality rate.

The study also found that pesticides aren't as good at preventing pests as bats. The quality of the crops likely declined, as farmers' revenue from crop sales decreased by nearly 29 percent. Combining this revenue loss with the expense of the pesticides, farmers in communities that experienced the bat die-offs lost \$26.9 billion between 2006 and 2017. Adding onto those losses the \$12.4 billion in damages from infant mortality, the total societal cost from the bat die-offs in these communities amounted to \$39.6 billion.

“When bats are no longer there to do their job in controlling insects, the costs to society are very large, but the cost of conserving bat populations is likely smaller,” Frank said. “More broadly, this study shows that wildlife adds value to society, and we need to better understand that value in order to inform policies to protect them.”

WHITE-NOSE SYNDROME CONFIRMED IN BATS IN WASHINGTON STATE THIS YEAR

Michael LeCompte

<https://www.nbcrightnow.com/>, Sept. 4, 2024

OLYMPIA, Wash. - White-nose syndrome and *Pseudogymnoascus destructans*, the fungus that causes the often-fatal disease of hibernating bats, has been detected in 11 Washington counties, including Benton.

“The fungus that causes white-nose syndrome was detected in Clallam, Clark, Grant, Grays Harbor, Island, Kitsap, Klickitat, Okanogan, and Whatcom counties for the first time in 2024,” said Abby Tobin, bat species lead for the Washington Dept. of Fish and Wildlife (WDFW). “In addition, white-nose syndrome was confirmed in Benton and Thurston counties for the first time this year.”

Bats infected with white-nose syndrome often leave hibernation too early, which causes them to deplete their fat reserves and become dehydrated or starve to death.

According to the WDFW, the first case of white-nose syndrome in the Western U.S. was in King County in 2016 and there have been 280 confirmed cases of the disease and fungus in Washington since.

While white-nose syndrome has been detected in 21 counties across Washington, it has been confirmed in nine.

The fungus that causes white-nose syndrome usually spreads between bats; however, it can spread if humans carry fungal spores on clothing, shoes, or recreation equipment that touches the fungus, according to the WDFW.

Anyone who finds sick or dead bats or sees bats behaving strangely should report the sightings on the WDFW website.

SCIENTISTS DISCOVER LIVE BACTERIA AND FUNGI SURVIVING IN EARTH'S UPPER ATMOSPHERE

Lydia Amazouz

<https://dailygalaxy.com/>, Sept. 10, 2024

A team of researchers from Spain and Japan has made a significant discovery by detecting a diverse array of live fungi, bacteria, and viruses high in the Earth's atmosphere.

This breakthrough, published in the *Proceedings of the National Academy of Sciences*, reveals the presence of numerous viable microbial species at altitudes between 1,000 and 3,000 meters above the planetary boundary layer. The findings provide insights into the long-distance transport of potential pathogens and their survival in extreme atmospheric conditions.

Microorganisms Thriving in Extreme Atmospheric Conditions

The study involved collecting air samples at high altitudes using aircraft over parts of Japan. By analyzing these samples in a controlled laboratory environment, the researchers identified 266 types of fungi and 305 types of bacteria, many of which are known to be hazardous to human health. The collected microbes were subjected to DNA analysis to determine their exact types and origins. Remarkably, the team found that many of the microbes were still viable, meaning they could reproduce and grow when cultured in lab dishes.

According to the researchers, many of the microbes appeared to have originated from soil or plants, suggesting they were carried into the atmosphere from land sources. The team hypothesizes that these organisms were transported from China, at least 2,000 km away, driven by high-altitude winds. The detection of these microbes raises important questions about the role of the atmosphere in the global spread of diseases, as many of the

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High-Altitude Microbes, cont. from page 7

bacteria and fungi found are considered pathogens capable of causing disease in humans.

Pathogenic Microbes: Airborne Travelers Across Continents

This discovery is particularly concerning because it demonstrates that pathogenic microbes can be transported over vast distances in the atmosphere, potentially spreading diseases across continents. While previous research had shown that dust particles could carry microbes over long distances—such as from Africa to the Americas—this study extends that understanding to a new level, showing that these microbes can survive extreme conditions found at high altitudes, such as lower temperatures, increased radiation, and limited nutrients.

The team noted that many of the microbes they discovered are known to inhabit the human body, particularly the mouth and intestines. “Our study does not necessarily prove causality between the presence of known human pathogens in bioaerosols and health effects,” the authors cautioned. However, the findings suggest a potential route for disease outbreaks, especially in cases where pathogens are lifted into the atmosphere owing to poor sewage disposal or other environmental factors.

High-Altitude Winds as Vehicles for Disease Spread

The ability of microbes to travel long distances in the atmosphere has raised alarms among scientists, as this could contribute to the spread of diseases in agricultural regions and across urban populations. The study found that microbes had been lifted by pressure systems such as the Siberian High, which likely carried them from agricultural regions in northeast China to the location where the samples were collected. This represents the longest transport distance reported for species harmful to humans, highlighting the potential for pathogens to spread over large areas via high-altitude winds.

As the researchers point out, airborne pathogens pose a significant threat to ecosystems and human health. “Many pathogenic bacteria, such as the familiar *E. coli* and various *Staphylococcus* species, were among those the flights collected,” they noted. These bacteria can cause a wide range of health issues, from gastrointestinal diseases to skin infections, and their ability to survive long-distance atmospheric travel makes them a global concern.

Implications for Global Health and Ecosystems

The findings of this study open new avenues for research into the behavior of microbes in the upper atmosphere and their potential impact on global health. Understanding how microbes survive and thrive in such extreme conditions could help scientists develop better strategies for mitigating the spread of airborne diseases. Additionally, further research could focus on tracking the movement of pathogens in the atmosphere across different regions and seasons to identify patterns in their transport and survival.

As Xavier Rodó, one of the study’s authors, noted, “This study confirms the long-distance transport of microbial pathogens, which has important implications for public health and environmental protection.” The researchers hope that their work will inspire more comprehensive studies to explore the potential risks posed by airborne microbes, particularly in light of climate

change, which could alter atmospheric circulation patterns and increase the spread of pathogens globally.

HISTORICAL NOTES ON PSMS: A Glimpse at Some of Our Earlier Membership Information

Brian S. Luther

Nowadays most everything related to PSMS membership is online and without interesting graphics, with some exceptions, like our colorful homepage website. But, back in the earlier days of our club things were different, when most all mass media was on a printed page of some kind. Here are just a few examples, which newer members never experienced.

Back then, PSMS sent out annual hard-copy membership rosters to all members, and here are a few examples. The first I’m showing is for 1972 and both the front and back covers were delightfully illustrated by Irene O’Connor with lovely hand-drawn mushrooms. Irene was an artist who contributed a lot to PSMS over the years early on, including designing the classic PSMS round logo. This distinctive logo was first seen on the 1973 and 1974 membership rosters, then continued on them for many years, occasionally with other front cover art work. Here’s what the 1975 roster cover looked like. It was blank on the back.



Claude L. Dilly

Feb. 21, 1934 – Aug. 31, 2024

Claude Dilly, 90, passed away peacefully on August 31, 2024, at Gracious Living, Bellingham, WA. Claude was the widower of past PSMS president Margaret Dilly who passed away in 2021 at the age of 94. Claude and Margaret were both well known, active members of the society and will be missed by all who knew them.



Claude was preceded in death by his wife, Margaret, his parents, two siblings, and son Dan. He is survived by his daughter Coni (Paul), daughter Karen (Larry), and son Howard (Melanie), sister Kaye (Carl), 11 grandchildren, 9 great grands, and 1 niece.