SPORE PRINTS

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HAPPY

HOLIDAYS

Spore Prints

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CALENDAR

Dec. 13 Membership meeting (in person only), 7:30 pm, CUH
Spore Prints deadline (early)

Dec. 19 Board meeting, 7:30 pm, CUH

BOARD NEWS

Marcus Sarracino

We are very proud of this year's Annual Exhibit Committee for the many adversities they faced and overcame with this year's show. Ultimately they coordinated and executed a successful show enjoyed by thousands. Despite housing in a new venue, with a lot of new volunteers, new show leads, and a whole host of other challenges, the feedback received was largely positive and the lessons learned will be applied to future endeavors. Well done Derek Hevel, Marion Richards, Milton Tam, and Molly Watts!

Did you volunteer at the show and think "That was fun, I sure wish I could get involved more?" Or maybe you've been interested in volunteering so you can attend the Eagle Creek field trip or get first access to mycophagy classes? For anyone interested in serving on the Board of Trustees for 2023–2025 please submit your names or nominations to Marian Maxwell. It's great to get new faces and fresh ideas involved so throw your name into the hat for elections next March!

Lastly, I am excited to share more news about the final monthly meeting of 2022. As previously announced we will be having a holiday social gathering/fundraiser. So on December 13th come on out to the Center for Urban Horticulture's atrium where we will have finger foods and drinks, including some holiday eggnog, and celebrate another great year of all things mushroom with the wonderful members of PSMS! We will also have a collection of vintage and unique mushroom-themed items (many donated from the estate of our esteemed past President Patrice Benson) for silent auction to benefit the Ben Woo Scholarship fund. Attendance is limited to 150 people and there will be a nominal $5 fee. Registration to this event on psms.org. Hope to see you there. Happy holidays!

MEMBERSHIP MEETING

Scott Maxwell

The December 13, 2022, general meeting will be "in-person only" (no Zoom) at the Center for Urban Horticulture. We will start letting members in at about 7:00 pm.

In the past, December's meeting has been a potluck "cookie bash. Given we still have some health concerns, this year the board is going to host the event with purchased trays of light food items, wine, coffee, tea, and soft drinks. To spread things out physically, we will be renting the atrium and patio area in addition to the meeting hall. This will be similar to the June event which was a huge success, providing our membership an opportunity to socialize and get to know each other. For those of you looking for holiday gifts, we are having a silent auction which will feature mushroom-related collectibles, books, kitchen items, vintage jewelry, etc., primarily from the collection of our former president Patrice Benson. The proceeds of this auction will be applied to our scholarship fund which supports students in the study of fungi in the Pacific Northwest. Patrice would have appreciated this, as mushrooms and PSMS were her passion. We will also have new/packaged mushroom-themed items from Cavellini. These items were extremely popular at our mushroom show and sold out. We have reordered for this event. We have also invited back our favorite bartenders who really did an outstanding job for us at our June gathering.

This event will be for members only. There will be a charge of $5.00 per person, with signups beginning December 1 on the PSMS web page at www.psms.org. The event will be restricted to 150 people and advanced registration is required, so sign up early. This will be a fun event, so please attend!

ELECTIONS! IT'S THAT TIME AGAIN!

Marian Maxwell

Do you want to know more about PSMS and would like to contribute in a meaningful way?

We are looking for members who are excited to help support our club who are willing to serve on the Board of Trustees for the 2-year term April 2023–March 2025. We are seeking to elect five Board of Trustee positions as well as President and Secretary for those terms that are expiring at the end of March 2023.

Requirements

- **All Board of Trustee Positions:** Trustees must be at least 18 years of age, a current paid or lifetime PSMS member, reside in the State of Washington, and willing to meet once a month for board meetings (we do not meet in July). Since the COVID pandemic, we now meet by Zoom, but the PSMS president has the right to request a meeting in person.
- **Five Replacement Board of Trustees Positions:** The five trustee positions open for election do not require previous Board of Trustees experience, merely a willingness to meet for board meetings, help oversee PSMS committees and events, and approve expenditures.
- **Executive Positions:** In addition to regular board requirements, executive positions like President and Secretary also require that the member have had served a previous term on the PSMS board. This requirement can be waived with the current board's approval if the member has had experience on the boards of other companies or nonprofits. No two members of the same household can serve on the executive board at the same time.

  President: In addition to the requirements listed above, candidates for PSMS president must be willing to direct and conduct both monthly Board of Trustee meetings and general membership meetings and to sign PSMS contracts. The President does not vote on board issues unless there is a tie.

  Secretary: In addition to the requirements listed above: Compile and maintain minutes from the board meetings, distribute minutes for approval to the Board of Trustees, prepare a monthly article for *Spore Prints* summarizing board activity for that month, and may be asked to respond to some communications.

If you are interested in contributing to our group in this way, please contact one of our board members listed on page 2 of *Spore Prints* or send a note to elections@psms.org. Further descriptions of the board of trustee's requirements are listed in the PSMS bylaws posted at http://www.psms.org/docs/PSMS-by-laws-2022.pdf.

Nominations close January 10, 2023, at the end of the general meeting. You may self-nominate. Voting is online in February. Elected candidates are invited to the March board meeting for a meet and greet with the current board. The new terms begin April 1, 2023. *Roll up your sleeves and come join us!*

FIELD TRIP REPORT, Oct. 29

Brian S. Luther

I arrived a little after 7:00 am with a load of firewood and swept out the shelter. Soon after Wren Hudgins rolled in with some kindling, so I got the inside fireplace going for everyone's comfort. We had excellent weather for this, our last fall field trip, with no rain and no smoke at all, considering we were right next to a large recent forest fire. The narrow parking lot was filled with cars more than half way around, about twice as many as usual for this location. I have not seen such interest in a single PSMS field trip since the 1970s—we had 186 members sign in! Of those, 80 were brand new members on their first PSMS field trip. Fantastic!

As soon as Hosting Committee co-chairs Debbie Johnson, Carolina Kohler, and Jamie Rumbaugh arrived, they got right to work making lots of hot coffee and setting out tasty breakfast snacks. Esther Jang also contributed some fresh fruit. What a spread. With the huge turnout, we had to keep making coffee for some time, but everything got consumed pretty quickly. Special thanks, Carolina, Debbie, Jamie, and Esther.

Wren Hudgins and Dave Weber had organized seven field trip guides: themselves, Steve Dorsey, Tara Henry, Pamela Young, Dan Paull, and Marcus Sarracino. So, most of those attending, but not all, got to go out with a guide.

Carolina Kohler

Morning meeting on Oct. 29 field trip.

I counted 98 different species of fungi spread out on six picnic tables. This was incredible considering how dry the conditions had been. Very few good edibles were found. These included a few clumps of *Hericium abietis*, one good-sized Cauliflower Mushroom (*Sparassis radicata*), a few very sad Yellow Chanterelles (*Cantharellus formosus*), a few *Pleurotus ostreatus*, a single half rotten *Aureoboletus mirabilis* and some Angel Wings were also brought in. This was the worst year in recent memory for chanterelles, with the extra dry summer and fall we had.

Interesting specimens collected included *Hypomyces aurantius*, parasitizing both *Trametes versicolor* and *Fomitopsis mounceae* (Northern Red Belt Conk; formerly *F. pinicola*), as well as an extraordinarily large, fully resupinate specimen of the polypore *Heterobasidion occidentale* (formerly *H. annosum*). It was peeled off mostly intact from a conifer log and presented to me for ID. It measures 26 inches (66 + cm) long. The largest measurement given for this species in the literature is approximately 15 cm long, so this is a very rare find and appears to be a record. I'm giving the specimen to WTU, the University of Washington's herbarium at the Burke Museum.

Brian S. Luther

Heterobasidion occidentale found on Oct. 29 field trip.

About 30 members stayed for a tasty end-of-day potluck at 3:30. Wren and I were the last out after cleaning up, and I headed for home about 5:30 pm. Even though edible fungi were few and far between, everybody had an excellent day out in the woods and got to learn some new mushrooms.

THE SCIENCE AND THE ART OF NAMING SPECIES

K.S. Seshadri

https://www.deccanherald.com/, Nov. 12, 2022

What's in a name? "That which we call a rose by any other name would smell as sweet" laments Juliet in the Shakespearean tragedy "Romeo and Juliet." However, for many of us studying biology, the name may be everything.

We have all, at some point, attempted to identify a bird or some plant. Often, we end up with, "Oh, here is a Tamarind tree" or "Oh, look, there is a House Sparrow." Scientific names such as *Tamarindus indicus* or *Passer domesticus* referring to the same species might scare people. The complexity of names stems from the combination of languages largely alien to us: Greek and Latin.

The Two-Name Concept

Back in the day when scientists were describing the natural world, they would use a multi-name structure to describe species, having something descriptive in the name. Much of this was happening in parts of Europe. Latinizing the names was a norm.

In 1735, Carl Linnaeus, a Swedish botanist, improvised a rudimentary system to put in place the system of Binomial Nomenclature. The words binomial and nomenclature stem from a combination of Greek and Latin. Nearly all species are known today in this format.

In this format, the first part refers to what is called a genus and the second part refers to the species. It makes it easy for people to know that a set of species are related to each other. For instance, *Homo sapiens* and *Homo neandrethalensis* are two species in the genus *Homo*.

The arrangement of species in their order of relatedness among each other was largely based on morphological features. However, these days, scientists rely on multiple lines of evidence such as DNA, vocalization, and morphology. Relying on morphology alone could be misleading because several unrelated groups of organisms often evolve similar features. For example, both bats and birds have wings. But bats are mammals and birds are not.

Who Decides Names?

The researchers who study biodiversity and assign names are called taxonomists. Studying the meaning of names is called etymology. There is a rigorous process involved in naming the species. While they can choose names of their liking, there are rules governing the description of species and the assignment of names.

Two sets of bodies govern the process of nomenclature. The one for animals is called the International Code for Zoological Nomenclature. The one for plants is called the International Code for Nomenclature of algae, fungi, and plants. The researcher must collect and preserve a physical specimen or a part as a "type" in a museum that is accessible to the public. The type specimen becomes the future reference point for the species. Often, when the type specimen is lost, another specimen is designated as a type.

Botanical types are dried and preserved in herbaria. In India, the collection of specimens is governed under the National Biodiversity Act and the Wildlife Protection Act, as well as by the animal ethics committees at the researcher's host institution. The morphology and other details of the species must be described in detail and published in a journal having either ISSNs or ISBNs which are accessible either in print or online.

Broadly, the name being given must be unique and not already in use within that group. To eliminate duplication, there is now an online repository where the names must be formally registered with the reference number linked to the publication. The name cannot be rude to someone, and people are not supposed to put their own names. There are ample examples of all of this being done, though.

Naming After "Characters"

The international codes mandated Latinizing of names, but that rule is now relaxed. Regional languages are now finding space in the list of names. For instance, we named a frog from the coastal region of Karnataka *Phrynoderma karaavali* because the frog is found there. Locals know the region as "karaavali" in Kannada. The genus name, however, is Latinized. *Phrynoderma* means warty skin. The tamarind tree, for instance, comes from the Arabic phrase Tamar-e-hind, which transliterates to the dates from India. Names referring to the locality where the species is found, are called toponyms.

There is also a long-running practice of naming species in honor of people—patronyms—used in various contexts. Historically, Linnaeus himself named species after people to get them to open their purses or curry favors, or even insult people. He named an insect *Aphanus rolandri* to "honor" his student Rolander with whom he did not get along well. By calling the genus "*Aphanus*" which is Greek for ignoble or obscure, Linnaeus made his dislike clear.

But patronyms risk taking away the charm of highlighting something about the species itself. Many of the Latinized names convey a lot of meaning to someone even with a rudimentary knowledge of Greek and Latin. The common Indian bullfrog, *Hoplobatrach tigerinus* comes from Greek—Hoplon (shield) and Batrachos (frog), and tigerenus (tiger-like stripes). Both characteristics are immediately visible on the large frog, measuring up to the length of our palm, with stripes on the body and legs. If the same species were to be named after someone, it won't say anything about the animal. Researchers continue to name species after celebrities and accomplished scientists, but the use of patronyms undoubtedly comes at the risk of not highlighting the characters of the organism.

Finally, as the Nobel Prize-winning physicist Richard Feynman says, there is a difference between knowing the name of something and knowing something. There is profound wisdom in his words when taken into the context of biodiversity conservation. There is an urgent need to know the name of some organisms and attempt to understand their role in the fragile ecosystem to be able to conserve them.

WALMART OFFERS WOMAN MUSHROOMS AS A REPLACEMENT FOR TAMPONS

Becca Monaghan

https://www.indy100.com/, Nov. 3, 2022

A viral tweet sent Twitter into hysterics after a Walmart customer claimed the supermarket tried to substitute their tampons with mushrooms.

When an item isn't available in an online order, supermarkets tend to replace it with a similar product. Most times, if a customer is not happy with the recommended alternative, they can reject it and receive a full refund. Some supermarkets also let shoppers opt out of the replacements.

The tweet, which racked up tens of thousands of likes and responses simply read: "Hi Walmart, I don't think mushrooms will work." The Twitter user included a screenshot of an email offering white mushrooms as the bizarre alternative.

INVASIVE FUNGI RECOGNIZED AS A GLOBAL THREAT

Eileen Drage O'Reilly

https://www.axios.com/, Nov. 3, 2022

The dangers posed by growing outbreaks of opportunistic fungi that kill 1.6 million people globally every year require new drugs, diagnostics, and surveillance programs, a CDC scientist tells Axios.

Driving the news: The pandemic accelerated the rise of drug-resistant fungi in health care settings, and global warming has expanded the range of fungi growth in certain areas—problems flagged by the the World Health Organization (WHO) which released its first-ever list of dangerous fungi last week.

What's happening: Fungi are "smart, tough organisms that are here to stay" and are evolving to take advantage of a growing immunocompromised population living in a world increasingly hospitable to certain pathogens due to climate change, says Tom Chiller, head of the CDC's Mycotic Disease Branch.

- "It could be a new species emerges and finds a niche in the environment and then happens to find an opportunistic host, and suddenly you see this new, weird infection," Chiller says.
- "We're in an era now of unprecedented emergence of fungal diseases not only in humans but also in agriculture and animal husbandry," says Cornelius Clancy, infectious disease doctor and professor of medicine at the University of Pittsburgh.

Zoom in: "In recent years, the epidemiology has shifted. We've seen the emergence of new fungi that previously were not recognized as causes of human infections or rare cases that have now become more prominent, and also the emergence of antifungal-drug resistant fungi," Clancy tells Axios.

- Chiller points to *Candida*, which is in our mouth, intestines, and skin but can sometimes invade the bloodstream and cause sepsis and other complications. Over the past decade, though, *Candida auris* has become more drug resistant and shown new characteristics, Chiller says. "This is a *Candida* that's actually transmitting, from patient to hospital environment to patient…That was really a sea change for us."
- Another threatening development is seen in *Sporothrix brasiliensis*, a dimorphic fungus that usually exists in different forms as either a mold that can be infectious when it's in the outside world or as a yeast once it's inside a human or animal body and not infectious to others.
- However, Chiller says there have been cases in Brazil where cats with *S. brasiliensis* give it to the vet via "spores flying out of their lesions into the vet's eyes, and these veterinarians were coming down with ocular sporotrichosis…We've never heard of a dimorphic transmitting like that."

Between the lines: Humans and fungi are both eukaryotes, which makes it harder to target drugs for fungi without hurting human cells as well and complicates efforts to create diagnostics that can easily identify the difference.

What's next: Chiller and Clancy say they are hopeful a new class of fungal drugs will be created—as some fungi have become resistant to all of the available classes of drugs. There have been some positive developments in the pipeline.

- More effort is needed as well for diagnostics and a global surveillance system. They hope the WHO's fungal priority pathogens list will provide impetus.

BUILDINGS MADE OF WOOL AND FUNGUS? MEET THE TEXTILE EXPERT WHO'S MAKING IT HAPPEN

Elizabeth Evitts Dickinson

https://www.washingtonpost.com/, Nov. 15, 2022

Imagine you're standing in an outdoor pavilion, one that's similar in design to a covered picnic area at a local park or an amphitheater, only instead of support columns made from concrete, wood, or stone, this structure is propped up by what appear to be posts of crocheted wool. Above you, a vast expanse of undulating roof is made of the same knitted material. Fungus coats this wool frame, forming the walls and the ceiling, not unlike the way plaster might cover the wood framing of a wall.

This is the premise of an experimental material known as Myco-Knit. "We're trying to make an all-fiber building," says designer Felecia Davis, an associate professor of architecture and a lead researcher in the Stuckeman Center for Design Computing at Pennsylvania State University. She is part of an interdisciplinary team testing how knitted materials, such as wool yarn, might function as the framing for a building while a mixture of straw and fungus mycelium embeds itself onto this knitted fabric to create the rest. Mycelium is composed of individual fibers known as hyphae, which, in nature, create vast and intricate networks through soil, producing things like mushrooms. The amazing thing, Davis tells me, is that something as basic as fiber can become both the structure (the wool yarn) and the infill (the fungus).

Davis and her partners are harnessing mycelium's fast-growing power by regulating environmental conditions in the lab to encourage the fungus's expansion on their knitted edifice. With the assistance of a computer algorithm made by one of Davis's PhD students, the team can virtually assemble and examine the structure stitch-by-stitch in order to predict its shape, before building it and letting the fungus propagate over the top.

cont. on page 6

Wool and Mushrooms, *cont. from page 5*

"The idea that future building materials could be 'grown' rather than manufactured is fascinating," architect Scott Duncan said in 2021, upon awarding MycoKnit a research prize from the foundation arm of SOM, the firm where he is a design partner. He noted that a malleable, lightweight material like MycoKnit has the potential to change the very shape of buildings.

It's projects like this one that have cemented Davis as a star in computational textile design, a subset of the architecture and design field that uses technology—processors, sensors, actuators, cloud computing, and networks—to develop new possibilities for soft materials. Davis is now working with her students to create a 12-by-12-by-12-foot MycoKnit prototype that can be fabricated and grown in one place and then taken on-site to build, like an Ikea kit. She imagines a future where biofabricated materials replace less-sustainable building supplies, many of which wind up in landfills.

Rebecca Kiger for *The Washington Post*

Mycelium spores growing on linen yarn for potential construction materials.

Davis is a triple threat designer: trained as both an architect and an engineer and with a penchant for technology.…Davis works with textiles, she says, because "you can address it at the nano- and microscales with tiny particles that you can spin to make a thread or yarn, or you can look at it from the massive scale. A building. A city."

COMPUTER CHIP MADE USING MUSHROOM SKIN COULD BE EASILY RECYCLED

Alex Wilkin

https://www.newscientist.com/, Nov. 11, 2022

Using mushroom skin to make the base of computer chips and batteries would make them easier to recycle.

All electronic circuits, which consist of conducting metals, need to sit in an insulating and cooling base called a substrate. In almost every computing chip, this substrate is made from unrecyclable plastic polymers, which are often thrown away at the end of a chip's life. This contributes to the 50 million tons of electronic waste that is produced each year.

"The substrate itself is the most difficult to recycle," says Martin Kaltenbrunner at Johannes Kepler University in Linz, Germany. "It's also the largest part of the electronics and has the lowest value, so if you have certain chips on it that actually have a high value, you might want to recycle them."

Kaltenbrunner and his colleagues have now tried using skin from the mushroom *Ganoderma lucidum* to act as a biodegradable electronic substrate.

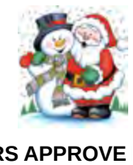
The fungus, which typically grows on decaying wood, forms a skin to protect its mycelium, a root-like part of the fungus, from foreign bacteria and other fungi. The skin didn't grow on other fungi the researchers tested. When they extracted and dried out the skin, they found it is flexible, a good insulator, can withstand temperatures of more than 200°C (390°F), and has a thickness similar to that of a sheet of paper—good properties for a circuit's substrate.

If kept away from moisture and UV light, the skin could probably last for hundreds of years, says Kaltenbrunner, so would be fine for the lifetime of an electronic device. Importantly, it can also decompose in soil in around two weeks, making it easily recyclable.

Kaltenbrunner and his team have constructed metal circuits on top of the mycelium skin and shown that they conduct almost as well as they do on standard plastic polymers. The substrate remains effective even after bending it more than 2000 times, and the researchers demonstrated that it could also work in a basic battery for low-power devices like Bluetooth sensors.

The researchers hope that the mushroom substrate will be used for electronics that aren't designed to last for a long time, such as wearable sensors or radio tags, but they first need to show it can work in current industrial electronic processes.

"The prototypes produced are impressive and the results are groundbreaking," says Andrew Adamatzky at the University of the West of England in Bristol, UK. Combining the dead mycelium skin with patches of living fungal material being developed for possible applications as sensory skin for adaptive buildings and robots could help develop wearable fungal devices, he says.



COLORADO VOTERS APPROVE LEGALIZING PSYCHEDELIC MUSHROOMS

Iris Dorbian

https://www.forbes.com/, Nov. 10, 2022

As a result of Tuesday's election, Colorado voters have approved Proposition 122, a ballot initiative that will decriminalize and regulate certain psychedelics.

The passage of this measure comes four years after Denver became the first U.S. city to decriminalize psilocybin or hallucinogenic mushrooms.

In 2020, Oregon was the first state to legalize psilocybin and decriminalize all drugs.

Highlights of the initiative, dubbed the "Natural Medicine Health Act," include:

- The development of rules for a therapeutic psychedelics program where adults 21 and older can visit a "licensed healing center to receive treatment under the guidance of a trained facilitator";
- Possession, use, cultivation, and sharing of psilocybin, ibogaine, mescaline (not derived from peyote), DMT, and psilocyn will be legalized for adults 21 and older; however, there will be no recreational sales component;
- Psilocybin and psilocyn will be permitted for therapeutic use at licensed healing centers until June 2026. After that point, regulators can decide whether to also permit regulated therapeutic use of DMT, ibogaine, and mescaline; and,

- An advisory board will be responsible for making recommendations on adding substances to the program, and the state's Department of Regulatory Agencies could then authorize those recommended additions.

Joshua Kappel, founding partner at top cannabis and psychedelic law firm Vicente Sederberg LLP and one of the drafters of Proposition 122, expressed relief on the passage of the initiative. He also lauded it for being the most comprehensive state psychedelic reform measure seen to date.

"It not only protects community healing modalities and the civil liberties of everyone in the natural psychedelic ecosystem," he said, "but creates much-needed access to natural psychedelic therapy to give hope to those who are suffering with hard to treat mental health ailments such as treatment-resistant depression, trauma, and PTSD. Now the real work begins."

Last June, Colorado Governor Jared Polis signed a bill to legalize MDMA prescriptions if and when the federal government ultimately permits such use.

STARVED YEAST POISONS CLONES

University of Tokyo via

https://www.sciencedaily.com, Nov. 7, 2022

Yeast is not the simple single-celled microorganism we once thought, but a competitive killer. When starved of glucose, yeast releases a toxin that will poison other microorganisms that have entered its surrounding habitat, even its own clones. This venomous phenomenon was previously unknown and contributes to our understanding of unicellular microorganism behavior and the evolution of unicellular to multicellular organisms, as well as having potentially useful applications for the food industry.

Bread baking became a popular new hobby during the pandemic, so nowadays you'll probably find a small packet of dried yeast stashed away in many a kitchen cupboard. For thousands of years, this little living fungus has been a staple part of our diet, enabling us to enjoy fluffy bread, sweet wine, and frothy beer. Until recently, yeast was thought to be a simple unicellular (single cell) microorganism, but researchers at the University of Tokyo have now discovered it has a murderous survival strategy.

"In the critical survival situation of glucose starvation, yeasts release toxins into their habitat which kill other microorganisms while the yeast itself acquires resistance," explained Assistant Professor Tetsuhiro Hatakeyama from the Graduate School of Arts and Sciences. "We have called this phenomenon latecomer killing. We were even more surprised to find that the toxins produced by yeasts can also kill their nonadapted clones, so they are at risk of killing not only invading microorganisms but also their own offspring. Such seemingly risky and almost suicidal behavior had not previously been found in a single-celled organism or even considered to exist."

Although cooperative forms of behavior are well known in many bacteria and fungi, this research is the first prominent finding of competitiveness occurring in clonal cells in unicellular organisms. This has important implications for our understanding of the ecology of microorganisms, as well as why some specific microorganisms grow during fermentation while others do not. To make this discovery, the team grew clonal cells (i.e., derived from the same parental cell) separately under glucose-limited and glucose-rich conditions. When the cells were combined, their growth patterns showed that yeast cells which had already adapted to glucose starvation were able to poison latecomers and keep food resources for themselves.

"Our research reveals a surprisingly selfish side to yeast behavior," said Hatakeyama. "The phenomenon we discovered is similar to a thought experiment proposed by the ancient Greek philosopher Carneades of Cyrene, called the plank of Carneades: If a sailor escapes from a shipwreck by holding on to a plank that is capable of supporting barely one person, and then pushes away another sailor who comes after him, will he be charged with murder?" The researchers suggest that this strategy may help yeast avoid mass starvation of the population, while also aiding selection of toxin-producing offspring that are more likely to continue their lineage. The strategy was observed in several different types of yeast—initially taken from beer, bread, and wine—which could mean that this phenomenon may occur more widely across this diverse species.

This discovery could be used to develop useful growth control mechanisms for economically important species of yeast, such as those used in the food industry. Although not included in this study, it may also pave the way to better controlling types of yeast which can negatively affect human and animal health. The team would next like to explore the implications of this discovery for cell evolution. "For the development of multicellular organisms, not only mutual activation of cellular growth but also mutual inhibition of cellular growth or programmed cell death in clonal cells are required," explained Hatakeyama. "Fungi are known to tend to an evolutionary transition between unicellularity and multicellularity more readily than other organisms, so we would like to unravel the relationship between the latecomer killing and the evolution of multicellular organisms. We hope this research will make a significant contribution to our understanding of ecosystem development and evolutionary transitions."

CHYTRID FUNGUS DEPLOYS VARYING STRATEGIES TO INFECT AMPHIBIANS

Tess Joosse

https://www.the-scientist.com/, Nov. 14, 2022

Since the 1970s, the chytrid fungus *Batrachochytrium dendrobatidis* (Bd) has spread globally amongst amphibian populations, wiping out entire species and decimating others. Yet while the pathogen, which infects an amphibian's porous skin and disrupts gas and water exchange, is deadly and ubiquitous, some species are more susceptible than others. Past studies have focused on

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Chytrid Strategies, *cont. from page 7*

animals' immune responses to Bd infection, but not on how the fungus might be adapting to different hosts. "It was not clear if the fungus itself was doing the same thing in the different species it is infecting," says María Torres-Sánchez, a postdoc at the University of Florida.

To find out, Torres-Sánchez took datasets from those early experiments and turned them on their heads, looking instead at what genes the fungus was expressing on the skins of different amphibian species with varying susceptibility to Bd. She and her colleagues compared the transcriptomes of Bd growing on 14 species of frogs, newts, and salamanders and of Bd grown on plates without a host.

While the fungus maintained a consistent set of housekeeping genes, the team found that Bd tailored the expression of other genes to each host, allowing it to pursue multiple infection strategies. For example, in more-vulnerable species, genes essential for attaching to and invading leukocytes, cells that defend a host from pathogens, were up-regulated. In more-resistant species, genes promoting quicker reproduction, perhaps to evade or overwhelm a host's defenses, were elevated.

The results are "really exciting," according to Amy Ellison, a molecular parasitologist at Bangor University in Wales who was not involved with the study. The list of differently expressed genes could provide "interesting targets" for further studies looking at the mechanism of Bd infection, Ellison adds, or in "identifying populations of amphibians that might be more at risk" for severe disease.

FUNGUS? BIOFILM? "ALIEN" GROWTH? Mass Blocking Wales Toilet Baffles Experts

Pandora Dewan

https://www.newsweek.com/, Nov. 14, 2022

British plumber Steve Ratcliffe got more than he bargained for when he was called out to replace a blocked toilet in Wales. Inside the ceramic bowl he found an enormous, alien-like growth, which has left experts baffled.

Steve Ratcliffe/Reddit

Mysterious growth in Wales toilet.

Ratcliffe said that the client lived on a cattle farm. Rather than relying on a public water supplier, the property received water from an underground pump via a borehole.

"The customer has had years of intermittent soak-away issues and backfilling problems...probably due to the age of the system, as it's not on mains drainage," Ratcliffe told *Newsweek*.

"It's just a crazy fungus that found a super ideal place to grow... dark, wet, a bit anaerobic perhaps and a source of food," one user said.

Others suggested it could be biofilm, an aggregation of microbial cells that are held together by an extracellular coating.

To get to the bottom of the mystery, *Newsweek* asked multiple experts what they thought the curious clump could be.

"It is very, very difficult to identify something like this using a picture," Angel Medina Vaya, a professor of applied mycology at the University of Cranfield, said. "Fungi are really happy in environments where there is organic matter and high humidity. Hence a toilet that has not been flushed for a long time could be the best place.

Fungi are incredible organisms able to grow in the most extreme conditions when no plants or bacteria would be able to survive, and here you appear to have a very good example," Vaya said.

Hans-Curt Flemming, a professor emeritus at the University of Duisburg-Essen and an expert on biofilms, said the sinister slime could indeed be a biofilm. "The phenomenon is most probably a fungus, not an alien. It is [likely] a biofilm formed mainly by fungi but also inhabited by bacteria.

"Fungi in toilet flushing systems are not unique but rarely reported. Who looks into their drain pipes and performs a scientific investigation?" Flemming said.

Luckily, he did not think the growth poses any significant health risk. "As it sits in the draining system, it will not pose any health threat. It is not poisonous, but consumption is not suggested."

Emma Thompson, the executive officer of the British Mycological Society, said that from this image alone it was impossible to determine whether the growth was even a living organism. She suggested that it could be something nonorganic, like degraded sealant.

This suggestion was echoed in many of the comments on Reddit. "It's more likely to be the wax seal that's put on when toilets are installed," said one user. "This almost certainly isn't fungal."

However, having seen the growth firsthand, Ratcliffe was certain it was not simply a piece of old plumbing. "I took the thing out, and I've been in the trade for years, and this is a first for me," he said. "I'm just saying, with absolute conviction, it's not wax."

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Brenda Fong
PSMS Treasurer 2022–2024

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