SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 580 March 2022

DOCTORS DISCOVER RARE "BLACK MOLD" GROWING IN RHODE ISLAND MAN'S BRAIN

Kaleena Fraga

https://allthatsinteresting.com/, Feb. 7, 2022

Tyson Bottenus didn't think much of the bicycle crash in Costa Rica. He and his fiancée Liza cleaned out his wound and continued on their trip. But when Bottenus returned to the United States at the beginning of 2018, he started suffering debilitating symptoms—symptoms caused, doctors say, by black mold growing in his brain.

"I was having frequent, intense headaches and a palsy started in my facial muscles, making it hard to smile straight," Bottenus wrote in a lengthy feature about his condition in *Buzzfeed News*. "She called Liza from the OR and said she could literally see a dark fungus with her naked eye," Bottenus said. "A far cry from the cancer she had been determined to find."

Lab samples determined that Bottenus had black mold—called *Cladophialophora bantiana*—growing on his brain. He likely contracted the fungus by breathing dust while biking in Costa Rica or through his bloodstream after crashing his bike there.

But knowing what was wrong with him didn't alleviate his symptoms.

"That was great to figure that out, but it's not great that I have fungus in my head," Bottenus said. "How do I get this fungus out? We're not supposed to have fungus in our heads." The answers aren't immediately forthcoming, as Bottenus's condition is extremely rare. According to the United States National Library of Medicine, there have been just 120 cases of culture-proven cases like Bottenus's since 1911. About half are found in India.

Bottenus wrote in *Buzzfeed* that people have suggested he form a support group for others with the condition. But "the sad truth is that if I did, I would be the only member… everyone I've come across with my condition is now deceased." Indeed, early cases of the black fungus were 100 percent fatal.

Surgery isn't an option—the fungus is too close to vital brain areas. But Bottenus's doctors have instituted an aggressive treatment regiment.

However, Bottenus abruptly stopped his "sledgehammer" of steroids in March 2020 because they made him immunocompromised and he worried about COVID-19.

"I equate this decision with one that someone stuck in a burning building might make: either jump to the street below or be consumed by the flames," Bottenus wrote.

Tyson Bottenus

A dark spot on Tyson Bottenus's brain mystified doctors before they determined it was fungus.

He ended up suffering a stroke, followed by "severe visual, vocal, and cognitive impairment."

"I had all sorts of different things happen after that," Bottenus said. "My voice was impacted, I had double vision as a result of that, my muscles in my hands were compromised. I had all sorts of different things going on there."

But through it all, Bottenus has managed to stay optimistic. He's found comfort in Buddhist teachings, has started working on his graduate degree, and can even keep biking, thanks to a tandem bike he shares with his fiancée.

"The quality of my life is the best it's been since before my infection," Bottenus said. "I can ride my bike, my eyesight is back to normal… I still live with a fungal infection in my brain but it doesn't dominate my life like it used to."

Still, the road before him is uncertain. Bottenus is working hard to embrace that. He's accepted the Buddhist tenet that resisting change creates suffering; accepting it leads to enlightenment.

"I can't escape the uncertainty around my future, but no one can," he wrote. "I just have to learn to live with it."

JAPANESE FARMERS USING HAMMERS TO GROW MORE SHIITAKE

Casey Baseel

https://soranews24.com/, Feb. 2, 2022

In Japan, there's an image of elegance, some might even say nobility, associated with farming. Maybe it's because you don't have to go all that far back in Japan's history to find a time when the country was still overwhelmingly agrarian, or perhaps it's a carryover from Shinto beliefs about the divinity present in nature.

Regardless of the reason, though, Japan's popular image of farmers is of people who work in reverent harmony with nature, delivering the fruits of their respectful labor to the nation's dinner tables. So it's a little jarring to learn that in one part of Japan, farmers aren't just delicately sifting the soil, but smacking things with hammers.

This technique is spreading among growers of shiitake mushrooms in Oita Prefecture, on Japan's southwest island of Kyushu. A unique aspect of shiitake it that they won't grow on the ground. Instead, shiitake need a tree trunk in order to form (or "fruit," to use the technical verb).

Shiitake growers can roughly predict when shiitake are going to start fruiting, and they've found that a simple and effective way

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Spore Prints

is published monthly, September through June by the
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CALENDAR

Mar. 8 Membership meeting, 7:30 pm (via Zoom)
Mar. 14 Board meeting, 7:30 pm (via Zoom)
Mar. 22 *Spore Prints* deadline

BOARD NEWS

Su Fenton

Greetings to all! Unfortunately, the board hasn't yet met this month. We will be meeting next week. We are off the normal routine for scheduling meetings, since this time it would have occurred on Valentine's Day.

However, I do have a little bit of information to share, from behind the scenes. First off, Molly Watts, who is a Trustee on the board, told me that the newly formed Mycophagy (i.e. consumers of fungi) Committee, of which she is a part, is planning to host two mushroom-themed cooking classes. The first one will be held in April and the second will be in May. They will be posting details in the March *Spore Prints*. The first people to be offered seats in the class will be club volunteers. Later, classes will be open to the general public.

Another bit of news, fresh off the press, is that the board voted on who should receive this year's Golden Mushroom Award. It was an impressive list of knowledgeable and hard working club volunteers. I know it was a difficult choice for most of us. We used a ranked voting method which allowed us to vote for more than one person. It sounds like we have a majority decision. So stay tuned for the results. And thanks to all the nominees who work so hard for us and the field of mycology.

Sadly, our beloved banquet which is usually held in March will need to be postponed, thanks to the dang pandemic continuing to kick us around, and held, we hope, in the Spring. That will be voted on at the next board meeting. We also will need to make a decision on whether the March meeting could be a mix of in-person and Zoom. Stay tuned for these decisions. Hope you had a good Valentine's Day celebration with whoever is in your "staying safe" bubble.

MEMBERSHIP MEETING

Scott Maxwell

The membership meeting on March 8, 2022,will be "virtual only" because of the earlier surge in COVID-19. We expect that in a month or so we can get back to our hybrid (in-person / virtual) meetings once again. We have expanded our ZOOM account to allow for more people to attend while in-person attendance is paused. The lecture will begin at approximately 7:30 pm. We will start letting people into the meeting at 7:15 pm.

Jeff Stallman

Once again, we will be featuring one of our talented members of PSMS, Jeff Stallman, who will present "Recent research in the Leotiomycetes: Insights on an understudied, hyperdiverse class of fungi." In his words, "While the Leotiomycetes contain many well-known commercially and ecologically important fungi such as powdery mildews (Erysiphales) and the fungus causing white-nose syndrome in bats (*Pseudogymnoascus destructans*), he is primarily focusing on fungi that form macroscopic reproductive structures. These small, cup-forming fungi are hyperdiverse, but few species are known compared with expected diversity, and most known species are described from Europe. Jeff will highlight interesting aspects of the Leotiomycetes and recent research in the group, while showcasing unique species and discussing the potential of community science to help increase our understanding of the class."

Jeff Stallman is a long-time PSMS member who left Seattle in 2014 and started pursuing a formal education in mycology. He received his MS from the University of Hawai'i at Hilo studying *Lepiota* and similar fungi on Hawai'i Island in 2019 and currently is a PhD student at Purdue University studying the fungal class Leotiomycetes (Ascomycota).

Jeff is helping with the current PSMS Pacific Northwest Fungi DNA sequencing project.

EXCITING NEWS FROM THE MYCOPHAGY COMMITTEE

Marcus Sarracino & Molly Watts

Molly Watts and I am happy to announce the rejuvenation of the Mycophagy Committee of PSMS, the gastronomic faction of the club. Mycophagy is *the eating of mushrooms*, and that is exactly what we plan on doing! For two years COVID really put a damper on our ability to put together food-related events, but we are trying to plan for the near future. Starting things off we will be piloting a fungi-themed cooking class at the Pantry in Ballard on Monday, May 9, 2022, at 6 pm, with chef/forager Becky Selengut—a cookbook author, culinary instructor, forager, and private chef based in Seattle. The cooking class will be hands-on: chopping, stirring, sautéing, and mixing with 15 of your fellow mycophiles and instructor throughout class. All guests will receive copies of the recipes and enjoy a communal meal with wine at the end of class. As is required with all in-person PSMS events, proof of vaccination will be required. Also, the Pantry requires students to wear an N95 or KN95 mask in addition to showing proof of ID and vaccination. The cost will be $135 and nonrefundable. Registration will be available soon. As a special "thank you" to all the members who volunteer their time and experience to the club, we will be giving them first dibs to sign up for this class. Any unfilled spots may be claimed by the general membership when/if they become available.

https://intentionalist.com/b/the-pantry/

Scene at The Pantry.

Stay tuned for more exciting mycophagy events!

Hammered Shiitake, *cont. from page 1*

to increase their yields is to spray the log with water about two weeks ahead of time, then grab a hammer and bang on the wood**.**

Strange as it may sound, the technique has been a bit of folk wisdom for some time, and the Oita Prefectural Agriculture, Forestry, and Fisheries Research Guidance Center recently confirmed that hammer time really does help lead to mushroom time**.**

Last month, the organization conducted an experiment, comparing the effects of hitting a log with a hammer versus leaving it unsmacked, and found that the wood that had been hammered subsequently produced more than twice as much shiitake (by weight)**.** The center recommends farmers strike the log five times on one side, and then five more on the opposite side**,** adding that the most effective striking spot is on the bark of the log, away from its flat-cut edges.

Researchers aren't sure why violence is the answer, except that subjecting the wood to vibrations somehow enhances shiitake formation on the log, and that hammering applies the necessary reverberations. The center hopes that greater adoption of the technique will lead to greater productivity for existing shiitake farmers and encourage newcomers to the profession.

ROBOTIC MUSHROOM HARVESTER

Keri Ferguson

https://techxplore.com/, Feb. 14, 2022

Nearly 10 years ago, local mushroom farmer Murray Good approached University of Western Ontario engineering professor Mehrdad R. Kermani with a challenge. Could Kermani and his team develop an autonomous mushroom-harvesting robot to address the labor shortage Good and mushroom farmers around the world were facing?

Kermani, a world leader in the field of safe human/robot interactions, knew this was a challenging problem that could take time. With patience, perseverance, and the help of his graduate students, he developed the prototype for what is now the first commercialized robotic harvesting system of its kind.

"When we first started the project, we had no specific data or approaches to reference," Kermani said. "We basically started from scratch."

Kermani succeeded where several research institutes and private companies worldwide failed, designing a robot that could pick mushrooms at a speed and quality comparable to or beyond human harvesters. He also took an innovative approach, developing a system that seamlessly integrates into the existing infrastructure of mushroom farms across North America.

Beyond addressing the agricultural industry's manual labor shortage, Kermani's efforts also help answer the demand for sustainable agriculture, with an aim to end hunger and achieve food security, a challenge identified in the United Nations Sustainable Development Goals.

Getting a Grip

Tasking robots with human actions isn't easy, with "grasping" as one of the more challenging motions to perfect. Humans, Kermani explained, grasp objects every day with little thought. In the case of picking mushrooms, they can look at a mushroom, determine if it is ripe, and grasp it with just the right amount of force.

University of Western Ontario

Robotic mushroom picker.

"If you go to a mushroom farm, the first thing you notice is that mushrooms are very dense and there are quite a lot of them growing in the beds," Kermani said. "Humans have the dexterity to easily grasp the mushroom. From time to time, they may change their maneuver in order to pick it properly. It's not always the same movement. Sometimes they bend it, sometimes they twist it, and sometimes it's a combination of both. It really depends on how they feel that mushroom.

"When you translate that into code for a machine, it's not a very intuitive thing," Kermani said.

His first prototype allowed him to experiment and perfect the picking mechanism, achieving a "soft touch" that avoided spoiling the easily-bruised mushrooms—an aspect other researchers hadn't achieved with previous suction cup models.

cont. on page 5

AKANTHOMYCES CF ACULEATUS[1] —A MOTH-KILLING MOLD FOUND ABUNDANTLY IN AN OLD MINE

Brian S. Luther

In 2009 I was alerted to a peculiar situation that a USFS Ranger brought to my attention and was very curious about. When an old abandoned gold mine in Yakima Co. was explored, the inside walls were covered with dead moths. All of them were coated with a grotesque mold, which not only killed them but was also holding them to the vertical walls. I arranged to meet up and go to the site, where I took photos and made collections. I also went back a second time a year later.

Old gold mine entrance.

Fungus parasite on dead moths in old gold mine.

The culprit could be the parasitic fungus *Akanthomyces aculeatus* or a related species. Dead moths infected with this fungus, however, are usually found infrequently and singly in the wild. What's peculiar about this situation was that they were found all together in great abundance in an old mine shaft. The walls of the mine were covered with dead, moldy moths, which became more frequent as you went farther inside. There were also some living moths there as well, indicating this was a location that they frequently visited, most likely as protection from the outside conditions. I'd forgotten about these collections and only recently remembered them. I sent the moth to an entomologist for ID.

Akanthomyces species belong to a large group of fungi called anamorphic molds. This means they lack a sexual life cycle stage, unlike Ascomycetes or Basidiomycetes. Instead they produce vegetative spores called conidia on structures called conidiophores, and these are what infect the moths. Decades ago anamorphic fungi were referred to as "fungi imperfecti" (imperfect fungi), for lacking a sexual spore stage. E. B. Mains (1950) monographed the genus *Akanthomyces* and related genera of molds here in North America and also published many other papers on entomogenous (insect loving) fungi. In the paper just mentioned, he incorrectly uses the species name "*aculeata*" rather than *aculeatus* for this fungus. This species name literally means *slender and sharp pointed* or *awl shaped,* in reference to the form of many of the synnemata[2].

In a detailed paper based on DNA analysis, Kepler et al. (2017) discuss and propose important name changes in the genus *Akanthomyces* and related genera in the light of new nomenclatural rules made by the International Botanical Congress in 2011. Prior to this publication, Morris (1963), states that at the time there were four species in the genus and provides an excellent illustration of the conidiophores.

Close up of infected moth showing mycelium and synnemata (arrow). BSL coll. #2010-103-1.

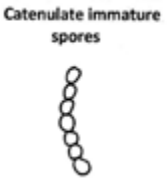
Collection Description

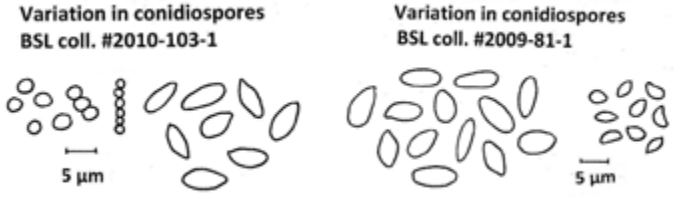
Akanthomyces sp**.,** similar to *A. aculeatus* Lebert

Collections studied: BSL coll. #2009-81-1 and BSL coll. #2010-103-1, both from the same gold mine shaft.

Macrostructure: Mycelium covering all of the moth body and extending onto the wings, whitish to cream-colored to very pale tan. Synnemata up to 1 cm long, cylindrical to mostly aculeate, often wider where arising from the host and narrowing upward, but quite variable in form with some blunt tipped, straight to twisted or contorted at times, simple or frequently irregularly branched, few to numerous per moth and concolorous with the mycelium.

Microstructures: Mycelium (0.5)1–4.0 µm wide, hyaline, smooth, mostly thin walled, some slightly thickened, septa infrequent, with some branching, parallel with intertwining and very tightly compressed within the core of the synnemata. Irregular crystalline material was often seen throughout mounts. Phialides[3] arising laterally from the conidiophore hyphae, somewhat difficult to observe, but some were seen that were immature with catenulate (chains) of equally immature conidiospores. Conidiospores abundant and quite variable, with four distinct types seen, all hyaline, smooth, and mostly thin to distinctly thick walled: 1. 2.5–3 × 2 µm, very broadly elliptic-fusiform; 2. 5.5–9 × 2.5–3.5 µm, elliptic-fusiform to elliptic to obovoid to cylindrical or rarely allantoid (sausage shaped), with some either slightly truncated at one end or with a fine pointed appendage; 3. 2.5–3 µm, globose to subglobose; 4. 4–4.5 × 1–1.5 µm and falcate (sickle-shaped).





Observations

Some of the hyphae I observed are extremely fine, being a micrometer or less is diameter.

The conidiospore variation in size and shape is remarkable and is not mentioned in other references about this fungus. I noticed differences in spore size and shape even comparing different moths from the same collection. The first two spore types recorded above fall mostly within the spore ranges documented in other publications for this species, but still show greater size variability, so I may be seeing different stages of spore maturity for the first two, or possibly I'm dealing with previously undescribed species. The globose spores I observed were very different from those on most of the moths and were much more often seen in catenulate

[1] CF = resembling or similar to; i.e., a fungus in the genus *Akanthomyces* similar to the species *aculeatus*

[2] Noticeable, erect reproductive structures produced by some fungi, bearing compact conidiophores, which fuse together to form a strand resembling a stalk of wheat, with conidia at the end or on the edges.

[3] A flask-shaped lateral or terminal conidiophore end cell producing conidia either singly or in a chain.

(bead-like) chains compared to the others. The predominance of different spores found on these moths has me wondering if the parasite might have distinct pleomorphic spore forms, or perhaps I'm actually dealing with several entirely different fungal parasites on the moths which were coincidentally found side by side in the exact same habitat, with the very same macroscopic appearance. Perhaps I've recorded the spores of secondary fungi parasitizing the moth as well, which could be the case with the falcate spores. I've illustrated the first three spore types mentioned above.

With all these different spore forms, still the great abundance of conidiospores produced means there is a good chance that living moths coming anywhere in contact with those infected will likely become infected also. Also, because of the vertical nature of the mine shaft walls, living moths landing below those infected will be directly in the line of conidiospores constantly dropping down, thus increasing their chances of infection. It's clear to me that the extremely confined space in the old mine where moths congregate results in a much greater degree of exposure to the fungus conidia, causing the parasite to spread rampantly and consistently. There are articles you can access online about this moth parasite, but I'm not aware of any others that mention the peculiar habitat or location I present here as having very large populations of the infected moths.

I don't know exactly how the moths become infected—whether they ingest the spores or if the spores simply land on their bodies and are able to infect them.

One of the collections cited by Mains (1950) was found by Alexander H. Smith in 1941 growing on a moth at Baker Lake, Whatcom Co., here in Washington. I contacted the Univ. of Michigan herbarium to get any further data they might have on that collection. Smith's moth was found by itself in the wild and was not in a cave.

We have hundreds of anamorphic molds here, in many habitats. For the most part, however, they're all inconspicuous and not likely to be either noticed or collected by people, with their defining features mostly all microscopic. A few, however, are obvious, colorful, and macroscopic. I reported on one especially striking and vibrant anamorphic fungus species that occurs in our Washington State woods in an earlier article (Luther, 2010).

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Robotic Mushroom Picker, *cont. from page 3*

Kermani's second challenge was "teaching" the robot to recognize when a mushroom was ready to be picked. He designed a vision component to scan the mushroom by size; one of the key determinants of ripeness.

"Mushrooms grow very fast," he said. "In 24 hours, they double their size, which means once they're ripe, you have to pick them. If you pick them too early, you don't get the yield. If you pick them late, it doesn't last on the shelf. It's not like an apple or orange; you have a very limited window of time."

With the capability to work 24-hour shifts, Kermani's robotic system can scan a mushroom and, if it is not ripe, make note to return at just the right moment a few hours later.

The core areas of focus took about four and a half years to develop to the point where Kermani and his team could begin testing the system on Good's farm.

"This was a gradual process," Kermani said, crediting Good for his role as a "forward-thinking industry partner who embraced technology and provided crucial, continual feedback throughout the process."

Based on the success of Kermani's research projects, Good founded Mycionics in 2014, with the knowledge transferred for commercialization in 2018. Last summer, the company attracted supercluster funding from Next Generation Manufacturing Canada to deploy and demonstrate the harvesting system.

RARE MUSHROOM FOUND IN MAINE

V. Paul Reynolds

https://observer-me.com/, Feb. 8, 2022

Entoloma indigoferum, the rarest of rare cerulean blue mushrooms, was discovered in the Jo Mary Lake area by Northwoods *Sporting Journal* columnist and sporting camp operator Bud Utecht and two of his clients during a trout fishing trek. With the help of his daughter, Tara, Utecht's research revealed that this is one of 20 of the rarest mushrooms in the country, never before found in Maine! First discovered in the 1870s, the next recorded sighting of the fungi was in the New Jersey Pine Barrens in 2013.

Bud Utecht

Entoloma indigoferum, *rare cerulean blue mushroom found by sporting camp operator Bud Utecht and two of his clients during a trout fishing trek in 2021.*

With great care, Utecht harvested the specimen and turned it over to the University of Maine, where it now resides in UMO's herbarium. Revisiting the "harvest site," Utecht discovered another of the rare mushrooms, but let it be.

Where, exactly, was it found, you ask? The finder's lips are sealed.

FRIEND OR FOE? COMMON PLANT DISEASE POSSIBLY PROTECTS THE HOST FROM PESTS

Athena Chan

https://www.ibtimes.com/, Feb. 14, 2022

A common plant disease, known as ergot, that is considered harmful may actually benefit the plant by protecting it from pests that eat it.

The fungal endophyte in the genus *Epichloë* has a symbiotic relationship with the "widely distributed" grass species, the red fescue, the University of Turku said in a news release. As the fungus cannot survive outside of its host plant, it often provides the plant with protection from pests and enhances its ability to "endure abiotic stress" in exchange for the nutrients the plant provides.

For their work, published in *Frontiers of Microbiology*, a team of researchers took a closer look at whether the presence of the fungal endophyte affects the occurrence of the aphids and *Claviceps purpurea* (ergot). Aphids are insects that are considered pests, while *Claviceps purpurea* is another fungus that causes the disease ergot in grasses. Grains contaminated with ergot are toxic to humans, and the disease is even seen as an "unwelcome guest" on farmlands.

"*C. purpurea*, the ergot fungus, is widely recognized as a plant pathogen that infects the inflorescences in the Poaceae family," the researchers wrote, adding that it tends to prevent the host from developing plant seeds.

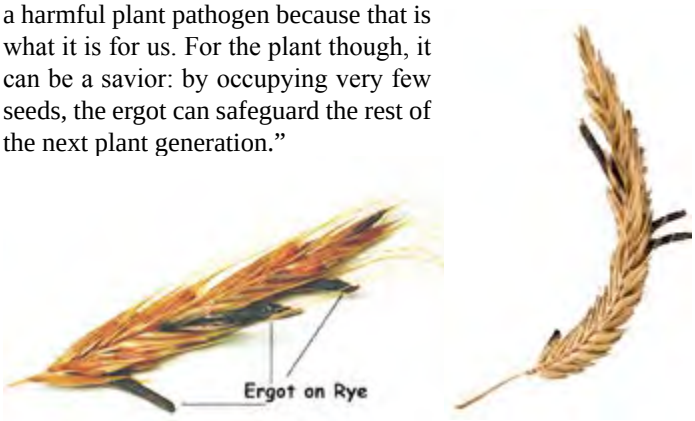
The researchers found that the Epichloë symbiosis did not affect the occurrence of aphids, but ergot was present more commonly in the plants with the fungal endophyte. It appears that the endophyte symbiosis has increased the chances of the plant getting infected by ergot, the university noted.

However, there were fewer aphids in the plants that were infected by the ergot fungus. In fact, the uninfected plants even had 4.5 times more aphids than the ones that were infected by *Claviceps*.

Researchers believe that the endophyte promotes ergot as it provides "notable" protection from aphids. Since the infection can only cause "minor seed loss," the "net effect" on the plant may still be positive, they added.

It's possible then that the "benefits of the ergot outweigh the harms," Miika Laihonen, a doctoral candidate and one of the study authors, said in the university news release. In fact, ergot has also been seen to repel other animals from eating infected plants.

"As humans, we have a natural tendency to judge the organisms from our own point of view. However, by doing so, we can miss a bigger picture," Laihonen said. "We classify the ergot fungus as a harmful plant pathogen because that is what it is for us. For the plant though, it can be a savior: by occupying very few seeds, the ergot can safeguard the rest of the next plant generation."



FUNGUS ADDED TO 25 MOST WANTED LOST SPECIES LIST

https://www.ecowatch.com, Feb. 10, 2022

The Earth is full of diverse and fascinating species, and more than 2,200 of them have been lost to science for at least 10 years. That's why the Texas-based conservation group Re:wild has launched its "top 25 most wanted lost species" list.

On Wednesday it added eight new species to replace those that have already been rediscovered, including its first fungus—*Austroomphaliaster nahuelbutensis,* the Big Puma Fungus. This species was last seen in South America in 1988.

FIRST EVIDENCE INDICATING DINOSAUR RESPIRATORY INFECTION

https://www.sciencedaily.com/, Feb. 11, 2022

warpaintcobra / stock.adobe.com

Diplodocus dinosaur scene.

A group of researchers from around the country, including University of New Mexico Research Assistant Professor Ewan Wolff, discovered the first evidence of a unique respiratory infection in the fossilized remains of a dinosaur that lived nearly 150 million years ago.

Researchers examined the remains of an immature diplodocid—a long-necked herbivorous sauropod dinosaur, like "Brontosaurus"—dating back to the Late Jurassic Period of the Mesozoic Era. The dinosaur, nicknamed Dolly, discovered in southwest Montana, had evidence of an infection in the area of its neck vertebrae.

They study, led by Cary Woodruff of the Great Plains Dinosaur Museum, identified never before seen abnormal bony protrusions that had an unusual shape and texture. These protrusions were located in an area of each bone where they would have been penetrated by air sacs. Air sacs are non-oxygen exchanging parts of the respiratory system in modern birds that are also present in dinosaurs. The air sacs would have ultimately connected to Dolly's lungs and formed part of the dinosaur's complex respiratory system. CT imaging of the irregular protrusions revealed that they were made of abnormal bone that most likely formed in response to an infection.

"We've all experienced these same symptoms—coughing, trouble breathing, fever—and here's a 150-million-year-old dinosaur that likely felt as miserable as we all do when we're sick." Woodruff said.

Researchers say these findings are significant because Dolly was considered a non-avian dinosaur, and sauropods like Dolly did not evolve to become birds; only avian theropods evolved into birds. The authors speculate this respiratory infection could have been caused by a fungal infection similar to aspergillosis, a common respiratory illness [caused by a mold in the genus *Aspergillus*] that affects birds and reptiles today and can lead to bone infections. In addition to documenting the first occurrence of such a respiratory infection in a dinosaur, this fossilized infection also has important anatomical implications for the respiratory system of sauropod dinosaurs.

"This fossil infection in Dolly not only helps us trace the evolutionary history of respiratory-related diseases back in time, but it also gives us a better understanding of what kinds of diseases dinosaurs were susceptible to," Woodruff said.

"This would have been a remarkably, visibly sick sauropod," Wolff said. "We always think of dinosaurs as big and tough, but they got sick. They had respiratory illnesses like birds do today, in fact, maybe even the same devastating infections in some cases."

The researchers suggest that if Dolly had been infected with an aspergillosis-like respiratory infection, it likely experienced flu or pneumonia-like symptoms such as weight loss, coughing, fever, and breathing difficulties. As aspergillosis can be fatal in birds if untreated, a potentially similar infection in Dolly could have ultimately caused the death of the animal.

"We have to continue to expand our knowledge of ancient diseases. If we look hard enough, we may begin to understand more about the evolution of immunity and infectious disease," Wolff said. "When we work together between multiple specialties—veterinarians, anatomists, paleontologists, paleopathologists, and radiologists—we can come away with a more complete picture of ancient disease."

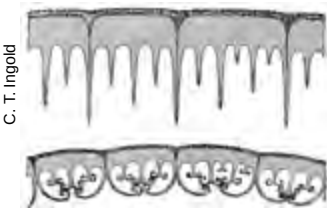
The research group included Cary Woodruff, a paleopathologist/veterinarian—Ewan Wolff (University of New Mexico, Albuquerque, NM), a veterinarian—Sophie Dennison (TeleVet Imaging Solutions, Oakton, VA.)—and two paleontologists who are also medical anatomists, Mathew Wedel (Western University of Health Sciences, Pomona, Calif.) and Lawrence Witmer (Ohio University Heritage College of Osteopathic Medicine, Athens, Ohio).

A COMMON UNCOMMON MUSHROOM

Dick Sieger

Schizophyllum commune is a most remarkable fungus. It is an annual mushroom that grows the world over on some 150 hardwood species, but it will make do with softwood, cactus, coconuts, sugar cane, bananas, grape vines, hay and straw, shower panels, roof felt, whalebone, and what have you. Mycologist Orson Miller found it growing inside some wooden beer caskets. It appears infrequently on lists of species collected in the Pacific Northwest because we don't spend much time hunting for mushrooms in Alder stands.

Schizophyllum commune is Latin for "common split-leaf," named for the unique way its gills work to conserve moisture. In dry weather the gills split, curl up, and enclose their spore-bearing surfaces. This happens because an outer layer of thin-walled cells dries out faster than a central axis so the gills warp. When rain returns, coarse hairs on the cap quickly suck up water and the gills reopen. A dried *Schizophyllum* that had been sealed in a vacuum for 53 years started producing viable spores a few hours after it was moistened.


C. T. Ingold

Schizophyllum commune gill.

Also, *Schizophyllum commune* is wonderfully fertile because it has well over 20,000 mating types. Some mushrooms have only two. Because of this huge variety of mating types, and because cultures are so easy to grow, *Schizophyllum commune* is a popular tool for studying mushroom sex, mushroom genetics, and spore dispersal.

In addition, *Schizophyllum commune* contains green fluorescent protein that enables it to glow under fluorescent lighting. Bryce Englehardt put a gorgeous photo of this on Mushroom Observer (https://mushroomobserver.org/species_list/show_species_list/1588).

The mushroom can be a human pathogen. It occasionally attacks people whose health is severely compromised, and the disease can be fatal. PSMS founder Dr. Stuntz showed me a photo of a *Schizophyllum* growing on the side of a person's nose, an image not soon forgotten.

Yes, *Schizophyllum commune* is edible. Tough though it is, it is a cultivated market mushroom in Malaysia where young ones and hot peppers are stewed for a long time in coconut milk. It's no surprise that the resulting dish tastes like peppers and coconuts. Folks in New Guinea use it as a chewing gum substitute (or perhaps it is we who use chewing gum as a *Schizophyllum* substitute). I found that when chewed, it soon develops an overpowering bitter mushroom flavor.

What appear to be reliable Web sites tell about health benefits that may come from consuming *Schizophyllum*, and others report that extracts from *Schizophyllum* are being used to develop medicines.


https://www.mushrooms.su

Schizophyllum commune Fries

CAP: fan-shaped; ½–1½ inches wide; densely covered with coarse pale gray to white hairs; margin lobed, becoming inrolled when dry
GILLS: radiate from the mushroom's point of attachment; pale to brown; widely spaced; thick; when moist parallel with a groove; when dry wavy and irregular (use a lens)
SPORE PRINT: white
STALK: absent
ODOR: of *Agaricus bisporus*
TASTE: strong, bitter, of *Agaricus bisporus*
HABITAT: on hardwoods
HABIT: in rows or groups; annual but may persist for several years
OCCURRENCE: world wide in all seasons
EDIBILITY: edible when softened by stewing

NORWEGIAN DESIGNER REVIVES LOST ART OF ROMANIAN HOOF FUNGUS **Rebecca Coons**

https://www.biofuelsdigest.com/, Feb.7, 2022

In Norway, up and coming designer Mari Koppanen is revisiting a mushroom leather that was once commonly used in the Transylvanian region.

She recently featured the nearly-lost technique in the Fomes furniture range. Comprising a stool and matching bench, the pieces were upholstered in amadou, a spongy, suede-like material made from *Fomes fomentarius*. The fungus's colloquial name, Romanian hoof fungus, comes from its shape, which resembles a horse's hoof.

"The [amadou] craft is in danger of disappearing as the number of families practicing it has reduced noticeably during the past decades," said Koppanen, who is researching the material as part of her doctorate at the Oslo National Academy of the Arts, tells *dezeen*. "It is a unique craft and the material could have big potential in the future. Compared to leather, it does not require killing an animal or heavy processes of soaking, tanning, and dyeing. The material is fully biodegradable, cruelty-free, and natural."

Traditionally, pieces of amadou are connected using a glue made from animal bone collagen, although Koppanen's Fomes range uses vegan bookbinding glue instead.

A CREAMY MUSHROOM PASTA **Elizabeth Jaime**

https://www.bonappetit.com/, Feb. 26, 2016

Begin by browning a good chunk of **butter** in a skillet—exactly how much depends on what kind of week you've had. As the butter begins to brown, add a handful of **sliced mushrooms** and let them cook down. Cremini work great, but any mix of mushrooms (such as maitake, shiitake, and king trumpet) would work. After the mushrooms are nice and browned, add a bit of **heavy cream**—not too much, just enough to make everything creamy.

While the mushrooms are browning, boil a pot of heavily salted water (you always need more salt than you think!) and add a box of **orecchiette.** I like my pasta *al dente,* so cook it a minute under the suggested boiling time. Once the pasta's done, add the drained orecchiette to the skillet with the buttered mushrooms and a *bunch* of **grated Parmesan** and mix it all up. A sprinkle of **chives** on top lends a pop of color. Once plated, top it with as much Parmesan as you can physically grate and give it another good stir.

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