SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 512 **May 2015**

SCIENTISTS DISCOVER SLIME MOLDS IN SOUTHERN AFRICAN DESERT

University of Arkansas News, April 13, 2015

FAYETTEVILLE, Ark. - An international group of scientists, led by University of Arkansas mycologist Steve Stephenson, discovered the first specimens of slime molds from the Namib Desert in southern Africa.

"Myxomycetes, a fungus-like group of slime molds, are usually associated with moist habitats, but we managed to collect approximately 50 specimens representing the first records from Namibia and the largest series of specimens known from any desert in Africa," Stephenson said.

Myxomycetes are not plants or animals but they share the characteristics of both. They feed on the microorganisms associated with dead plant material, especially bacteria and fungi, and they play an important role in vital ecosystem processes such as nutrient cycling. Myxomycetes are commonly found in soil and on dead wood and leaves on the forest floor. However, a few species can be found in an ordinary lawn.

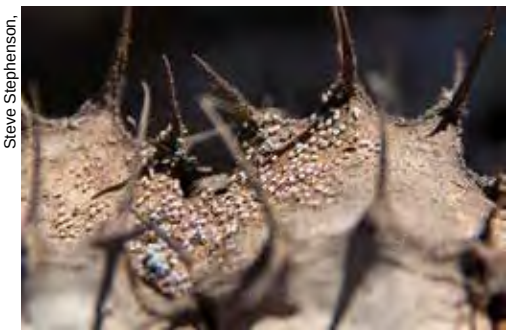
"The most important scientific aspect of our expedition was to document the occurrence of myxomycetes in yet another region of the world," he said. "We also collected a large series of samples of dead plant material, from which we will isolate additional specimens of myxomycetes in the laboratory."

Stephenson, a research professor of biological sciences in the J. William Fulbright College of Arts and Sciences, is one of the world's leading experts on myxomycetes. He has traveled to all seven continents to collect and study these often abundant but understudied organisms.

The team was based at the Gobabeb Training and Research Center, an internationally recognized center for dry-land training and research located in what is considered the oldest desert on Earth.

"Gobabeb is located at the intersection of tall red sand dunes with virtually no vegetation and gravel plains with only scattered plants," Stephenson said. "The region receives only about an inch of rain each year."

Steve Stephenson.



Fruiting bodies of a myxomycete (small round white structures) on the decaying remains of a cactus-like plant.

PRESIDENT'S MESSAGE

Kim Traverse

Well, the big event of the spring, Mushroom Maynia, is almost upon us—Sunday, May 17, from 10 am until 4:30 pm at CUH. Any members who want to help out will be let in free even if we have all the help we need! I'd rather you come check it out than stay away because you don't think we need the help. These kinds of activities are an important part of the PSMS mission, and the more members who experience it and can offer suggestions or get excited enough to help out in subsequent years, the better.

ID clinics continue on Mondays from 4–7 pm at the big glass atrium at CUH. If you have never had the time nor inclination to attend. you are missing another of our wonderful events. We actually get a bit raucous sometimes. A great way to see what mushrooms are being found currently. Sometimes people let actual locations slip out!

There are still some spring field trips you could attend. Life is too short not to get out into the woods a few times every year. Regret never evens that score.

2015 MUSHROOM MAYNIA

Milton Tam

Where: The Center for Urban Horticulture, UW Campus
When: Sunday, May 17, 10:00 am–4:30 pm

For the members who took publicity flyers and postcards for our Mushroom Maynia event, if you haven't done so already, NOW is the time to distribute and/or post them. Also, please spread the word to your friends and neighbors and tell them about Mushroom Maynia. Our vision is that Mushroom Maynia will be educational as well as entertaining, and is designed for kids and their families. We will showcase how fungi play an important role in our lives and also how we all can have some "fun" with "fungi."

A group of us recently met to share ideas and plan activities for this event. Mushroom Maynia will never be just a smaller spring version of our fall show because there are relatively few species of mushrooms in spring compared with the fall. Rather, Mushroom Maynia is an opportunity to present additional activities and displays that cannot easily be added to the fall show. We also want to make sure Maynia is every bit as fun for us and the public as the fall show. So if you have an hour or more on Sunday, May 17, please stop by CUH and see what we've prepared for you.

We still need a few volunteers for the event. If you can help for an hour or more, please email Kim Traverse at traverse.kim@gmail.com.

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CALENDAR

May 4	Free public ID clinic, 4:30–7 pm, CUH atrium
May 9	Field trip (see website for details)
May 11	Free public ID clinic, 4:30–7 pm, CUH atrium
May 12	Membership meeting, 7:30 pm, CUH
May 17	Mushroom Maynia, 10 am – 4:30 pm, CUH
May 18	Board meeting, 7:30 pm, CUH board room Free public ID clinic, 4:30–7 pm, CUH atrium
May 19	*Spore Prints* deadline
May 22–24	Field trip (see website for details)
May 29–31	Field trip (see website for details)
June 1	Free public ID clinic, 4:30–7 pm, CUH atrium
June 6	Field trip (see website for details)

MEMBERSHIP MEETING

Tuesday, May 12, 7:30 pm, Center for Urban Horticulture, 3501 NE 41st Street, Seattle

Buck McAdoo

The speaker for May will be Buck McAdoo, who will talk on "Unusual sightings of PNW fungi and some of the challenges identifying them." Buck will be showing slides of some of the more esoteric fungi encountered over 20 years of collecting in the Pacific Northwest. When looked at superficially, these interesting mushrooms are quickly filed as known species. When looked at closely, however, they keep resisting attaching a proper scientific name. Buck will share his efforts to figure out what he has collected, the far ranges of resources he accessed, and some of the mistakes he made along the way identifying. If time permits, there will also be slides of Tibetan boletes and Amanitas at the end.

Buck McAdoo is an amateur mycologist and avid recorder of fungi wherever he may roam. Since 1989 he has been writing "the Mushroom of the Month" column for the Northwest Mushroomers' Association, Bellingham. You can access them on the net at http://www.northwestmushroomers.org/newsletter/.

Would people with last names beginning with the letters L–Z please bring a plate of refreshments to share after the meeting.

MUSHROOMS WERE ON THE UPPER PALEOLITHIC MENU

Archaeology, April 17, 2015

LEIPZIG, GERMANY - Analysis of dental calculus on 18,000-year-old teeth found in Spain's El Mirón Cave indicates that Magdalenian hunters ate a variety of plant foods and mushrooms, in addition to meat from red deer and ibex. Robert Power of the Max Planck Research Group detected a diverse assemblage of microremains in the dental calculus using optical and scanning electron microscopy with energy-dispersive X-ray spectroscopy. "These types of microremains show that the individuals at El Mirón consumed a variety of plants from different environments, as well as other foods, including possibly bolete mushrooms," he said in a press release. "This finding at El Mirón Cave could be the earliest indication of human mushroom use or consumption, which until this point has been unidentified in the Paleolithic," Power concluded.

BOARD NEWS

Luise Asif

New board members were welcomed to their first meeting. **Mushroom Maynia** is progressing smoothly and people can sign up online to volunteer. Danny Miller has prepared all 510 ***Spore Prints*** to be uploaded on the PSMS website. Thank you, Danny. PSMS has been invited by a curator associated with **MOHAI** to provide historic PSMS items for a food exhibit. Ron Post will be the liaison for PSMS and MOHAI. **Liability waivers** will go into effect for field trips starting with the next field trip. The board is exploring developing a proposal for a **Cedar River Watershed Survey Project**, more information to come. A preliminary committee is forming. Work is continuing on clarifying our **privacy policy** for the website. Paul Stamets is speaking at Town Hall on May 4th; it is already sold out. PSMS will have a table at the event. Because of scheduling conflicts, Bellevue College is being considered for this year's **fall show**.

IN SEARCH OF MORELS

George Little

The State Journal Register, April 23, 2015

While walking down what I thought was a deserted dirt road at Jim Edgar Panther Creek, I was caught out in the open. The approaching vehicle lost sight of me when it went down the hill. I had just enough time to stuff my mesh sack of morels into the brush.

The driver stopped to ask if I'd found any mushrooms. I told them I hadn't uncovered anything but ticks and plenty of those.

Trying to be helpful, I described a spot on the north end of the site where I'd found a gunny sack full of morels a couple of years ago. He'd still be on public land with a nearby parking area. He wouldn't have been any happier if I had told him the truth or given him the GPS coordinates of Captain Kidd's treasure.

When he was out of sight, I didn't have a twinge of remorse. He might find a mushroom or two in that area—maybe a boatload of them—maybe not. It was just another skirmish on the front lines of the annual morel wars.

If the guy in the truck were a seasoned hunter with years of batter-dipped golden-fried mushrooms under his belt, he wouldn't have believed me for a second. As my dad would say after sending a novice mushroomer off on a wild goose chase, "What did he think was going to happen?"

ARSENIC IN YELLOWKNIFE MUSHROOMS

CBC News, April 19, 2015

Last year's record-breaking 2014 forest fire season has the Northwest Territories primed for a mushroom picking boom. The territorial government has said that this season's morel mushroom harvest—valuable mushrooms that grow in burned-out areas—could be worth up to $10 million.

But not where would-be pickers near the capital city of Yellowknife are concerned.

The bad news, according to Drew Williams, a spokesperson for the territorial government's Department of Industry, Tourism and Investment, is that "Arsenic and heavy metals can be anticipated to be in mushrooms, which would include morels, around Yellowknife and the surrounding area" because of the now-closed Giant Mine. "The recommended distance from Yellowknife that we have been using in information sessions is 50 km."

The good news, according to Williams, is that there aren't expected to be many morels in the affected area. "The entire morel harvest story is focused on last summer's burn area, which is not in the immediate Yellowknife proximity," Williams said in an e-mail to CBC.... there is no reason to believe that there will be any significant morels in the 50 km perimeter of Yellowknife."

They may look good, but....

TRACING DUST SAMPLES USING FUNGAL DNA

Matt Shipman

http://www.rdmag.com/, April 16, 2015

.Researchers from North Carolina State Univ. and the Univ. of Colorado, Boulder, have developed a statistical model that allows them to tell where a dust sample came from within the continental U.S. based on the DNA of fungi found in the sample.

The primary goal of the research was to develop a new forensic biology tool for law enforcement or archaeologists. "But it may also give us a greater understanding of the invisible ecosystems of microbial life that we know are all around us, but that we don't fully comprehend," says Neal Grantham, a PhD student in statistics at NC State and lead author of a paper on the work.

The researchers developed the model using data from the Wild Life of Our Homes citizen science project conducted by the Your Wild Life lab based at NC State. The project collected dust samples from approximately 1,000 homes across the continental U.S., including samples from 47 of the 48 contiguous states.

The goal of that project was to test the dust samples for DNA to identify the microbial species present in and around our homes. One of the things the project found was that the types of fungi—or fungal taxa—varied widely from region to region.

"Based on that finding, we wanted to determine if you could predict where a dust sample came from based on the fungi present in the sample, and—most of the time—we can," Grantham says.

The researchers developed a model that analyzed the fungal taxa present in a dust sample and predicted where the sample came from. About 5% of the time, the model's predictions were within 35 miles of the correct sampling site. Those were the most accurate predictions. The worst 5% were off by at least 645 miles. The model's median prediction error was 143 miles. However, the research team is already working to make the model more accurate by developing more advanced algorithms.

"The work we've done so far was to determine whether this concept was viable," Grantham says. "Now that we know it is viable, we're developing statistical methods that are better suited to the problem.

"Ultimately, we want to have an online tool for law enforcement to run the results of dust samples taken from a piece of clothing, a body, or a vehicle and get information on where the clothing, body, or vehicle has been," Grantham says.

The paper was published online in *PLOS ONE*.

TREATMENT FOR MUSHROOM POISONING DEVELOPED IN SANTA CRUZ SAVES LIVES

http://www.santacruzsentinel.com/

via *Mycolog*, Humboldt Bay Myco. Soc., March 2015

Follow-up to March 2014 article

A couple from Canada who mistakenly picked and made a meal of deadly mushrooms at Pinnacles National Park got life-saving treatment this week from doctors at Dominican Hospital. "World class," said Kenneth Monroe, 87, a retired commercial fisherman,

cont. on page 4

Poisoning Treatment, *cont. from page 3*

from his hospital bed, thanking Dr. Todd Mitchell for overseeing his care while the doctor was lecturing in Sweden.

Monroe expects to be released Wednesday. His wife, Irene, is "100 percent back to normal," he said, but she declined to talk about the experience.

Mitchell, who checked on the Monroes on Tuesday, pioneered this treatment for amatoxin poisoning eight years ago while working in Dominican Hospital's emergency room. For six years, he has been the primary investigator for a U.S. Food and Drug Administration clinical trial of the treatment using Legalon, an intravenous preparation of silibinin from the common milk thistle. Most clinical trials are based at university medical centers. This one is based at Dominican Hospital, which stocks and distributes the drug, which is made by the Swedish pharmaceutical firm Meda.

Of the 75 patients treated since 2007, Mitchell said, 66 made a "rapid and complete recovery." Dominican treated 11 of the 75 patients, including five since 2009 who rapidly recovered, he said. He consulted in the care of patients in Vietnam and India and has given presentations in Italy, France, Denmark, and Poland.

Monroe, of Victoria, BC, described himself as a lifelong mushroom hunter who got fooled by *Amanita ocreata*, which is similar to *Amanita phalloides*, the death cap. "They don't look like the *Amanita* we have at home," he said. The couple ate steak and mushrooms in their camper between 5 and 6 pm. Thursday. By 1:30 am, Monroe had diarrhea and was throwing up. His wife got sick later that morning. They spent the night in a motel room. Saturday morning, they went to the emergency room at Memorial Hospital in King City.

Mitchell got the call at midnight in Stockholm, where he had been invited to speak on Monday to the Swedish Poisons Information Centre about his amatoxin treatment. He advised Mee Memorial doctors to "very aggressively hydrate" the patients, providing an intravenous saline solution, and to measure the urine output. He called Dominican Hospital and found beds available. Dr. Igbekele Daodu admitted the couple to Dominican, and Mitchell sent him the treatment guidelines, putting the Monroes on the road to recovery. Mitchell thanked the Dominican pharmacy staff who volunteered to deliver the antidote Legalon SIL to Marin and San Francisco this past weekend.

A couple from China also showed up at Marin General Hospital with symptoms of amatoxin poisoning. With treatment, the wife was discharged Sunday, Mitchell said, and her husband, who had severe liver toxicity, was taken to UC San Francisco Medical Center, then made a full recovery after 72 hours of treatment.

Early treatment is key, Mitchell said. Of the six patients who died and three who got a liver transplant, they either started the drug too late, more than four days after ingesting the poison, or had already developed kidney failure. In the past three years, eight people in California died.

"We really need to be contacted as quickly as possible, preferably by the Poison Control Center when they first hear about a case," Mitchell said. "Early contact with our clinical trial is the best way to assure that this new treatment protocol will be initiated quickly, making sure the kidney function is preserved, and that the patient will then rapidly recover with the intravenous silibinin," he said.

WHAT AGRICULTURE CAN LEARN FROM TERMITES AND FUNGI

http://phys.org/, April 16, 2015

Other living creatures were involved in agriculture way before humans. Termite species in Africa and Asia have been cultivating fungi for consumption for tens of millions of years. And they do it well as the harvests of a colony retain the same high yield level for up to several decades. How do termites achieve this? Millions of years of symbiosis between termites and fungi may hold the key to higher agricultural yields, according to evolutionary biologist Duur Aanen of Wageningen University. His research proposal was awarded with a Vici grant of 1.5 million euros from the Netherlands Organization for Scientific Research.

Duur Aanen is fascinated by the question of how termites manage to achieve these long-term high food yields. "Looking at a colony of termites you can see hundreds of thousands of workers that are extremely busy maintaining their own fungus gardens. As a group, their productivity is unprecedented. However, when we imitate this monoculture in the lab, the yield drops considerably after several generations. We think this is caused by unconscious selection of unwanted properties. So the question is: what do the termites do differently to ensure that their success continues for decades? It's clear they make the right selection, but we don't know how they do this."

The answer to the question requires far-reaching evolutionary knowledge, which Aanen hopes to obtain over the next five years with the research group he is assembling using the €1.5 million Vici grant. "The symbiosis between the termites and their fungi shows similarities to agriculture as we know it. Termites cultivate their fungi in large-scale monocultures similar to how modern farmers cultivate their crops. The termites have become fully dependent on their cultivated fungi, like humans have become dependent on their cultivated crops. And not only that: the cultivated fungi have also become fully dependent on the termites for their survival, like our crops have become fully dependent on farmers for their survival. So we never find these fungi outside a termite colony."

Although, as a biologist, Aanen is mainly attracted to the fundamental character of the research, he believes that the resulting knowledge will also find its way into practice. He mentions two interesting applications. "Firstly, fungi are increasingly being used by industry, in the production of enzymes, for example. And of course, there are also cultivated edible mushrooms, the fruiting bodies of fungi. For both applications we sometimes see a strong reduction in productivity, which is probably due to unconscious selection. For companies it is very interesting to see how one could maintain high productivity, as achieved by termites."

FUNGUS USED TO BREW UP NEW FRAGRANCES

Renee Morad

Discovery.com, March 7, 2015
via *The Spore Print*, LA Myco. Soc., March 2015

Would you wear yeast perfume? Boston-based Ginkgo Bioworks is brewing up a new concoction that contains yeast—that's right, the microscopic fungus—that's been genetically engineered to smell like roses.

This mixture could serve as a more convenient and cost-effective alternative to using actual rose oil, a classic perfume component derived from roses picked by hand from fields in Bulgaria and Turkey and then later distilled.

Bioengineers at Gingko coded the genes of the rose to discover which enzymes were responsible for producing its smell. The experts identified specific chemical compounds from these enzymes and then modified the genome of yeast to engineer multiple strands of fungus to produce different metabolic reactions.

So far, French fragrance company Robertet, which uses natural ingredients for perfumes created for clients such as Chloe and Bottega Veneta, has jumped on board to partner with Gingko.

Companies like Robertet believe there's a market for fungus fragrance. Although a rose-like scent can be reproduced by synthetic substitutes that are created by mixing four or five chemicals together, perfumers believe this falls short of the subtleties used to distinguish a high-end perfume.

Culturing microbes is also a welcome improvement from the vast majority of synthetic scents that are produced from petrochemicals.

In the future, microbes could help produce a variety of scents that are cheaper and more consistent, since they're produced in a more controlled environment. The practice could pave the way for more complicated genetically engineered scents that mimic, say, compounds from jungle orchids that resist cultivation, which are very difficult to get ahold of. But one question remains: Will fragrance companies inform customers about the unusual product process on their perfume's label? If not, some of us could soon be spritzing ourselves with yeast and remain completely oblivious. Don't say we didn't warn you.

GUCCI'S TRUFFLE SHUFFLE

Mark Miller

Portland Tribune, April 24, 2015

In the life originally planned for her, Gucci's boundless energy was a hindrance, not an asset.

Marilyn Richen, the yellow Labrador retriever's owner, says she originally took in Gucci for guide dog training. Her dog had recently died, she explains, and she and her partner didn't feel ready to bond with another puppy just yet.

But to hear Richen tell it, Gucci was no good at being a guide dog.

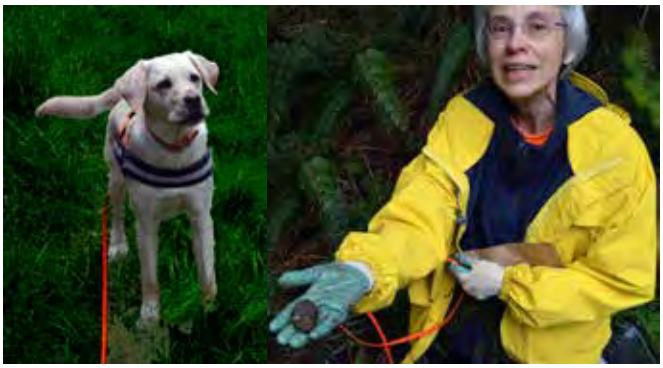
"They need a dog that a blind person can trust, and that means that they don't scavenge, they don't steal food, they don't do a lot of things that dogs often do. And Gucci, in spite of the training we gave her and everything we tried to do, she never became the kind of dog that a blind person could trust," Richen says.

But since washing out of guide dog training, and being adopted into Richen's home, Gucci has taken well to another kind of training: learning how to follow her nose.

On Jan. 22, Gucci took home first place in the inaugural Joriad North American Truffle Dog Championship in Eugene, beating out nearly 30 other amateur truffle-sniffing dogs from across the West Coast.

"Who can imagine a $500 check for something that you're doing for just fun?" Richen asks rhetorically.

According to the Joriad's organizers, during the competition, Gucci found a truffle every one minute, 35 seconds, on average over the course of an hour.



Marilyn Richen holds up an Oregon black truffle that her dog Gucci, also pictured, found Monday, April 13, in the woodlands near Rainier. Gucci found another truffle about 15 minutes later. April is not considered peak truffle season, and Richen had expressed doubt before setting out that she would dig up any at all.

MUSHROOM HUNTER RESCUED FROM MUD

Carl Burnett Jr.

Lancaster Eagle-Gazette, April 15, 2015

LANCASTER, OHIO - A Lancaster man looking for mushrooms Wednesday morning found himself stuck knee deep in mud and needing help in Alley Park.

"I was out mushroom hunting and got off the track," Dave Waters said. "I found myself stuck in the mud and tried to get out and just kept sinking until it was up to my knees. Luckily I had my cell phone with me and could call for help."

Medics and firefighters from both Lancaster and Berne Township responded.

Lancaster firefighters Tod Burwell and Dave Linehan were among the first to reach him. "He was pretty much up to his knees in the mud," Linehan said. Burwell said they were able to free one leg and then the other.

"He had a walking stick with him and we just started getting him to use it to pry and move his feet," Burwell said.

No mushrooms or injuries were reported from the incident, except for a bruised ego and some muddy pants.

"This isn't the first person we've had to rescue from mud," Linehan said. "It happens."

SIX BIZARRE THINGS ABOUT FUNGI

Cat Adams
BBC Campus
http://www.bbc.com/, Feb. 2, 2015

Fungi Gave Us Alcohol

It's impossible to write an article praising fungi without first thanking Kingdom Fungi for getting early humans drunk.

One group of fungi, the yeasts, generates their energy through a process called fermentation. Yeasts take sugar from plants and break it down into a compound they can use for energy, along with the byproducts carbon dioxide and alcohol.

Alcohol poisons most microbes. But because yeasts produce so much alcohol, yeasts have evolved to tolerate very high alcohol concentrations. In a swirling vat of fermenting liquid, other harmful microbes perish.

When harmful microbes perish, humans have a better chance at thriving. Around 10,000 years ago, long before humans invented pasteurization and refrigeration, a drink rich in nutrients but free of disease-causing bacteria was extremely valuable.

In fact, some researchers, such as biomolecular archeologist Patrick McGovern, think early humans started growing and storing grains not because people wanted more bread, but because they wanted more alcohol.

McGovern is the Scientific Director of the Biomolecular Archaeology Project for Cuisine, Fermented Beverages, and Health at the University of Pennsylvania Museum in Philadelphia, US.

He has found humankind's obsession with alcohol goes back much earlier than was previously believed. He was able to sequence the DNA of yeast from Egyptian wine vases over 5,000 years old. The yeast is an ancestor of today's modern brewing yeast, *Saccharomyces cerevisiae*.

In China, McGovern found evidence that people brewed alcohol even earlier, over 9,000 years ago, long before the invention of the wheel. Because, priorities.

Scimat / Science Photo Library)

Yeast in a fermented drink.

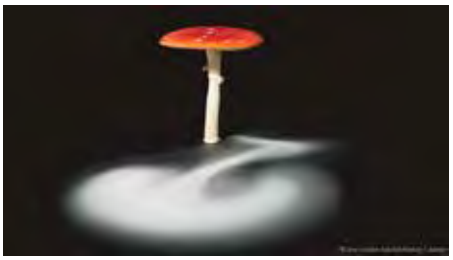
Mushrooms Make Their Own Wind

Yeasts produce ethanol in striking quantities, but mushrooms can create an actual force: wind.

Consider a mushroom as the fungal equivalent to the fruit of a tree. The cap of the mushroom is full of spores, much like a fruit is full of seeds. But unlike a tree, the majority of an individual fungus is hidden underground, usually forming a network that connects multiple fungi together.

It behooves a mushroom to send its spore-children as far away as possible, so the offspring don't compete with their parent for nutrients, for example. And unlike many tree fruits, only a few animals disperse mushrooms. Instead of relying on others to do their dirty work, mushrooms make use of the tools they have. Their main tool is water.

When it's time to eject their spores, mushrooms release water vapor. The water evaporates, cooling the air immediately surrounding the mushroom. This cooler air is denser than warm air, and so it flows out and away from the mushroom, creating lift. This lift can carry spores up to 4 inches (10 cm) both horizontally and vertically.



Yon Marsh Natural History / Alamy

Mushroom spores need to travel.

Some Fungi Make Zombies

While some fungi produce their own wind, other fungi produce the stuff of nightmares.

In tropical forests around the world, species of the fungal genus *Ophiocodyceps* infect carpenter ants, landing on the ant and then burrowing into its brain.

But this is no simple brain-siege. In Thailand, for example, *Ophiocordyceps unilateralis* first causes the ant to walk erratically, eventually plummeting from its normal home in the canopy to the forest floor below. The fungus then directs the ant to traverse up trees a precise number of centimeters, just less than a meter above the ground, where the temperature and humidity are ideal for fungi to thrive.

The fungus can control not only the height the ant travels to, but also the direction the ant faces, which is usually north-northwest. An uninfected ant would normally not bite a leaf, but infected ants do, clamping down on the underside of a leaf, almost always in the very middle of the leaf, where it is strongest. Like something from an science fiction story, the zombie ant bites down at precisely solar noon.

The ant then dies in this unusual position, stiff with postmortem lockjaw due to muscle atrophy from the fungi rapidly growing in its head. For up to two weeks, the ant corpse remains locked to the leaf while the fungus reproduces, eventually raining spores on unsuspecting healthy ants walking below, carrying food to their nests in the canopy.

And the zombification cycle repeats.

The fungus Ophiocordyceps unilateralis *has turned this ant into a zombie. New spores are spread from the staff that protrudes through its neck.*

The zombie ant fungus *Ophiocordyceps* has perfected zombification to a science that has inspired both movies and video games, and was recently the topic of a science crowd-funding campaign to determine which genes are important for the fungus to control its host.

Everybody loves a good zombie story, perhaps the zombie-makers most of all.

One Fungus Accelerates Faster Than Any Other Organism on Earth

When it comes to maximizing physics to evict their children, fungi leave other life in the dust. Not only can mushrooms generate their own wind, but one poo-dwelling fungus, *Pilobolus crystallinus*, accelerates faster than a speeding bullet, and faster than any other organism on the planet.

Pilobolus isn't shaped like a typical mushroom. It's reminiscent of a tiny, translucent snake sporting a sort of wonky bowler hat. The rimless hat is actually a sac of spores. Unsurprisingly, *Pilobolus* is also known as the hat-thrower fungus, because it "throws" its spore-filled "hat."

Pilobolus crystallinus.

Fungi Can Have over 28,000 Sexes

If you've ever agonized over finding that perfect partner among a sea of mediocre potential love matches, take solace. Life could be much more complicated: you could be a split gill fungus, hunting for a mate.

Granted, some fungi are fairly tame in the bedroom. Yeasts have only two sexes, controlled by two sex genes called, say, gene 1 and gene 2. A type 1 yeast is compatible with all type 2 yeasts, or half the population.

The drawback of a simple two-gene system is that an individual is also sexually compatible with half its siblings. If a sibling is the only compatible fungus nearby, the two can hook up, but their children will lack genetic diversity.

We find the opposite approach in the split gill fungus, *Schizophyllum commune*. In this widespread species, each sex gene can have hundreds of versions. In order to be sexually compatible, an individual must find a mate that has different versions of both genes. In other words, the mate has to be the opposite "sex" at every gene in order to do the deed.

The sexy split gill, Schizophyllum commune.

Jason Hollinger

All these different sexes, up to 28,000 of them, might seem unnecessary, but the higher number of combinations helps keep genes shuffled in case of a new threat. Threats can be environmental such as drought or fire, or biological. Such as parasites.

Parasites on fungi can result in rare delicacies such as the Lobster mushroom, *Hypomyces lactifluorum*. This parasitic fungus grows on other edible mushrooms, turning them a reddish color similar to a cooked lobster. The resulting FrankenFungus may look strange, but is considered a delicacy that sells for over $20 a pound.

The Largest Living Thing on Earth is a Fungus

Last but far from least, fungi also outcompete other living things in terms of their epic proportions. A single individual fungus in Oregon spans 3.7 square miles, and is between 1,900 and 8,650 years old. This truly humongous fungus grew undetected until the 21st century, however.

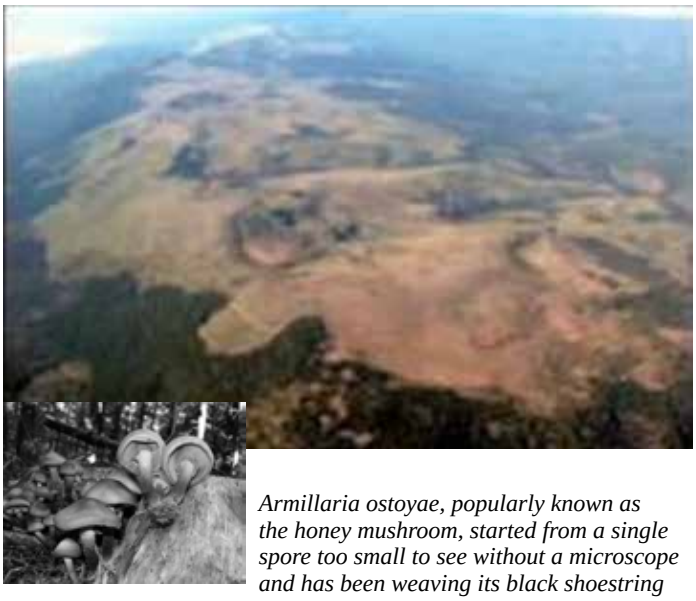
Fungi such as the honey mushroom, *Armillaria solidipe*s, grow mostly underground. This particular species is a tree parasite, causing white rot root disease on living trees and growing as a tube-like form called a hypha. The hyphae grow and branch to form an underground network, connecting roots between multiple trees.

We only see mushrooms breach the surface when the fungus reproduces sexually. If a fungus never has sex, we might not know it's there.

Scientists were only able to discover that the honey mushroom can grow to such extensive sizes with the advent of new technology to sequence DNA from multiple mushrooms, and finding that the mushrooms were all genetically identical.

Using this same DNA sequencing approach, scientists have also begun to sequence communities of microscopic fungi living in soil and water, inside plants and animals, and even in the air itself. The rate at which scientists find unique fungal DNA has raised the estimate of the total number of fungi on Earth to upwards of 5 million species.

All these undiscovered species beg the question, what other fascinating feats might these furtive fungi be hiding?



Armillaria ostoyae, popularly known as the honey mushroom, started from a single spore too small to see without a microscope and has been weaving its black shoestring filaments through the forest for an estimated 2,400 years. Now about 880 hectares [*2174.5 acres*] *of the Malheur National Forest in eastern Oregon are filled with mushrooms.*

TRUFFLES CONTAIN "BLISS" MOLECULE

Nic Fleming

http://www.bbc.com/, Dec. 12, 2014

The demeanor of pigs and dogs used by truffle hunters when they are close to making a find might best be described as animated. Or possibly even frantic. So what is it about the subterranean delicacies that triggers such vigorous enthusiasm in the animals trained to sniff them out?

Italian scientists may have hit on the answer. It turns out the black truffle (*Tuber melanosporum*) contains a "bliss molecule" similar to the substance that gives cannabis its psychoactive properties.

Mauro Maccarrone, of the Campus Bio-Medico University of Rome, Italy, and colleagues have revealed the highly-prized fungi produce anandamide, a compound that triggers the release of mood-enhancing chemicals in the human brain, and does so using the same biological mechanism as tetrahydrocannabinol (THC), the chemical responsible for producing the mind-bending effects of marijuana.

Black truffles get their color from dark melanin pigments. Research published by Maccarrone and his colleagues in 2012 showed that in humans melanin production is triggered by the release of anandamide.

The researchers were intrigued when their tests revealed the truffles had the means to make anandamide and contained the chemical but did not have the receptors to which it binds and that would allow it to trigger effects.

"This suggests they do not make anandamide for themselves," said Maccarrone. "Our interpretation is that they make it to attract animals that do have these receptors."

Truffles rely on being unearthed and eaten by animals so that their spores are spread in their dung. Animals known to eat truffles include pigs, meerkats, grizzly bears, chacma baboons and a shy, elusive marsupial called the long-footed potoroo.

MUSHROOM ASTROLOGY **Bob Lehman, LAMS**

Taurus (Apr. 20 – May 20): You enjoy the aesthetic and sensual qualities of mushrooms—their forms, colors, textures, aromas, and flavors—and you prepare tasty dishes from the edible ones. You insistently search for particular species that meet you qualifications, although you also may fill your basket with mushrooms that you never use. You like the idea of living off the land and not having to pay for your food. You are protective about your favorite hunting place.

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