SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 591 April 2023

THE POTENTIALLY DEADLY FUNGUS *CANDIDA AURIS* IS SPREADING QUICKLY IN THE U.S.

Ayana Archie
https://www.npr.org/, Mar. 21, 2023

Shawn Lockhart/CDC

Undated photo of a strain of Candida auris cultured in a Petri dish.

The fungus *Candida auris* is becoming a more dangerous public health care threat, as the number of drug-resistant cases jumped in 2021, the Centers for Disease Control and Prevention said Monday.

The fungus is resistant to several antifungal medications, but the CDC said it is not seen as a threat to healthy people. Still, the national public health agency is calling *C. auris* an urgent threat because of its resistance to medications. It can cause serious illness and death in people who are already sick, use invasive medical devices, or have long or frequent stays at health care facilities.

About 30 percent to 60 percent of infected people have died from the yeast, though that is "based on information from a limited number of patients," the CDC said.

"The rapid rise and geographic spread of cases is concerning and emphasizes the need for continued surveillance, expanded lab capacity, quicker diagnostic tests, and adherence to proven infection prevention and control," CDC epidemiologist Dr. Meghan Lyman said.

Candida auris has been reported in more than 30 countries, and was first detected in the U.S. in 2016. Between then and December 2021, there have been 3,270 clinical cases in the U.S. in which patients have been infected and 7,413 screening cases, in which the fungus was present in patients but was not causing infection, the CDC said.

It can spread from person to person or from interactions with contaminated surfaces.

The case count may have increased so quickly due to a lack of prevention, poor control methods in health care facilities, and better efforts to detect cases, the CDC said.

The yeast is identified through testing bodily fluids, but it has alarmed the CDC because it is more difficult to distinguish from other yeasts and may be misdiagnosed, making it harder to contain.

Ed. note: The alarming spread of the antifungal-resistant fungus Candida auris in hospitals across the U.S. was the most widely reported mushroom-related news this past month.

SCIENTISTS DISCOVER RARE FUNGUS THAT INFECTS AND TAKES OVER THE BODIES OF TRAP DOOR SPIDERS

Stephanie Hogan
https://www.cbc.ca/, Mar. 20, 2023

With recent attention around the HBO drama *The Last of Us* and its infectious fungus that turns people into zombies, the timing of a recent discovery in the Brazilian rainforest perhaps couldn't have been better.

Mycologist João Araújo is one of a team of scientists who believe they have discovered a new parasitic fungus that infects a species of spiders and takes over their bodies.

"It was amazing," Araújo told *As It Happens* host Nil Köksal.

Araújo and his colleagues were doing research as part of a collaboration between England's Royal Botanic Gardens, Kew; the New York Botanical Garden; and the Rio de Janeiro Botanical Garden.

He and his colleagues were walking in the rainforests north of Rio de Janeiro—actually, crawling on the forest floor "to see the low level fungi"—when he came across something that looked like a mushroom stalk emerging from a hole.

"It was purple," he said.

João Araújo

The purple parasitic fungus, discovered in Brazil's Atlantic rainforest, pokes out of a trapdoor spider's burrow after wrapping itself around the arachnid.

The purple hue was unusual, said Araújo, who is the assistant curator of mycology at the New York Botanical Garden. He was quite certain they had stumbled on something previously unknown.

The fungus was cylindrical—it looked like the stalk of a mushroom without the cap—and was also quite "robust" according to Araújo, measuring about 10 centimeters in length. It was a *Cordyceps* sp., a fungus which typically attack a host species,

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CALENDAR

Apr. 11	Membership meeting, in person and via Zoom, 7:30 pm, CUH
Apr. 17	Board meeting, 7:30 pm, CUH
Apr. 24	*Spore Prints* deadline

BOARD NEWS

Marcus Sarracino

Election Results: We are excited to welcome incoming new officers President Colin Meyer and Secretary Carolina Kohler and board members Marion Richards, Sandra Ruffner, and Pei Pei Sung, whose terms officially start at the general membership meeting on April 11. Congratulations also to returning board members Wren Hudgins and Joe Zapotosky on their reelection. We are deeply grateful to the outgoing board members—two-term President Randy Richardson, Molly Watts, and Bruce Richardson—for their contributions over their term(s). PSMS is a volunteer-led organization and only runs because of dedicated individuals like these. They will be missed. We look forward to working with the new PSMS board and their infusion of perspectives.

On the topic of changes in the board, Thad Steffen has submitted his resignation citing life imbalance and Kelsey Hudson will be his replacement with a term ending in March 2024.

Committees: Anyone interested in serving as the chair of the Volunteer Committee or the Scholarship Committee should reach out to the president or vice president. The PSMS activities that we all enjoy face extinction unless new folks step up and offer to help lead them. A new committee has been formed for PSMS' involvement in a MycoBlitz being organized by Stephen Russel and the Hoosier Mycological Society to expand our understanding of fungal diversity on a national level.

Misc.: We will not be hosting a Mushroom Maynia event this year, but hope to resume this delightful spring event next year. We have finalized the policies and procedures so the PSMS library is open and ready for members to check out books.

Lastly, while this is my final message to you as the interim secretary of PSMS, I will remain on the board and as co-chair of the Mycophagy Committee and am excited about all the fungi-filled events this year. Let us cheer for Spring is almost here!

MEMBERSHIP MEETING

Scott Maxwell

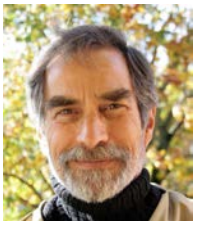
Lowel Dietz

The general membership meeting on April 11, 2023, will once again be a hybrid including both in-person and Zoom at the Center for Urban Horticulture. We will start letting in-person attendees in at about 7:00 pm and Zoom attendees at about 7:20 pm.

This month Lowell Dietz will be presenting on a topic that will interest mushroomers, cultivators, and gardeners who have an interest in the upcoming growing and mushrooming season. Lowell's presentation is titled "Cultivating Mushrooms while Sequestering Carbon to Create Regenerative Soil." In Lowell's words, "He will reveal how he stumbled across ancient truth. Seeking to extract more heat from wood he used to cook straw for mushroom cultivation, he was blessed with a byproduct: biochar. This was added to another byproduct, worm castings. The mixture proved to be similar to the regenerative soil created by ancient farmers along the Amazon and its tributaries. When biochar is used as a soil additive, carbon is bound up in soil, so the energy to cook the straw is carbon negative. Gardeners can use this information to create soil that does not need fertilizer. Soil bacteria stash nutrients (normally outgassed by plants) into biochar 'lockers.'" Also per Lowell, "Circumspect thinking inspired by natural processes has the potential to reverse climate change, end food insecurity, and free agriculture from expensive and harmful chemical addiction." To find out what this means, you should attend this upcoming presentation.

Lowell is the owner of Dietz Construction and the Dietz Mushroom Farm in Sequim, Washington. He is the previous president and is a lifetime member of the Kitsap Peninsula Mycological Society. He has a close relationship with the Master Gardener Program sponsored by Washington State University and is a frequent presenter on permaculture and mushroom cultivation. He is also the creator of a product he calls "Sequim Terra Preta." He is also an expert on mushroom cultivation and vermiculture.

PRESIDENT'S MESSAGE — Randy Richardson



Thank goodness for term limits. I continue to wish that we could get back to the standard of the first 40 years of the club's existence when no one was president more than 2 years. But, despite the time and energy consumed by this role, overall it has been enjoyable, due mainly to all the great help—board members, committee members, and willing volunteers. **I am very appreciative to all those who have made my time as president so worthwhile**.

At the start of my second year, I had to cancel the beloved Survivor's Banquet and learn more about Zoom than I'd ever imagined. Later we received a gift of Alexander Smith's book and 3D slides which I am still trying to figure a good way to present (there are only 19 polarized glasses). With help we at last found a new insurance company—many members did not know that our prior carrier forbade us from cooking or consuming mushrooms! And we strengthened the club's finances. Yet left to improve are youth education outreach, carpooling, etc. With the energy of our valued volunteers, these and other issues can be overcome.

We welcome our new President, Colin Meyer.

GOLDEN MUSHROOM AWARD — Randy Richardson

The Patrice Benson Golden Mushroom Award is presented yearly to a member or members of PSMS in recognition of their exemplary dedication and long-standing service to the Puget Sound Mycological Society. These individuals have been instrumental in contributing to, shaping, and developing our group in a large way. We thank them for their countless hours of service on our Society's behalf.

This year, we have two winners, Gwen Heib and Dory Maubach.

Gwen Heib

Gwen Heib

Gwen and her husband, Ted, joined PSMS in 1970, putting them in the select group of just a few living people who've continuously been members of our club for over 50 years. Brian Luther remembers Gwen and Ted being at just about all the early PSMS field trips, with their daughter and a pet Parakeet named Graystoke. Brian will never forget how they'd potty trained it to poop on demand, by saying "go," while holding it out a ways. Gwen and Ted loved the social aspect of PSMS, as well as searching for mushrooms. With Ted's classic "mountain man" look, he appeared on TV in some of the *Northern Exposure* episodes, filmed across the mountains in Roslyn. Sadly Ted passed away in 2011.

If you want to hear lots more stories about Gwen and Ken, catch Brian at a field trip. For as long as he can remember, Gwen has been actively involved as a volunteer for our club, helping at field trips, meetings, Mushroom Maynia, and at the exhibit, and that continues to this day. Now in her 80s, she is still very active, and the PSMS board strongly feels she is deserving of our PSMS Golden Mushroom Award, which comes with lifetime membership.

Thanks, Gwen, for your friendship and all you've done for PSMS over the years.

Dory Maubach

Dory Maubach

Dory joined PSMS in 1996, and has been a stalwart in the Bridle Trails project, one of a small group who always come. She has been a field trip host, and is most often seen now doing microscopy at Ben Woo Forays, both microscopy and the kids table at the fall exhibit, and at Mushroom Maynia. She is particularly good with kids. Unseen, she spends hours preparing slides for microscopy classes. Dory was part of search crews for Hildegard Hendrickson. She initially resurrected the fluorescent display at the fall show. Outside PSMS, Dory has taught and tutored biology and done prairie reclamation in Montana as part of her interest in environmental and ecological issues. Dory is invaluable to our volunteer coordinators, since she is so willing to jump in and help out on just about anything.

Thank you, Dory.

BRACKET FUNGI KNOW WHICH WAY IS UP: THIS IS WHY — Susan Pike

https://www.seacoastonline.com/, Mar. 28, 2023

I was thinking I should write about a spring-like subject, the dawn chorus that now greets us every morning or the skunk cabbage and rhubarb pushing up through the thin remains of the snow. But then I found the coolest fungi that made me forget about signs of spring and instead focus on bracket fungi, woody shelf fungi that had been around all winter, survivors of the cold.

Bracket fungi were growing out of a tree that had been toppled by past snowstorms and high winds. What caught my eye were the convoluted shapes some of the fungi had attained in their attempt to grow in the correct orientation in response to their tree now lying almost upside down.

Just like humans, most plants and fungi can sense gravity. Just think about how seeds "know" to send their roots down and their shoots up while in the soil, away from the light. Charles Darwin was one of the first to recognize and document this phenomenon, gravitropism, in plants. Tropism is the technical term for the growth or turning of an organism in response to an environmental stimulus, like light (think about flowers that track the sun—positive phototropism) or, in this case, gravity. Positive gravitropism means growing toward the source of gravity (downward) while negative gravitropism would be growing away.

Fungi, which are more closely related to us than they are to plants, can sense gravity and are often gravitropic. Mycologist Britt Bunyard, writing in the journal *FUNGI* (volume 5:4, 2012) has a wonderful description of his first experience with fungi gravitropism. "I had made a nice collection of *Amanita muscaria* (these are the stereotypical white-stemmed mushrooms with red caps) and brought the specimens into the lab for all to enjoy. The following day, I returned to the table where I had left my mushrooms and

cont. on page 6

Brazilian Spider Fungus, *cont. from page 1*

such as an insect, by using mycelium to invade and eventually replace the host tissue.

Araújo said what they discovered the fungus was doing with trapdoor spiders in the Brazilian rainforest was even more interesting than the zombies in *The Last of Us*—though he admits as someone who has worked in the field for 13 years, he may be a bit biased.

"I live these fungi everyday," he said, "so I think they're amazing." He points to fungi's ability to adapt and develop new ways to invade a new host.

"The true biology and evolution and diversity—and the strategies that they use to infect the different hosts, from ants or flying wasps to burrow spiders... I think the whole story is beautiful."

Trapdoor spiders build burrows in the ground with a little door made from their silk. They rarely come out and instead capture their prey by quickly opening the door and grabbing an insect as it passes by.

Araújo says the newly discovered fungus—which doesn't have a name yet—was managing to throw its spores into the burrow of the spider, entrapping and, eventually, mummifying it.

"We are not sure yet how their life cycle works because this is a very, very new discovery," he said, but added that he does know the fungus prevents other pathogens, such as other fungi or bacteria, from getting to the spider.

"Imagine how many other soil micro-organisms are trying to penetrate and to consume this spider," he said. "So the fungus mummifies the spider in order to keep it protected."

Araújo is hoping that the newfound pop culture interest in fungi translates into more research. He says the long-neglected field of mycology could hold the key to dealing with new pathogens that destroy forests or crops—or potentially even cancers.

"We can use fungi to tackle this these problems, but we need basic research," he said.

"We need foundational, taxonomic, systematic, and evolutionary studies of these fungi. We need to understand them first before trying to use them for something."

FUNGUS-KILLING COMPOUNDS NAMED AFTER ACTOR KEANU REEVES

Jennifer Sandlin

https://boingboing.net/, Mar, 20, 2023

Research scientists at the Leibniz Institute for Natural Product Research and Infection Biology in Jena, Germany, recently discovered bacterial compounds that they have named "keanumycins," after actor Keanu Reeves, because of their ability to evade predatory amoeba and slay harmful enemies. *Esquire* magazine explains.

Lead author Sebastian Götze described the keanumycins as creating "holes" in the surface of the pathogen, causing it to "bleed" to death. This lethal action is similar to the way Reeves dispatches his foes in the *John Wick* films.

In a study recently published in the *Journal of the American Chemical Society*, lead author Götze and his colleagues describe keanumycins' strength against the common *Botrytis cinerea, a* pest that causes a gray mold rot. *Botrytis cinerea* affects more than 200 types of fruits and vegetables, including strawberries and grapes, per the statement. The researchers used keanumycins to significantly clear this blight from hydrangea leaves.

Keanumycins don't just help plants fight off fungal diseases, though—they are also great news for humans. *Esquire* magazine explains that "They also work against *Candida albicans*, a naturally occurring fungus in the human body that can cause infection when it overproduces."

These keanumycins could be a game changer, and play a role in the creation of new antifungals for humans and plants. *Esquire* calls this discovery a "big deal," given that "many fungi have become resistant to drugs and substances that have been used to kill them in the past." *Fortune* magazine further explains:

The discovery could lead to the creation of new antifungals for both crops and people—a welcome development given the global threat posed by antimicrobial resistance. Antimicrobial resistance, which includes antibiotic resistance, occurs when bacteria, viruses, fungi, and parasites evolve over time, becoming less responsive to medicines, making infections increasingly difficult, or impossible, to treat.

And *Smithsonian magazine* adds that, "The newly identified compounds could be an affordable and environmentally friendly alternative to fungus-killing chemicals used in agriculture."

BARTENDERS HAVE FUN WITH FUNGI

Allie Corey

https://www.fox13news.com/, Mar. 21, 2023

SAFETY HARBOR, Fla. - Gigglewaters restaurant and movie theater in Safety Harbor likes to shake things up at the bar. "We try to follow trends that are happening in cocktails, and we try to look for interesting opportunities to kind of explore what's happening in the cocktail world," said owner Rachel Wilson.

For example, the Shroomtini, a cocktail with mushrooms.

Gigglewaters Shroomtini.

"We looked at different ways to bring mushrooms to cocktails to kind of create balance and interest in them. We like to bring something from a movie to a cocktail, so we find a way to create a cocktail that's inspired by the movie. Everyone who has tried them has been pleasantly surprised," said Wilson.

The lion's mane mushrooms used in this Shroomtini come from Joe Lovino's Cactus Hat Mushrooms in Tampa. "This is a relatively new experience for me. I've never had a mushroom cocktail," said Lovino. He's pleasantly surprised after his first sip.

"I don't drink martinis but if this is what it tastes like I'm now a fan. I think the dried lion's mane in it just makes it more savory, and it's enjoyable to drink. I found myself wanting to gulp it more than sip," said Lovino.

He was also impressed with the Lion's Mane lemonade. "I didn't get the mushroom in it, which to me is a plus. I don't really want

to taste mushrooms in my drinks, but this is really pleasant," said Lovino.

Until now, his go-to drink has been his lion's mane coffee.

"I think mushrooms belong in just about anything these days. The health benefits are being discovered and are very promising for things like focus and memory, especially for lion's mane. It's actually very rewarding to see something you grew evolve into a drink. I never thought mushrooms would make their way into cocktails but here we are, and it's great," said Iovino.

SARASOTA ENTREPRENEUR GROWING MUSHROOMS ON TOP OF THE OCEAN

Selene San Felice

https://www.axios.com/, Mar. 19, 2023

A Sarasota man says he's found the key to sustainable farming—good morels.

Todd Kleperis is growing mushrooms on the waters off Siesta Key in what he calls the OPod. The pod launched on the water two weeks ago, and within the next two months he tells Axios his mushrooms will be in high-end Sarasota restaurants, though he won't yet say which ones.

The pod is a form of ag-tech similar to indoor vertical farming efforts like Brick Street Farms in St. Petersburg.

Todd Kleperis

Kleperis and his pod (left) and the mushrooms growing inside it (right).

Why it matters: Climate change is taking its toll on the farming industry, with climbing temperatures costing farmers an estimated $27 billion in crop insurance losses between 1991 and 2017.

Hurricane Ian is a prime example of that in Florida, costing the state more than $1 billion in agriculture losses, the University of Florida reported in a new estimate last month. High winds and drenching rains hit our citrus, cattle, vegetable, and melon operations the hardest.

Kleperis' pod uses sustainable power and water, reducing costs and environmental impact compared to traditional farming, he says.

How it works: Kleperis' pod uses uses a solar-powered generation system that desalinates ocean water to grow mushrooms in a temperature-controlled environment inside a sea-floating chamber.

Kleperis says he chose mushrooms because they're easiest to grow with a small amount of water, power, and space. And they're nutrient-dense. Once the mushrooms are harvested, he can replant them in soil inside the pod and start the process all over again.

In future harvesting cycles, he'd like to expand into leafy greens and other fruits and vegetables.

The intrigue: Kleperis says his pod is the first of its kind to grow food sustainably on the water.

The closest thing that compares, he says, is a company called Nemo's Garden that's growing food in domes underwater off the coast of Italy.

How it happened: Kleperis founded his company, Tekmara, last year to get the pod project off the ground. He says he built the pod itself over the course of about 5 months in his garage.

Tekmara is part of the Tampa Bay Innovation Center's most recent Climate Tech cohort.

Kleperis tells Axios he wants to use the pod not only for sustainable farming, but to raise awareness of the importance of protecting our oceans as a food resource.

"If we can get out in front of it, we can change a whole industry and radically help populations all around the world," he says.

MORE CASES OF FUNGAL ILLNESS IN MICHIGAN PAPER MILL WORKERS

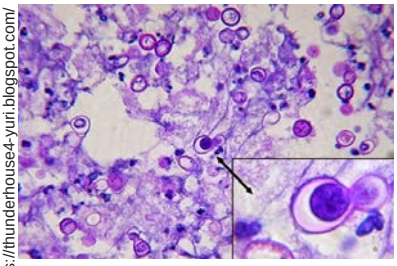
https://www.miningjournal.net/, Mar. 28, 2023

ESCANABA, MI - Public Health Delta and Menominee (PHDM) Counties is still investigating a string of fungal pneumonia cases associated with the Escanaba Billerud Paper Mill as the number of cases continues to climb.

According to PHDM, 14 cases have been confirmed of blastomycosis, an infection caused by fungi called *Blastomyces dermatitidis* or *Blastomyces gilchristii*.

A confirmed case is a person with symptoms of blastomycosis and where the fungus has either been grown from a culture or seen by microscope in a specimen. Probable cases are when the individual has the symptoms of blastomycosis and has had a positive antigen or antibody test identifying the fungus.

https://thunderhouse4-yuri.blogspot.com/



Blastomyces dermatitidis. Numerous cells are seen within the FNA of material from the lung. The insert shows one cell in particular and the large based budding as a daughter cell is being produced.(1000X, PAS, Nikon).

The number of confirmed and probable cases is an increase from what was reported by PHDM late last week. As of March 17, there were 35 confirmed or probable cases of blastomycosis associated with the mill. PHDM was first made aware of the cluster of atypical pneumonia infections among mill employees Feb. 28, though some mill workers developed symptoms in January.

Over the past five years, an average of 26 cases of blastomycosis has been reported annually in the entire state of Michigan.

At the request of Billerud, the National Institute for Occupational Safety and Health, an OSHA research agency, will perform a health hazard evaluation focused on studying the health and safety

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Michigan Blastomycosis, *cont from page 5*

of Escanaba mill employees. A team of experts from NIOSH, the Centers for Disease Control and Prevention, the Michigan Department of Health and Human Services, and PHDM will visit the site to tour the mill. During the tour, the team will meet with members of management, the mill's occupational health and safety team, and union representatives.

The evaluation is expected to continue after the on-site visit is complete, as the NIOSH team works to analyze data and review the case investigation collected by PHDM.

PHDM is still interviewing patients identified by health care providers as potentially having blastomycosis. Information from those interviews is being shared with MDHHS and NIOSH.

Billerud has taken a number of steps to help protect the workers, including providing N95 masks, inspecting ventilation systems, changing filters, and deep cleaning common areas.

"Though no causal link to our mill has been confirmed, we continue to take this matter very seriously," said Brian Peterson, operations vice president at the Billerud Escanaba Mill.

The fungi that cause blastomycosis grow in moist soils and decomposing matter, such as wood and leaves. A specific source of the fungus causing the outbreak at the Escanaba paper mill has not been identified, but because the fungi are common in the environment in the Upper Peninsula., identifying a specific source of exposure can be difficult.

"The addition of an independent review by NIOSH will deepen the investigation. We continue to work with OSHA, PHDM, and an industrial hygienist to determine common areas where affected employees have been," Peterson said.

People can get blastomycosis infections by breathing in the fungal spores; however, most people who inhale the spores do not get sick. Those who do get sick can develop a cough, which sometimes presents with blood, as well as fever, chest pain, difficulty breathing, night sweats, fatigue, weight loss, muscle aches, and joint pain.

There is no vaccine for blastomycosis, and the disease cannot be spread between people or between people and animals.

Blastomycosis is treated with antifungal medications. Treatment for the disease is most effective when started as soon as possible after diagnosis by a health care provider.

OREGON APPROVES NATION'S FIRST PSILOCYBIN GROWER LICENSE TO SUPPLY PSYCHEDELIC SERVICE CENTERS **Kyle Jaeger**

https://www.marijuanamoment.net/, Mar. 22, 2023

Oregon regulators have approved the nation's first-ever psilocybin production license under a novel state-based regulatory framework for broad access to the psychedelic that voters approved in 2020.

The Oregon Health Authority (OHA) announced on Wednesday that they've granted a psilocybin manufacturer license to the woman-owned business Satori Farms PDX LLC.

The so-called magic mushrooms produced at the manufacturing facility will help supply future businesses where people can go to have the psychedelic administered in a supervised environment.

Regulators were tasked under the historic voter-approved initiative to begin issuing licenses for the manufacturing, testing, and administering of psilocybin by January 2, 2023. The Oregon Psilocybin Services (OPS) said they expect to issue additional licenses for those categories "in the coming months."

"We congratulate Tori Armbrust of Satori Farms PDX LLC for being issued the first psilocybin license in Oregon's history and for representing women leading the way for the emerging psilocybin ecosystem," OPS Section Manager Angie Allbee said in a press release.

"We are committed to fostering an inclusive partnership with our regulated community to ensure safe, effective and equitable psilocybin services throughout the state," Allbee said.

Psilocybe cubensis.

While there are research institutions that have been licensed by the federal Drug Enforcement Administration to propagate psilocybin mushrooms for study purposes, this development in Oregon marks a historic first in that the license was issued at the state level for broad administration to anyone who feels they could benefit from the psychedelic.

OHA has also approved 48 psilocybin worker permits so far. A total of 224 worker permit and license applications has been submitted to the state as of Wednesday.

But the implementation of the psilocybin initiative in Oregon hasn't gone without hiccups.

There's a major question about local access, for example, as more than 100 cities across the state have enacted two-year moratoriums or bans prohibiting the service centers from being established in their jurisdictions.

Also, the Netherlands-based Synthesis Institute that invested heavily in creating a training program for facilitators to administer psilocybin at the future centers recently disclosed that it ran out of funding.

The rule-making process has proved contentious at times, too. Some advocates have raised concerns over the perception that regulators were prioritizing for-profit corporations to manage the psilocybin services program over community-based organizations and indigenous groups.

Bracket Fungi, *cont. from page 3*

was surprised to find them—no longer pencil-straight. During the night they had continued to "grow." Or so I thought. The stems had become curved with the mushroom caps no longer resting on the table, instead resuming a position above and horizontal to the surface." Mushrooms do this to orient their caps in such a way that the spore-bearing parts (the gills or pores) are directed downward for spore dispersal.

Susan Pike

Convoluted bracket fungi.

What I find so interesting is how fungi know which way is down, how they sense gravity. In our vestibular system, deep within the inner ear, lie organs that contain tiny stone-like calcium carbonate crystals embedded in a gelatinous matrix. These particles weigh against tiny sensory hairs that line the inside of these organs, telling us which way is down. If you spin or shake your head you often feel dizzy or disoriented because the particles aren't settled in the downward position anymore. It turns out fungi use a similar system to detect gravity. The nuclei in fungal cells act like the calcium carbonate crystals in human vestibular systems. The fungal nuclei settle against the internal skeleton of the cell, tugging on filaments inside the cell, signaling which way is up. In the case of Bunyard's lab bench *Amanita* mushrooms, when he laid the mushrooms on their sides the nuclei settled in a different orientation, pulling on the filaments, triggering cellular changes that resulted in the bending of the stem of the mushroom. I can't wait to pick some mushrooms and try this!

Susan Pike

Upside down bracket fungus with little one right side up growing from it.

So, like plants and like humans, fungi know which way is up. Their response to the pull of gravity was tested back in 1996 on the International Space Station. Fungi grown in zero gravity grew in random directions.

However, it turns out this doesn't quite explain what was happening to my bracket fungi. Instead of turning towards or away from the pull of gravity, bracket fungi form new brackets; one term for this is gravimorphogenesis. According to Bunyard if a bracket fungus is repositioned other than perfectly horizontal, a new bracket will form growing horizontally to the surface, often on top of or out of the original fungus. This is what I was seeing in the bracket fungi in my woods. Tiny new fungi growing out of the original with the correct gravitational orientation after their host tree had fallen.

Next time you are in the woods, play nature detective. If a tree has just fallen, its mushrooms will be oriented in the original position. But give them some time and new bracket mushrooms will grow or old stemmed mushrooms will turn, ensuring that they are correctly oriented to the pull of gravity.

DEMAND FOR TRUFFLES IN DUBAI IS SOARING. HERE'S THE MAN TO CALL

Lisa Fleisher

The Seattle Times, Mar. 26, 2023

One weekend in 2020, chef Francesco Guarracino got a call from one of his regular customers, a very wealthy man flying back to Dubai, United Arab Emirates, from London. The diner was looking forward to a favorite dish with truffles that evening at Roberto's, where Guarracino is group executive chef.

But Guarracino knew he didn't have enough truffle in the kitchen, so he made a call to one man: Massimo Vidoni. Vidoni, a 54-year-old Italian native, has become known in Dubai as the "Truffleman," a name he says a chef coined years ago. The Truffleman excused himself from a family brunch to personally deliver just enough high-quality product to Roberto's.

"The service Massimo provides is second to none," Guarracino said. "That's why he cracked the market."

Vidoni's business, Italtouch, has become the go-to supplier of truffles and caviar for a roster of 500 clients across the Gulf region that include Michelin-starred restaurants and winners of the regional 50 Best restaurant awards. The company imported more than 8,000 pounds of truffles in 2022 from countries including Italy, France, and Spain.

Demand has never been stronger for truffles in Dubai, where diners expect to be offered dishes adorned with caviar, truffles, or even gold leaf—at a premium price, of course. The import value of truffles into the United Arab Emirates neared $4 million for the first time in 2021 and was up 113 percent from 2017, according to United Nations trade data. In that same period, revenue at Italtouch increased 235 percent, according to figures shared with Bloomberg.

Before Vidoni came to town, chefs in Dubai would get their truffles from general food importers that were more concerned with getting staples like potatoes, rice, and meat to clients. They would often have a small selection of truffle products, and quality would vary.

Christopher Pike / Bloomberg

Massimo Vidoni inspects a shipment of black truffles imported from Perigord, France, and Umbria, Italy, in the Italtouch warehouse in Dubai.

Restaurant owners were often more interested in the place's vibe than the taste of the food. "Here, they spend $50,000 for a chandelier, no problem," Vidoni says, but owners will come down on chefs for the cost of ingredients.

Vidoni started his Dubai business by walking into restaurants with a scale and some truffles and insisting the chef have a whiff. He found himself educating clients on the basics: White truffles are only available for a few months in the late fall and early winter; truffles are best served with fatty foods like oil, cream, butter, and cheese; they don't go well with acidic and spicy food, such as tomato, which contrasts with and overpowers the flavor.

"Back then, truffles were not very popular," he said. "When I started introducing truffles to other importers and distributors, they all rejected me and told me they were not interested. Many people told me selling them is not a great idea."

Vidoni got his start in the truffle and caviar import business in New York City in the 1990s, when he worked for Italian truffle importers. He also co-owned a cafe, Terramare, on East 65th Street in Manhattan, and his clients included Nobu, Daniel Boulud, Thomas Keller, and Rocco DiSpirito. He has pictures with Donald Trump, whose hotels he supplied. In 1997, he made headlines for selling a 1 kilogram truffle for $3,600.

He moved to Dubai in 2011 when his wife's company transferred her to the emirate. He decided to try to replicate his New York business in the Middle East.

Vidoni is called upon in tight spots, such as when a wealthy Russian absolutely needed some truffles. The catch? He was on his

cont. on page 8

Dubai Truffleman, *cont. from page 7*

yacht off the coast in the Persian Gulf. Vidoni sent an employee to deliver the goods. The employee was picked up on a Jet Ski and brought to the yacht. He delivered the truffles, collected the payment, and was returned to shore.

He also was summoned to Abu Dhabi to deliver truffles in August 2020 when a delegation of Israelis visited the UAE as part of the events around the Abraham Accords, which normalized relations between the two countries. Amid tight security, truffles were used in challah brioche.

In one of the larger truffle deliveries of late, Vidoni also supplied the truffles for the smash opening weekend of Atlantis the Royal, which hosted Beyoncé and 1,500 guests for the three-day event. The hotel bought 50 kilograms of truffles, including 40 kilograms of black winter truffles from France and 10 kilograms of white truffles from Alba—worth more than $100,000.

Vidoni attributes the increase in truffle consumption both to the growth of Dubai as a dining destination and to the desire of chefs to add a little bit of luxury to every bite. Truffles are added to the traditional pasta, risotto, and pizza, but also used with hummus, sushi, wagyu dishes, and even on top of tuna tartare. For dessert, they're shaved on pistachio and vanilla ice cream or cheesecake.

When Dubai went into lockdown in 2020, Vidoni decided to offer his ready-made products—truffle oil, tins of caviar—to the general public. His operation was far from sophisticated. First he posted on a few Facebook groups. To his surprise, he did so well he had to replenish his stock. Three times.

On the strength of the recent growth, Vidoni sold a majority stake in the business last year to Transmed, an international distribution and logistics company, with the goal of expanding to Saudi Arabia, China, and India.

Guarracino, for example, says he initially would buy about 100 grams of truffles a week. Now it's 10 to 20 kilograms a week of what many chefs consider a Dubai staple.

"Now there is no single restaurant that doesn't have truffle, and really, a big part of this was Massimo," Guarracino says. "No matter in which part of the world you are, if you are on the land, in the desert, on the moon, on the sea, he will come and we will bring it to you. That's it."

> *Since February, at least 150 people—most of them civilians—have been killed by Islamic State attacks targeting dessert-truffle hunters or by landmines left by the extremists, according to the Syrian Obser-vatory for Human Rights.*
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> —https://www.iraqinews.com/, Mar. 24, 2023

CLEAN MUSHROOM LEGISLATION — Dick Sieger

On April 1st, the government of Mycostan enacted a law that prohibits edible wild mushrooms from harboring dirt, forest debris, or larvae. Violators will be incarcerated in the national herbarium. The bill was introduced by Dr. Manny Grants Waystead who is a professor of tentative mycology and the editor of *The Journal of Unreproducible Posits*. Dr. Waystead says his bill will make gritty soufflés a thing of the past.

UPDATE ON THE RARE *AMANITA* I REPORTED ON LAST SEPTEMBER — Brian S. Luther

In the September 2022 issue of *Spore Prints* I told you about a rare species of *Amanita* I found in spring and gave a provisional name (Luther, 2022). In the meantime a small portion of the collection was sent to Danny Miller (PSMS Education Chair) to be DNA sequenced. The results recently came back, and it was found to be identical to *A. pahasapaensis*, which, unbeknownst to me at the time, had already been given this provisional name. Info about this fungus can be found at http://amanitaceae.org/?Amanita%20pahasapaensis, but, it has not yet been formally published as a new species. According to the website, it's been found in South Dakota, Arizona, New Mexico, and Colorado, with one collection possibly from Skamania Co., WA, in 2019. Thus, it's a rare species in the PNW. It's interesting that it's been found here only recently. The collection I described came from Kittitas Co., WA. When I first saw it last June on the field trip ID table, I immediately recognized it as something unusual. This adds to our knowledge of the mycoflora in our area. The collection will be given to the WTU, the Burke Museum Herbarium at the UW, along with my initial notes, photos, a photomicrograph of the spores, and the DNA sequence.

Reference

Luther, Brian S. 2022. "First report of a rare *Amanita* from Washington State. *Spore Prints 584* (Sept.), p.4. Online and in color at www.psms.org.

Morels! Morels!
The musical sound
The more you look
The more will be found
The more you find
The better you feel
so eat more morels
in every meal.

—Eva Villanueva

MUSHROOM ASTROLOGY — Bob Lehman, LAMS

Aries (Mar. 21 – Apr. 19): You are energetic in your mushroom hunting and love to explore new territory. You visit several sites in the course of a day's foraying even if the first site had more than enough mushrooms for you. You are confident and enthusiastic, and you act on inspiration. When everyone else knows it's too dry for mushrooms, you go find them. You like to make quick identifications and you risk poisoning yourself.

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 your 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.