

SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 583 June 2022



THE INDOOR PROSPECTS OF A PRIZED MUSHROOM

Alla Katsnelson

The New York Times, April 26, 2022
[abridged]

When new buds emerge on trees and the ground warms with the advent of spring, foragers fan out through woodlands, scanning the leaf litter for morel mushrooms.

Prized for their nutty, earthy taste, they sell for as much as \$50 a pound fresh and \$200 a pound dried. They appear for just a fleeting few weeks—in New York, generally from late April to early June.

Experienced morel hunters return to well-guarded spots year after year, often exhibiting a form of selective hearing loss when asked where they collected their haul.

Unlike some wild mushrooms which can be easily cultivated, morels have a quirky life cycle that makes them notoriously tough to grow. Dr. Gregory Bonito, a biologist studying morels and other fungi at Michigan State University, explained.

Cultivating morels isn't impossible. Until 2008, at least one U.S. grower produced them commercially. And since about 2014, farmers in China have done it outdoors in the spring; however, yields can be variable, Bonito said.

But prospects for morels on demand appear to be looking up. In December, after four decades of research, Jacob and Karsten Kirk, twin brothers from Copenhagen, announced that they had devised a method to reliably cultivate hefty amounts of morels indoors, year-round, in a climate-controlled environment.

The Kirks say they have grown about 150 kg (330 lb) of the mushrooms using their system. Last year's crop yielded about 4.2 kg over a 22-week cycle, which tallies up to about 10 kilograms per square meter (or 20 lb per square yard) per year.



The Danish Morel Project

Morels growing indoors in a climate-controlled environment in Denmark, the fruit of decades of research by Jacob and Karsten Kirk.

“That’s really a lot,” Jacob Kirk said. Karsten Kirk added, “the cost per square meter for producing a morel will be roughly the same as producing a white button mushroom.”

In 1986, two researchers at Michigan State University and another from California caused a hubbub in the mushroom cultivation world when they published the first of three patents describing a method for growing morel sclerotia and coaxing those sclerotia to produce morels.

According to Gary Mills, one of the inventors of the patents and general manager of the specialty mushroom cultivation company Gourmet Mushrooms in Scottsville, Mich., the method described in the 1980s worked great. In the 1990s and from 2005–2008, he and his colleagues were growing hundreds of pounds of morels each week in facilities in Michigan and Alabama. But in 2008, the financial crisis hit, and morel growing operations ceased.

Developing the Kirk brothers’ method was a winding process. By 2003, they had achieved some incremental steps, but money was running low, and it seemed as if they might have to close up shop. Just when they most needed the boost, a small outdoor cultivation project bore fruit, and they soon managed to translate their outdoor success into indoor morel growth. “We now had a standard method that we could improve step by step,” Jacob said.

Since 2005, they have worked on perfecting that method. They created and optimized artificial soil and two different types of nutrient substrates and tested different climate and light conditions. Based on their observations in nature, they found that including grass in their soil somehow stimulates the mycelium. And after developing a prototype for several cultivation strategies, they designed and built a system of movable pallets to commercialize the most productive one.

The Kirks work alone and keep meticulous records of their experiments. Only two other people know the full details of the operation: their investor and Helena Kirk, Karsten’s daughter. After working so single-mindedly for so long on the science of morel cultivation, the Kirks are still figuring out how best to commercialize their product. So far, they have given away most of their yield to their investors and to a handful of chefs.

So far, the Kirks say they have been able to grow morels from 92 out of 102 specimens, or variants, of a particular type of morels called black morels that they’ve collected over the years. Last year’s bumper crop came from the sclerotia of two of them—variants 195 and 234.

But the brothers’ morel experiments are far from over. This season, they tested 22 new variants they found last year, from which they harvested 9 kg (20 lb) in the past few weeks. All of the new variants produced morels, and six were especially fast growing and plump. One of them, 340, is the duo’s new darling. “It’s just like finding gold when you find a new strain,” Karsten said.

Spore Prints

is published monthly, September through June by the
PUGET SOUND MYCOLOGICAL SOCIETY
Center for Urban Horticulture, Box 354115
University of Washington, Seattle, Washington 98195
(206) 522-6031 <http://www.psms.org>

OFFICERS: Randy Richardson, President^{2021–2023}
president@psms.org
Scott Maxwell, Vice President^{2020–2022}
psms-VP@psms.org
Brenda Fong, Treasurer^{2020–2022}
treasurer@psms.org
Su Fenton, Secretary^{2021–2023}
secretary@psms.org

TRUSTEES: 2021–2023:
Valerie Costa, Wren Hudgins,
Bruce Robertson, Molly Watts,
Joe Zapotopsky
2022–2024:
Luise Asif, Marian Maxwell,
Anne Polyakov, Marcus Sarracino,
Thad Steffen

ALTERNATE: Vince Stanton

IM. PAST PRES:

SCI. ADVISOR: Dr. Steve Trudell

EDITOR: Agnes A. Sieger, 271 Harmony Lane,
Port Angeles, WA 98362
sieger@att.net

CALENDAR

June 4 Field trip (see PSMS website)
June 14 Membership meeting, 7:30 pm, in-person at CUH
June 20 Board meeting, 7:30 pm, via Zoom
Aug. 14 Board meeting, 7:30 pm, via Zoom
Aug. 23 *Spore Prints* deadline

BOARD NEWS

Su Fenton

First off, a reminder: *Spore Prints* is going all digital as of September 2022. Please make sure that PSMS has your correct and updated email address as you don't want to miss out on future issues. I know we all appreciate and enjoy the outstanding newspaper put out by Agnes Sieger 10 months every year. (It is not printed in July and August.)

May was a long and important meeting for the board as we head toward summer. We have been hard at work on a number of important projects. First, we have been researching how to update our insurance to better protect the club from various types of liability. We have been pleased with what we found. We will be joining with a nonprofit aggregate insurance pool called Propel.

Another area of concern has been what to do with the club's money, which has been sitting in the bank not gaining value nor keeping up with inflation. After some research and much discussion, we have decided to use the same investment company to manage and invest our funds as used by the Stuntz foundation to successfully manage their funds.

On another note, PSMS has updated our website to add an "Donation" button. So if you, or some member of the public, want to contribute to PSMS's mission, this will be an easy way to do so.

Finally, we have upgraded our Zoom capacity to accommodate up to 500 people. This will allow for more attendance, and we hope allow for easier access.

As I mentioned in the last Board News, the club will be hosting an event to replace the missed Survivors' Banquet usually held in March. It will be held on June 14, 2022, from 7:00–9:30 pm at the Center for Urban Horticulture in place of our regularly scheduled general meeting for June. We will be renting the lovely atrium as well as our usual meeting room and serving tasty finger foods and wine. There will be a \$5.00 admission fee to offset costs, and the number of attendees will be limited to 140, so be sure and register early on the PSMS website.

MEMBERSHIP MEETING

Scott Maxwell

The membership meeting on June 14, 2022, will be "in-person only" (no ZOOM) at the Center for Urban Horticulture. Masks will be required for attendance. We will start letting people into the CUH meeting hall at about 7:00 pm.



This month we are switching things up a bit. To give people a chance to get to know each other after a long bout of COVID restrictions, we will be having a finger food event with pre-purchased trays of light food items, wine, coffee, tea, and soft drinks. To physically spread things out, we will be opening up a couple of the side doors to the meeting hall and we are adding the atrium space across the patio. Depending on turnout, there also may be an introduction of PSMS committee chairs and perhaps a slide show featuring our local fungi. *This event will be for members only.*

There will be a charge of \$5.00 per person, with sign-ups beginning May 27 on the PSMS web page at www.psms.org.



This should be a fun event, so please attend!

INDIANA 3-YEAR-OLD PICKS IMPRESSIVELY

LARGE MOREL MUSHROOMS Lawson Gutzwiller
WLWT5, May 9, 2022

HILLSBORO, Ind. - A family who was out hunting for morel mushrooms in western Indiana this weekend ran into a big surprise.

Rob Clodfelder said he and his 3-year-old grandson Brigston were hunting near Hillsboro, Indiana, when they came across some impressively large morels.

Clodfelder said Brigston picked the mushrooms himself. He said it was a special outing for the two of them.

He posted photos of Brigston holding the mushrooms on Facebook, and they have since gained quite a bit of attention.

3-year-old Brigston Clodfelder shows off his huge morels.



FIELD TRIP REPORT, April 30

Brian Luther

The day started out cool and wet on our first spring field trip, but we got a mix of occasional sun breaks, then back to drizzly conditions throughout the day. Even so, 131 members attended, of which 38 were on their very first PSMS field trip—probably the best turnout we’ve ever had at this location. I got a fire going right away when I arrived at about 6:15 am, and owing to the conditions it was a very popular spot most of the day.

Our hosts were Dave and Wuqi Weber, working hard and doing a great job giving us morning snacks and very welcome hot coffee to get us all going early on this damp day. We had some obstacles. The Snohomish Co. Parks Dept. failed to turn on the power and lights for us or open up the main bathroom house, even though we’d paid for and reserved Shelter #1 long in advance. It was discovered that the other shelter a couple hundred feet away *did* have power, so we had to take all the coffee makers over to it, then shuttle the hot coffee and hot water back to the correct shelter for members. Very inconvenient, but we got through it. Fortunately, the single large portable toilet was adequate, if barely, all day—at least until it ran out of TP mid-afternoon! I contacted the Snohomish Co. Parks Dept. and made a formal complaint with the superintendent about these issues. As a result, we received a refund.

The field trip guides included Wren Hudgins, Dave Weber, Joe Zapotosky, Randy Richardson, and Jamie Ardena. Paul Hill and his wife also graciously took out some brand new beginners.



Field trip ID table, April 30, 2022

I counted 45 species displayed on the picnic table. Quite a few members found at least some Oyster Mushrooms (*Pleurotus ostreatus*), which for the most part were in prime condition. Except for this species, no other good edibles were found. A couple of out-of-season oddballs showed up: some *Craterellus tubaeformis* (Winter Chanterelle) were found along with *Stropharia ambigua*, also a typical fall species. Others of interest included a large *Fomitopsis* sp. conk that was covered on both the cap and the pore surface with the parasite *Hypocrea pulvinata*, making it look like it was covered in creamy-beige colored “barnacles.” Several cute little jet-black cup fungus *Donadinia (Plectania) nannbeltdii*, having long narrow stems, were also brought in.

It ended up being sunny at the end of the day during potluck, with 12 members staying for it. Delicious hot soups made by Debbie Johnson (with White Chanterelles she’d picked last fall) and by Carolina Kohler and Jamie Rumbaugh helped us to warm up and have an excellent and satisfying finale to a fun day out with friends.

FIELD TRIP REPORT, May 6–8

Brian S. Luther

Wren Hudgins and I did some scouting Friday before heading over to the group camp. We were the second to arrive, after Jamie Ardena. Cloudy and somewhat drizzly conditions prevailed at first. Then things mostly cleared up and the sun was warm, but it was breezy much of the weekend. We searched for and cut some firewood to get a campfire going before the other members came and kept the fire going most of the time. I stayed until about 4:30 Friday evening, and by that time several more members had showed up. I returned early Saturday morning to find the parking area packed with cars, tents everywhere, and everybody up and about having coffee and snacks provided by our delightful hosts Alexandra Sullivan and Jeffrey. Thank you, Jeffrey & Alexandra—you really started the day out right for us!

In all, 71 members signed in. Our volunteer field trip guides were Wren, Jamie Ardena, Julia Benson, and Dave Weber, assisted by apprentice guides Sandra Ruffner, Tai Warner, and Pamela Young. Groups went out in the morning to different locations and by lunch time had found only a few species, including morels. But, groups again went out in the afternoon, and many came back with lots of morels, some finding just a few to many.

I counted 28 species of fungi displayed. A number of common burn site fungi were collected because this general area has had large fires in the past. Except for the morels, the only other good edible found was a single specimen of *Suillus albivelatus*. A number of *Verpa bohemica* came in, which gave me the chance to compare and contrast them with true morels. Unusual finds included two specimens of *Hygrocybe singeri*, normally a fall fungus.

Not quite half of those coming stayed for the exceptional potluck Saturday evening, in spite of very windy conditions. The picnic table was covered with tasty dishes, and some members cooked morels and the *Suillus* to share with others. It was a very satisfying end to a fun couple of days out camping and collecting.



Field trip potluck, May 7, 2022.

FIELD TRIP REPORT, May 14

Brian S. Luther

We were blessed to have the use of the excellent red barn for our third spring field trip, with all its amenities, because it rained most of the day. We did get a few sporadic sun breaks, but it was mostly pretty wet, and we had all of our activities inside.

Nineteen people signed in, 30 of whom were nonmembers but had registered with the facility ahead of time. It was an enthusiastic group, in spite of the prevailing weather. I expounded on the benefits of becoming members of PSMS and I think I talked several into joining.

The hosts for our morning coffee and breakfast snack were new members Vern Hodgson and Sunida Bintasan, with some assistance from Oz Ozkin. With four coffee pots going simultaneously, we ended up getting lots of hot coffee, along with the food items. We greatly appreciate new members getting involved right away as they did. Thank you!

The field trip guides included David Weber (co-chair of the PSMS Field Trip Safety Committee), Al Philipps, Andrew Graesser, Marcus Sarracino, Sandra Ruffner, and Tai Garner.

I counted 43 different fungi displayed. Some folks found one or two morels, others quite a few. Again, as with the previous field trip, only one other good edible species was found besides morels, a single *Suillus* (Slippery Jack). Five different species of *Gyromitra* were brought in. The surprise find of the day was a rare specimen of *Polyporus squamosus* (Dryad's saddle), growing on the base of a living cultivated box elder (*Acer negundo*) on the trails around the field site. I photographed, documented, and dried the collection. This is only the second time I've seen this species here in Washington State. The first collection I'd ever seen of this fungus here was also found on a PSMS field trip (Luther, 2014).

We had a small but delightful, potluck at 4:00 pm with very tasty dishes. A few members stayed to help clean up, along with the facility staff. Special thanks to Joshua Schaub, our facility coordinator, for being so welcoming and allowing us to use their facilities.

Reference

Luther, Brian S. 2014. *Polyporus squamosus* found in the Entiat River Valley. *Spore Prints* 504 (September), p. 6. Online and in color at www.psms.org.

FIELD TRIP REPORT, May 21

Brian S. Luther

We had to change to this location only five days ahead of time, but it worked out. We ended up in a pleasant spot next to a scenic little lake, except for the noise from nearby I-90. We got a mixed bag of weather for the day—cloudy at first, then sunny and very warm, then dark clouds rolled in, it got cold and rained for a while, and there was no shelter.

One hundred and nine members signed in. Kitty Loceff brought us very welcome coffee in the morning, and another member thoughtfully brought some donuts for everybody. We had seven field trip guides, so almost everyone was able to sign up, thanks to Randy Richardson, Wren Hudgins, Julia Benson, Dave Weber, Bill Buck, Dan Paull, and Sandra Ruffner.

I counted 52 species displayed. At least a few morels were found by some. Others found quite a few. Only a couple of other edible species came in, but in very small numbers. The real out-of-season oddball was a nice fresh clump of *Hericium abietis* (Bear's Head), a common fall species, which I'm not sure I've ever seen in spring before.

We didn't have a potluck, because the site had no potable water, but everybody seemed to have a good day.

DISTANTLY RELATED MUSHROOMS GAINED THE ABILITY TO MAKE TOXIN VIA HORIZONTAL GENE TRANSFER

Bob Yirka

<https://phys.org/>, May 10, 2022

A team of researchers affiliated with several institutions in China and the U.S. has found evidence that suggests three distantly related types of mushrooms gained their ability to produce a dangerous toxin via horizontal gene transfer sometime in their past. In their paper published in *Proceedings of the National Academy of Sciences*, the group describes their genetic analysis of multiple species of mushrooms to determine which genes in three particular species were responsible for producing the same toxin and what it showed them about its origins.

Scientists have known for some time that the three mushrooms—the Deadly Dapperling [*Lepiota subincarnata*], the Destroying Angel [a common name shared by three lethal white *Amanita* species (*A. ocreata*, *A. verna*, and *A. virosa*)], and the Funeral Bell [*Galerina marginata*—are not only toxic, but also have an identical toxin. Some scientists assumed they must have a common ancestor, but the researchers in this new effort suspected something else was afoot because the three species are so distantly related. To get to the bottom of the matter, they obtained samples of the three mushrooms along with samples from 12 others.

To find out which part of their genome was responsible for making the toxins, the researchers sequenced all of their samples. They found two genes that were responsible for creating the toxins and were identical in all three species. A closer look at the genes showed that they were, indeed, distantly related, but it also showed that the genes responsible for producing the toxins were not passed down from a common ancestor. That left just one other possibility—sometime in their past, all three had received a horizontal gene transfer from another, possibly extinct, mushroom.

A horizontal gene transfer occurs when a third party, such as a bacterium, absorbs some of the genome of a host it is infecting and then passes those cells into another host that it infects. The researchers note that horizontal gene transfer is common with bacteria. In many cases, they steal bits of host DNA, add it to their own, and then pass it on to their offspring. Those offspring can then add the new DNA to cells they infect in another host.

Maybe you have some soft stone-washed jeans. Now, you didn't really think they make those variable-color, sort-of-faded-out jeans by hiring little old ladies with babushkas to take them out to the rocks on the stream and beat them? No! The jeans are placed in a large vat containing a fungus, Trichoderma, which produces enzymes (cellulases) that partially digest the cotton fibers of the jeans, for that stone-washed look and softness.

—Tom Volk

MYCOPHAGY COMMITTEE REPORT: Cooking with Chef Selengut Marcus Sarracino & Molly Watts

Monday, May 9, may have seemed like a run-of-the-mill day, but it was in fact a special day for the Mycophagy Committee, as it was our first official event after re-invigorating this long dormant facet of PSMS. On that night 18 PSMS mycophiles got together at The Pantry in Ballard to learn, cook, eat, and share in our passion for all things mushroom with a master of fungal feasts—Chef Becky Selengut.

Molly and I had begun brainstorming ideas back in 2020 on how to get the Mycophagy Committee going again when COVID struck and put an end to all of our plans. However, once restaurants started opening up to dining in person again last fall, we met up for a mushroom-themed meal in Seattle alongside fellow PSMS member and private chef Karen Armijo. She had reached out to us through Luise Asif, PSMS Volunteer Committee chair, wanting to join the Mycophagy Committee and help where she could. Karen mentioned a possible class with famed “Shroom” Chef Becky Selengut and we knew right away that this was going to be something special and got to work planning! After weeks of emails, negotiations, communications, and necessary authorizations, we finally had an event to announce. Registration filled up quickly once it was announced, so with all our hard work done all we had to do was wait for the big day.

May 9 found us looking for The Pantry tucked in the rear of the building. Once inside, we were warmly welcomed in by Becky and her assistant Heather with a glass of wine. At each of the seats, we were presented with aprons, name tags, cutting boards, chef knives, and printed copies all of the recipes we would need that evening. After some introductions, housekeeping, and safety announcements, we were put to work. With the name tags we were all given and our shared love of mushrooms, the 18 of us immediately felt comfortable, connected, and had no trouble jumping in.

First we sliced King Oysters, then diced morels, halved huge shiitakes, zested lemons, chopped herbs and alliums, minced ginger, and julienned green onions for garnish. Everything else was pre-measured and neatly prepared for our five mini-groups to make our first classic dish: fresh morels and cream sauce on toast points. Some of us cooked on the main range top while others cooked on single burner butane stoves, but either way it was incredible!

While we worked on that first dish, Chef baked the sliced Oyster mush-

rooms with olive oil and salt on high heat until they were perfectly crispy golden and turned them into an ambrosial mushroom salad with pine nuts, lemon, parsley, extra virgin olive oil, and sliced Parmesan. This was my (Molly) first time eating mushrooms in a salad, and it definitely got me thinking of other ways to incorporate mushrooms into future dishes!

To top off the evening Chef Selengut poured us another glass of wine and made a belly-bursting amount of Dan Dan noodles with tender shiitakes that were glazed and sautéed to perfection, beautifully browned ground pork, quick-pickled mustard greens, and a chile-peanut oil that was freshly made the day before.

It was all so delicious, educational, and incredibly fun! We’re already looking forward to the fall when we will continue the collaboration with The Pantry and the amazing mycophile Chef Becky Selengut to offer more mushroom-themed classes, with new mushrooms and equally amazing dishes.

The demand for the first class was so overwhelming we added a second class on Monday, June 6. We’re pleased to announce that class is also full. Thank you to everyone who expressed interest in this event. Rest assured we will be offering more events like this and others in the future. Sign up for the next Mycophagy Cooking Class in the fall, you won’t regret it!



Mycophagy Committee cooking class at The Pantry, May 29. Left to right, top to bottom: Happy group of eager mycophagists, Chef Becky Selengut holding a sheet pan full of sliced King Oyster mushrooms as she instructs the class, morel toast points, King Oyster mushroom salad, participants diligently slicing King Oyster mushrooms, and a big bowl of Dan Dan Noodles with shiitakes.

FRIENDLY FUNGI ANNOUNCE THEMSELVES TO THEIR HOSTS

<https://phys.org/>, May 17, 2022

For many years after discovering a diverse population of sometimes dangerous microbes constantly living in our intestines, scientists described the situation as a form of living with the enemy. But when it comes to commensal populations of the fungus *Candida albicans*, the dreaded invader may be better seen as a helpful friend arriving with gifts.

That's the key message of a study published May 17, 2022, in *Cell Reports* by a team led by Sing Sing Way, MD, Ph.D., an infectious diseases expert at Cincinnati Children's Hospital Medical Center.

"This fungus could be invisible to our bodies if it wanted to be. It can mask many of the ways our immune system knows how to recognize it," Way says. "Instead, our work shows that it purposely exposes itself to gain the benefit of our bodies recognizing it and not attacking it."

Many people are familiar with the concept of probiotics, or "good" bacteria. Scientists also have learned that fungi can do good for people, including sometimes replacing bacteria in the commensal state and performing similar beneficial functions.

"However, fungi also are much more complicated than bacteria, and relatively understudied compared to bacteria," Way says.

Blinking "Hello"

In years past, many scientists believed that the simple presence of certain fungi in the gut was enough to signal to the body that it had a proper balance of microbiota. Even inert fungi could be detected via the surface structures and chemicals of their cell walls.

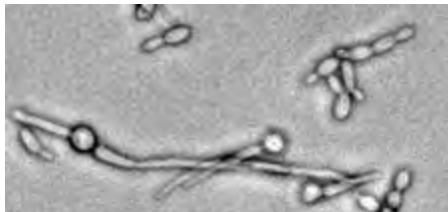
"This paper shows that commensal fungi need to be alive and actively making proteins that stimulate our immune cells to elicit that commensal benefit. They need to be metabolically and transcriptionally active," Way says.

To determine how *C. albicans* becomes recognized as commensal, first author Tzu-Yu Shao, an immunobiology graduate student, worked with scientists at Cincinnati Children's, Brown University, the University of California San Francisco, and the Institut Pasteur in Paris to conduct a series of experiments establishing colonization in mice.

They learned that the gene UME6, which helps regulate filamentation in fungi, is essential for allowing intestinal *C. albicans* to "prime" the immune system so that it can fight off a wide range of infections. Initially, the team expected this priming effect to be caused by either extremely high or low expression of this gene.

However, the beneficial effects did not occur when colonization with *C. albicans* was locked into either extreme. Instead, engineering the fungus to oscillate between high and low levels of UME6 expression during colonization was essential. This blinking

Microscopic image highlights the polymorphic nature of commensal *C. albicans* fungi, which are capable of growth in long filamentous and smaller yeast morphologies.



Cincinnati Children's

back and forth appears to signal to the body that *C. albicans* is beneficial. In return for not being chased out of the intestine, the fungi help the body more rapidly respond and fend off infection by a variety of microbes—including *C. albicans*.

"We found that not only does the fungus have to be living, it has to purposely execute a program of expressing specific cell wall components so that our bodies can detect them. They are deliberately doing that to help us and themselves," Way says.

Next Steps

Eventually, it may be possible to manipulate this process to restore healthy levels of commensal fungi. But first, Way's team seeks to learn more about how this symbiotic relationship works.

"Good" fungal colonization can begin as soon as birth but can take months to complete. Later, various events can cause other fungal populations to dive. How do such population variations affect the commensal benefit? The team also plans to explore how commensal *C. albicans* works in other tissues, including oral mucosa, lungs, skin, and the birth canal.

"We're interested in figuring out in more depth how and why we are colonized with these microbes," Way says. "Given that our immune systems can see them, additional next steps also include understanding why colonization does not normally cause aberrant inflammatory reactions."

A FUNGUS-BASED WOOD STAIN FROM THE NETHERLANDS

<https://www.fungiforce.com/>

A small company in the Netherlands has created and commercialized a fungus-based wood coating to protect and tint untreated wood. The product, called Fungi Force, consists of two parts. First a layer containing *Aureobasidium pullulans*, a naturally occurring harmless yeast-like fungus, is applied to the wood followed by a layer of linseed oil, which protects and feeds the fungus. About a week after application, Fungi Force has attached itself to the wood, and the protective layer is dry. Processing is restricted to dry weather and temperatures above 10°C.

As Henry Ford said of the original Model-T, It "comes in any color you want, as long as it's black." Color limitation aside, the Fungi Force website lists several advantages.

- It is easy to apply. No surface preparation is required.
- It doesn't peel off
- It requires hardly any maintenance. Annual treatment with natural linseed oil to feed the fungus and keep it nice and black is sufficient. After a few years, this maintenance can even take place every other year.
- It is self-healing. Minor damage such as cracks and scratches is repaired by the living layer itself.
- It is ultimately cheaper than normal stain, which has to be reapplied every two to five years.

The website recommends it for outdoor structures such as fences, pergolas, garden houses, playground equipment, doors and frames, wall cladding, and garden furniture. However, it has already caught the attention of builders and architects. Netherlands-based

architect Joris Verhoeven of Joris Verhoeven Architectuur, for example, selected it when constructing a self-sufficient home for himself and his family designed to become part of its surroundings.



<https://www.treehugger.com/>

Fungus-coated house designed by architect Joris Verhoeven.

Fungi Force is being produced on a small scale and availability is limited. It comes in cans of 0.75 liter or 2.5 liters, good for treating approximately 6 m² or 20 m² of wood.

IOWA MUSHROOM HUNTERS FIND MOTHER LODE OF MORELS, PICK 175 POUNDS IN TWO DAYS

Phil Bourjaily

<https://www.fieldandstream.com>, May 16, 2022

Rusty Gates of Alexandria, Missouri, and Jimmy Johnson of rural Keokuk, Iowa, hunt morels together every spring. On Saturday, May 7, the two friends found and harvested an incredible 131 pounds of the highly sought mushrooms while walking the woods of Lee County in southeastern Iowa. Johnson has hunted morels since he was a boy and has never found more than 75 pounds in an entire season, which usually lasts about a month.

He told the Burlington *Hawk Eye* that the hunt began without any indication that they were in for a once-in-a-lifetime day. Gates and Johnson found just three morels between the two of them in the first hour of the hunt. They kept going—and found a virtual carpet of mushrooms in the woods. “It was just non-stop as we were walking,” Johnson told *The Hawk Eye*, “We just see four or five here, then take a few steps and see more. It was continuous.”



Jimmy Johnson

Rusty Gates and Jimmy Johnson pose with 131 lb of morels they found at an undisclosed location in Lee County, Iowa.

Experienced hunters like Johnson usually key on dead elm trees. An elm with the bark still slipping off the trunk often means morels nearby, and while Johnson and Gates found mushrooms near elms, they found them near maples and white oaks as well, which Johnson noted for future hunts. As they picked and picked and their burden grew, they called Johnson’s son, Trenton, and told him to bring a vehicle to the woods to haul some of the bags of morels home. Johnson and Gates picked for six hours, then went out the next day and found another 44 pounds.

Johnson said they just got lucky, that soil temperatures and moisture conditions just happened to be right for a bumper crop of morels in southeastern Iowa this year. Morels usually come up when daytime temperatures reach the 60s and low 70s, and nighttime lows get above 40. Conditions on May 7 were ideal with highs around 70, following several days when nighttime lows had been in the mid-40s.

Johnson and Gates divided their huge haul of mushrooms evenly, as they always do. Johnson kept 20 pounds for himself, gave many to family and friends, and sold the last 16 pounds at the going rate of \$25 per pound. He plans to spend the \$400 on some kind of mushroom hunting gear, but he doesn’t know what it will be yet. If he keeps making finds like this one, he might want to think about saving up for a dump truck.

STARTUP MAKES CARBON-NEUTRAL, HIGH-PROTEIN PASTA FROM FUNGI Adele Peters

<https://www.fastcompany.com/>, May 23, 2022

Early in the pandemic, when her mother was diagnosed with prediabetes, Michelle Ruiz, a chemical engineer at ExxonMobil, wondered how she could help make the life change easier, as her parents struggled to figure out how to adjust their diets. “We’re from Ecuador, and we found that all the foods that are most culturally embedded in our daily lives are packed with refined carbohydrates that would make my mom’s diabetes worse,” she says.

As she started thinking more about food, she noticed that a growing number of startups were beginning to use mycelium, the root-like part of mushrooms, to make plant-based meat alternatives for foods like chicken breast. She realized that mycelium also could be used to make a high-protein, low-carb flour for pasta, tortillas, and other foods typically made with wheat flour—options that would be far healthier, especially for someone with diabetes.

From her work at Exxon—which happened to involve running a wastewater-treatment plant—Ruiz also realized that it could be possible to make mycelium-based products affordable enough to compete with wheat. The key was using something that would normally be discarded: sugar-filled water waste from food and beverage manufacturers like breweries. Breweries pay a surcharge to wastewater-treatment plants to treat that sugary water, a byproduct of brewing, and the process involves using fungi and bacteria to consume organic material in the water. Mycelium, Ruiz knew, could do the same job.

For a brewery, paying for wastewater treatment can account for 20 percent of their operating costs; annual costs can be in the

cont. on page 8

Mushroom Pasta, cont. from page 7

millions. At the same time, around half of the cost of production for companies producing mycelium comes from buying sugar.

Last year, Ruiz began working on a startup, Hyfé Foods, to commercialize the idea. The startup will partner with food and beverage manufacturers and build its own production inside their facilities, since moving the water would be too expensive.

“We take the water that would normally go down the drain at a very specific point in the plant where it’s still food safe,” Ruiz says. The water goes through a pretreatment process and then gets added to bioreactors filled with mycelium, along with oxygen and micronutrients to help the mycelium grow.

The mycelium grows into tiny spheres resembling couscous. Then it’s filtered out of the water, dried, and turned into a flour that can be used to make other foods. Hyfé plans to sell both the flour and finished products to food companies.

Because the process helps avoid creating waste, it’s actually carbon neutral. At wastewater-treatment plants, after fungi and bacteria chew through the water, they’re filtered out and sent to landfills, where they emit methane, a potent greenhouse gas. Because a bowl of pasta made from mycelium has as much protein

as a chicken breast, without the carbon footprint, the startup thinks that it can be an alternative for climate-conscious consumers.

Production could begin quickly enough to begin to respond, to a small degree, to the global wheat shortage caused by the war in Ukraine; right now, countries are relying on some reserves of wheat but are quickly running out. The startup eventually wants to have production facilities inside food manufacturing plants around the world.

“That is the most efficient from a cost standpoint,” Ruiz says. “But then the second part is you’re giving individual regions around the world the sovereignty of producing their own food. It’s a decentralization of food production versus relying on one particular region to produce a specific type of food and then ship it all over the world.”



Mycelium spheres.



Mycelium flour.



Mycelium pasta.

Hyfé Foods

Note: This will be your last newsletter until September, when we go digital only.

Have a great summer!

Non-Profit Org.
U.S. POSTAGE
PAID
SEATTLE, WA
PERMIT NO. 6545

RETURN SERVICE REQUESTED

Puget Sound Mycological Society
Center for Urban Horticulture
Box 354115, University of Washington
Seattle, Washington 98195

