

SPORE PRINTS

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NASA'S WILD PLAN TO BUILD McMANSIONS ON MARS—OUT OF FUNGUS

Mark Wilson

<https://www.fastcodesign.com/>, May 12, 2018

I hate to break it to you, but there will not be any geodesic domes on Mars. At least not if Christopher Maurer is to be believed.

“You’ll see a lot of renders with glass domes and little houses, and things like that, but I don’t know those are serious scientific proposals,” he says. “Those are the real estate sales pitches for astronauts to come to Mars.”

Maurer is a Cleveland-based architect who will bring you down to earth very quickly about the romantic ideal of colonizing another planet. Most of us realize it’s probably a one-way trip. The Mars One Foundation—which dreams of putting colonies on Mars by 2023—recently had 200,000 people volunteer for the adventure, even knowing they’d have to die on the red planet. Elon Musk, whose SpaceX promises to land on Mars in 2024, has announced a plan for a city that would house a million people. The idea: to mine Mars for materials to turn into geodesic domes. (Keep in mind, Musk is having difficulty building cars on Earth.)

Often, these broad strokes visions overlook tremendous design problems, beyond Mars’s $-55\text{ }^{\circ}\text{C}$ average temperatures and lack of a breathable oxygen atmosphere. But Maurer has a solution: grow Martian buildings out of mushrooms. And he’s working with NASA to make it a reality.

The Problem Of Building Materials In Space

Right now, it costs about \$10,000 to put a single pound of payload into orbit. Even SpaceX admits you can’t possibly carry all of the materials you need with you because the rocket payloads would be too pricey, so that means you’re probably forming a shelter *in situ*, instead, out of Martian dirt.

Maybe a dirt hut doesn’t sound so bad, especially in the fetching red hue of Mars soil. But there’s another catch: To block the cancerous radiation that flows through most of space, you need more than some adobe bricks. You need 10-foot-thick walls of the soil, which is why that scenario probably has you just moving underground instead—“living like early burrowing mammals,” Maurer says.

A Novel, Organic Solution

In his Ohio architecture firm, Redhouse Studio Architecture, Maurer has spent the past three years experimenting with refuse from mushroom harvesting—stuff like its mycelium root structure humans don’t typically eat—compressing the waste into strong planks to build sustainable housing. At a conference, he met NASA scientist Lynn Rothschild who had also been considering the potential of mycelium as a growing material.

Independently, they’d both reached the same vision, and realized if so, they might as well work together to actualize it: Why not just grow buildings from the ground up? And instead of settling for earth, why not try it on Mars?

“With one spore, you could grow mycelium, indefinitely,” says Maurer. “With just a little seed biology, a couple of pounds going into space can turn into thousands of tons of building materials on destination.” And with a carefully designed, vacuum-sealed plastic bag, that mycelium can grow into a giant habitat with little to no human effort required, filling its casing like an intergalactic pop-up tent.

Now, Maurer and Rothschild hope to prove the concept first on a NASA-funded study here on Earth, by turning 1,722 lb of material (most of which is the plastic shell) into a McMansion-sized igloo that grows itself in just a few weeks. The ambitious scale is actually to the spec of NASA’s own reference manual to colonizing Mars, which was compiled in 2009.

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MEMBERSHIP MEETING

Tuesday, June 12, 2018, at 7:30 pm at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle

Our speaker for June is Chef Langdon Cook, who will talk on "Nature's Secret Pantry: Wild Edible Fungi from Patch to Plate."



Langdon Cook

Explore the Pacific Northwest's wooded haunts with this award-winning author and culinary adventurer on a quest to find the region's most sought after wild mushrooms for the table. Langdon will present a year of mushroom hunting in field and kitchen, from spring through winter. Visit patches near and dear to all of us as well as more remote and far-flung regions known only to longtime foragers. Slides of fungi in their habitat and in finished dishes will have you reaching for your boots, baskets, and sauté pans. Q&A and book signing to follow.

Langdon Cook is the author of *The Mushroom Hunters: On the Trail of an Underground America*, winner of the 2014 Pacific Northwest Book Award and described by *The Wall Street Journal* as a "rollicking narrative...delivering vivid and cinematic scenes on every page." Cook's newest book is *Upstream: Searching for Wild Salmon, from River to Table*, selected by Amazon as a "Best Book of the Year." His writing appears in numerous publications and has been nominated for a James Beard Award (2016) and a Pushcart Prize. Langdon lives in Seattle with his wife and two children.

COUPLE QUESTIONED BY POLICE AFTER POSTING FACEBOOK PHOTOS OF MORELS THEY PLANNED TO COOK

Matthew Wright

Dailymail.com, May 18, 2018

Maryland police arrived at a couple's home after a man posted photos on Facebook of himself finding mushrooms in a wooded area and shared that he intended to cook them.

John Garrison, of Darlington, Maryland, posted photos of himself and his girlfriend, Hope Deery, finding morels while out on May 11.

A few hours later, police came and questioned the duo about the possible use of psychedelic, or "magic," mushrooms.

"He thought he was on the biggest bust of his career thinking we were having a magic mushroom party before I explained to him that morels are a native choice edible mushroom," Garrison said.

Garrison describes how he dug through the trash to find a piece of a morel so that he could give it to the officer, but the officer still did not believe him.

"Which was shocking to me because morels look nothing like psychedelic psilocybin mushrooms and I figured a police officer would know what illegal drugs looked like," he added.

According to Garrison, a second officer showed up soon after and confirmed that the mushroom was indeed a morel.

No one was hurt in the ordeal, but the officers did process the couple's IDs.

CALENDAR

- June 9 Field trip (see PSMS website)
- June 12 Membership meeting, 7:30 pm, CUH
- June 18 Board meeting, 7:30 pm, CUH board room
- Aug. 21 *Spore Prints* deadline

MORELS COME UP IN THE ODDEST PLACES

Brian S. Luther

While planting flowers at our Leavenworth, Washington, property recently we noticed a solitary morel poking between planter bed stones, all by itself. This species, *Morchella importuna*, is known for being a widespread landscape morel, showing up in an endless variety of human disturbed or cultivated areas. This species was described as new in 2012 from a collection in Washington State.



If they succeed, they'll demonstrate a dwelling that's also possible to grow on Mars—with a payload that's almost two orders of magnitude lighter than NASA previously thought possible.

A Strange, Old Material

Perhaps mycelium seems like an odd building material. It's probably something you've never even heard of, since the mushroom is the reproductive fruit of the plant that you eat, and the mycelium is the part that lives out of sight, under the Earth's surface. How could you build a house out of fungus?

In fact, it can have tensile strengths that rival wood. It's also lightweight, fire retardant, and self-healing. A little water, CO₂, and algae (or similar food) is all it needs to grow into habitats, furniture, or even shells for rovers.

"It may sound strange and weird to talk about [growing] a biological structure on Mars, but think about it: we've been using biology to build habitats on the Earth for thousands of years. Whether you're talking about a tepee with wood and skin or houses made out of wood, we use biological products in building all the time," says NASA's Rothschild. "I'm sitting here looking at myself, and I have leather in my shoes, I have cotton in my jeans, and wool in my sweater."

Rothschild is an astrobiologist and synthetic biologist. She believes that it may be possible to not just grow a fungus shelter, but to seed it with genetically engineered bacteria that would help absorb harmful radiation. One possibility is that the fungus itself could develop melanin, the same thing that makes our skin tan in the sun, to help convert harmful energy into more food for the structure. Such genetic engineering is another thread of the project that Rothschild plans to study.

In any case, Rothschild and Maurer imagine that they can build a dwelling that looks a lot more like a human home than a prehistoric burrow, simply because you can grow mycelium in any shape you want. And in doing so, life on Mars could feel much more like a life worth living.

Looking Ahead

As promising as the work may sound, growing a habitat on Mars is still a long ways off. This nine-month proof of research grant itself is just beginning now, and it's aimed at projects that NASA deems 10 to 20 years away from fruition. If it goes well, the team will pursue another that lasts for two years.

"We're showing in principle this would work," says Rothschild. "A double-bag dome igloo is a very easy concept." Growing it 33.9 million miles away is just slightly more complicated.

* * *

Yarsagumba, the caterpillar fungus, has become rare in the uplands Manang district of Nepal this year, although, found in abundance in the past. Previously plentiful at an altitude of 3,000 m, the fungi are now rarely found even at 4,000 m.

Every year, usually for the whole month of May, residents of Manang district along with their children leave homes and businesses to collect Yarsagumba, one of the most expensive herbal remedies.

— Ramji Rana
<https://thehimalayantimes.com/nepal/>, May 15, 2018

As usual, I came up Friday evening to check on members arriving. Many had already set up their tents, and Julia Benson had a campfire going. By Saturday 36 members had signed in, with three being new. Conditions were rainy for the campers Friday night, and it drizzled off and on throughout Saturday, but the weekend was mostly dry, just overcast.



Brian S. Luther

Field trip base camp.

Our hosts were Debbie Johnson and Shinsim Kim, and we were all happy to have the hot coffee and breakfast snacks they provided. Thank you, Shinsim and Debbie! Not only did we have the old CCC shelter for cover, but Marcus and Christina Sarracino had set up a 10 × 10-ft canopy over the hosting and food table, which was very useful. The campfire was kept going all weekend and was very popular and welcome considering the conditions.

We had three volunteer field trip guides: Wren Hudgins, Julia Benson, and Erin O'Dell. Most everyone found at least some morels, and a few did quite well.

The other good edibles that came in were *Pleurotus pulmonarius* (our only Oyster Mushroom that's found on dead conifers) and a single *Boletus rex-veris*, our spring *B. edulis*. Forty-five different species of fungi were collected, and as always I did table tours discussing all species found.

The potluck was exceptional, with many tasty dishes. Noteworthy items were Patrick Levad and Erin O'Dell's yummy pizzas they made using large iron skillets right over the campfire, along with their super delicious and unique Candy Cap-flavored ice cream made on the spot. They had dried and powdered the Candy Caps from last fall. What a treat!

Everyone said they had a great time, and we'll be back again at this location in the fall.



Brian S. Luther

Christina Sarracino, Sweta Agrawal, and Erin O'Dell with homemade Candy Cap ice cream.

FIELD TRIP GUIDING AND SAFETY

Wren Hudgins

History

Many years ago PSMS used to have informal field trip guidance. If there were a few experienced and generous members at a trip, one or more of them would often be willing to take out one or more newcomers, giving up their own hunting time to do it. The program, which was never official, gradually died out, and for years afterwards, newcomers were on their own for hunting, although identification of specimens was always provided.

Bringing it Back

A few years ago we started taking steps to revive and improve this program. We found some willing volunteers with at least moderate experience. Concerned about legal protection for our volunteers, we wrote a hold-harmless agreement and started requiring field trip attendees to sign it. We checked with the club's liability insurance carrier to see if guides would be covered. (As long as they operate within limits of what they know and club guidelines, they are.) We started giving safety talks at field trips, started requiring attendees in guided groups to have a whistle, and started giving out whistles. There was a compass navigation training for guides a couple of years ago and then a tree identification training, and we have another training scheduled for early Fall 2018 before the Fall field trips.

Thinking that we wanted to make this an official PSMS committee, we proposed same to the PSMS Board and were approved. I am chairing the committee, and members are Izzy O'Dell, Erin O'Dell, Jesse Clark, Les Rawlings, and Jamie Ardeña. It's an easy committee to be on as we have yet to hold an "in person" meeting. The PSMS Board doesn't care what we call ourselves and, for a while, we operated under the provisional name of the "Field Trip Guiding Committee." More recently we decided to rename ourselves the "Field Trip Guiding and Safety Committee." The program is aimed at newcomers primarily and is educational in nature. We can guarantee mushroom education so new members can later successfully hunt on their own, but we don't guarantee mushrooms. If all the newcomers who want a guided experience have signed up for a group, and spaces remain, we'll be happy to take out a non-newcomer.

Current Status

Currently there are 15 guides and two potential additional guides. The program is all volunteer, and there is no requirement to be available to guide any minimal number of trips, although if any guide is unable to guide even one trip in two years (four mushroom seasons) then I'm asking that person to withdraw until they are able to be more available. The result of all this is that at any given field trip we may have six guides show up to lead groups or we may have none. It often happens that we have more newcomers wanting a space in a guided group than we have spaces available.

We continue to require whistle possession for those going out in a guided group, and we have a limited number of whistles each season that we are willing to give out to members, one per person, per lifetime, honor system, no exceptions. Bringing your own whistle solves this potential barrier to going out with a guided group. We review whistle signals at the start of every field trip in our safety talk. Guides will have rules for their groups, and if you

aren't certain you can follow those rules, please don't sign up for a guided group experience. Groups may be up to 10 in number, less if the guide so prefers, and these experiences are for members only, not guests. Our guides do have some navigation training, but we insist in our safety talk that members going out in a guided group are really responsible for paying attention to where they are going and how to get back safely to the starting point. It is not safe to go into the woods and fail to pay attention to where you are.

Future Plans

Our guides have more than average mushroom knowledge, and are generally interested in increasing their identification skills. Consequently we have arranged free attendance at some PSMS classes for them and plan to continue doing that, as it helps the guides improve their knowledge and it also serves the club's need to develop a cadre of intermediate level (and eventually expert level) identifiers. Additional trainings will be offered in navigation, group management, and other topics of group interest.

It has been a challenge to determine the best way to have newcomers sign up for a guided group, and we will be changing how we do this to a first-come, first-served basis. There will be sign-up sheets at field trips for a place in a guided group, right next to the sign up sheets for the field trip itself. So earlier-arriving newcomers wanting a guided experience will have a better chance of signing up for limited spots than later-arriving members.

Our guides don't really hunt mushrooms when they guide; they manage a dispersed group of people in the woods, a task sufficient to require their entire focus. The job is part mushroom identification (focus on the main edibles), part education about habitat, and part people management. If any member wishes to join our ranks and work with us, I'd welcome some discussion about that possibility, so you may contact me (contact info. in club roster).

Our committee, as is the case for all PSMS committees, provides a path from passive to active membership. Active membership provides a sense of reward and accomplishment, you meet pretty interesting people, and best of all you have much more fun (compared to passive membership). The club will give back to you twice what you put into it; ask any active member.

TOXIC MUSHROOMS IN IRAN KILL 11 PEOPLE AND POISON MORE THAN 800

Saeed Kamali Dehghan

<https://www.theguardian.com/>, May 21, 2018

At least 11 people have reportedly died in Iran after eating toxic mushrooms. Emergency services in up to 10 provinces, mostly in the west of the country, reported that more than 800 people had become ill from mushroom poisoning and scores had been taken to the hospital. It is unclear what kind of mushrooms those affected had eaten.

Mushroom poisoning on such a large scale is rare in Iran. Most of those affected were from the province of Kermanshah, on the border with Iraq, where at least seven people were reported dead and 336 admitted to the hospital. The neighboring provinces of Lorestan and Kurdistan also reported high numbers of cases.

Authorities are scrambling to warn citizens against buying mushrooms sold in loose packaging and from picking wild mushrooms,

even if they resemble edible species. Eating poisonous mushrooms can result in a range of symptoms from a bad headache to gastrointestinal problems and death.

The semi-official Tasnim news agency said officials linked the phenomenon with abundant rain, which resulted in an excessive growth of wild mushrooms in western Iran.

Speaking to Tasnim, an Iranian woman living in a village in Kermanshah recounted the circumstances surrounding her mother's poisoning. "Like previous springs, she went out and picked a lot of mushrooms," said the woman, who was identified only by her first name, Behnaz.

"She fried some and ate them and got poisoned. We took her to hospital while she was feeling really terrible. She has since recovered and doctors are happy with her progress."

Behnaz added: "Some of my mother's neighbors also got poisoned and had similar symptoms, but they felt much better and have since been discharged from hospital.

"Residents of this area always use wild mushrooms but have never had any issues, and it's surprising for us to see this happening this year in Kermanshah and its vicinity."

Masoud, 31, from Kermanshah's Firouzabad district said he felt lucky to be alive. "I couldn't believe [it] as I ate these mushrooms all the time in previous years."

Masoud said eating wild mushrooms was part of the local culture. "It is really strange."

FROG-KILLING FUNGUS ORIGINATED ON KOREAN PENINSULA

Joanna Klein

The New York Times, May 18, 2018



An Oriental fire-bellied toad, which was imported into Europe from South Korea. By studying a wide range of samples from all over the planet, researchers say the rise of global trade helped spread the disease that has wiped out many amphibians.

In the 1970s and 1980s frogs and other amphibians seemed to be disappearing overnight. By 1999, researchers had determined the culprit was a deadly disease caused by a chytrid fungus which infected the animals with tiny, swimming spores.

Today this disease, called Chytridiomycosis, is thought to be one of the deadliest pathogens on the planet. It infects hundreds of species of amphibians and is thought to have wiped out a third of all frog species. These animals are important contributors to biodiversity and insect and disease control and may even be sources of new types of medicine.

For decades, scientists hoping to save these semiaquatic animals from extinction have been trying and failing to pin down the origins of this mysterious killer. They knew it developed from a common ancestor, but could not agree on where or when. Now, an international group of scientists has compared the genomes of 177 samples of the deadly fungus from six continents. They determined that the pathogen most likely arose on the Korean Peninsula 50 to 100 years ago and spread through global trade.

Their research, published May 10 in the journal *Science*, reiterates that the pathogen comes in many different strains, some more virulent than others. It suggests that new variations of the fungus can still develop and spread disease without proper protections.

Previously, researchers were limited by the scrappy bits of the fungus' DNA they could obtain by smearing a cotton swab across the skin of a frog or a salamander.

But by sequencing the full genomes of samples of the fungus, also called *Batrachochytrium dendrobatidis* or Bd, from all over the world, the team, led by Simon O'Hanlon and Matthew Fisher, infectious-disease epidemiologists at Imperial College London, found that samples shared the most genetic information with a group obtained from frogs that live on the Korean Peninsula, suggesting this was where the pathogen had originated.

They also discovered that this Korean lineage contained strains that were more genetically diverse than any others—and because it infected animals but did not kill them, it likely had been living with amphibians, who learned to tolerate or defend against it, for some time.

The researchers think the virulent, global strain emerged within the past century coinciding with rapid development in global technology, commerce, and trade. During this time, animals stowed away in equipment or produce or they were traded directly as scientific or medical specimens, food, and pets. These amphibians likely harbored the fungus, allowing it to become more virulent and spread to others not adapted to it.

And it is still happening, said O'Hanlon.

"I don't think we really knew the scope of it," said Karen Lips, an amphibian ecologist at the University of Maryland who wrote an accompanying commentary. "All the different flavors of chytrid are in the trade. And they're hybridizing and being moved about. None of this is good news for amphibians."

Many regulators have assumed that animals can harbor only one kind of chytrid fungus. But Lips said this paper brings attention to how diverse strains of the fungus could slip through the cracks and cause greater declines if trade is left unregulated.

"They like to say, well the horse has left the barn, and I say, well maybe one horse left the barn and all the other ones are still in there," she said. "We need to make sure they don't get out either, and that they don't mate and have babies that also escape."

That might require enforcing trade bans of species known to harbor the disease—as they have done for some salamanders that harbor a sister fungus called Bsal—or quarantining and testing amphibians for Bd, especially those arriving from Asia, she said.

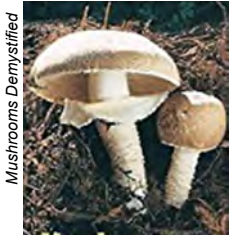
But she emphasized that, "this is a much bigger picture than frogs, chytrid, and amphibians." This case merely highlights the importance of preventing the global spread of infectious diseases for all kinds of plants and animals.

SOME SUMMER MUSHROOMS

Dick Sieger

The spring mushroom season is winding down. Here is a run-down of some mushrooms to look for during our warm, dry off-season. The descriptions are sketchy, so don't use them for final identification.

The Prince



Mushrooms Demy-stified

Agaricus augustus is the big mushroom pictured on the cover of *Mushrooms Demy-stified*. It's found near needle-bearing trees. When you brush off the soil that's always in the middle of a scaly cap, yellow tints appear. Try to collect young ones when the cap is sort of a marshmallow shape because warm summer temperatures encourage an invasion of those tiny maggots with black heads. A pleasant aroma of bitter almonds helps distinguish it from *Agaricus moelleri*, a poisonous mushroom that folks might mistake for The Prince.

Agaricus osecanus

Speaking of *Agaricus*, here's one to look for in grassy places as you near Olympic National Park. The smooth white cap of *Agaricus osecanus* can be as big as a dinner plate. It stains yellow with handling, smells like almond or anise, and its stalk has a medial bulge with a big, thick ring. Sneak into that unguarded pasture, hypothetically of course, and grab a sackful because you may never find a tastier mushroom.



Fairy Rings



Marasmius oreades, the Fairy Ring mushroom of fields and lawns, is valued by the French but seldom eaten around here. Even when the mushrooms aren't showing, you can see where they have been because of arcs with sparse inner edges and lush green outer margins. Circles of it expand year after year. A televised Scottish golf tournament showed a 30 ft circle on the links. The caps can dry out in the field and then come back to life when it rains. You can do what nature does—dry them and then have fresh mushrooms to cook with when they are rehydrated. Discard the tough stems. You may want some help with identification because this mushroom lacks striking features. And keep an eye on your puppy because I know of at least one dog that became ill after grazing on *M. oreades*.

Garden Mushrooms

Stropharia rugosoannulata, the Garden Giant or Wine Cap, is found on cultivated land and only on cultivated land. Where did it grow before there were farmers? It can be planted in gardens that have some wood mixed into the



soil. Look for purple-brown caps that can be 8 in. across. Spores color the gills (and also your dinner) black. Eat young ones.



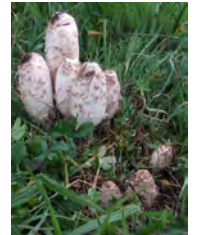
Wikimedia.org

Also growing in gardens is *Chlorophyllum brunneum*, formerly known as *Macrolepiota rachodes*. White flesh shows between coarse brown scales on a cap that is 4 to 8 in. across. The bottom of the stalk bulges abruptly. This fine-tasting mushroom has sickened some people, so small portions are best the first time around.

Chlorophyllum rachodes has a more gradually bulging stalk base but is otherwise quite similar and tastes just as good.

Inky Caps

Coprinus comatus, the Inky Cap, likes poor, hard soil, and it can push through blacktop using hydraulic pressure. It's a great beginner mushroom because of its unique appearance. Its conical cap is narrow, white, and has shingle-like scales. The edge of the cap melts into ink progressively from the bottom up. *Coprinus comatus* is more closely related to *Chlorophyllum* species than it is to most of the other inky mushrooms—twice, evolution has developed this strategy to aid spore release. You'll want to cook your collection up soon before it turns black. Refrigerated immersion in water or a quick zap in the microwave inhibits maturity. A big potful shrinks and makes a small bowl full of delicate creamy soup.



Shelving Polypores



Shelving polypores such as the *Ganoderma applanatum* will be on trees, snags, and logs in hot dry weather when all the fleshy things have disappeared. Perennial ones add a layer every year, so you can tell their age by counting the ridges. They can live for many years, so please don't kill them. Paul Stamets uses them for research but studies them *in situ*. He removes a plug for a small sample and then re-plugs the hole.

Fomes officinalis was once used as a treatment for malaria because it tastes bitter like quinine. Collectors gave an interesting slant to the term "mushroom hunting." High-up conks were shot down with a rifle.



Domestic Mushrooms



When the warm tan cups and saucers of *Peziza domiciliana* show up in your domicile, it's a sure sign that something is leaking. They'll grow on anything in your house that gets wet. The mushrooms are a half inch to several inches in diameter with the round margin becoming distorted when clusters of mushrooms push against one another. Sniff one and you'll recognize the fragrance of fresh morels, and might be tempted to cook some with your scrambled eggs. But of course you know better.

Death Caps

Finally there's *Amanita phalloides*, which worldwide kills more people than any other mushroom. It came here from Europe associated with ornamental trees and is spreading and becoming

more common. Because its tree partners are planted in urban areas, you may find it in parks and along city streets. Daniel Winkler saw what may have been a hundred of them around the Bellevue Court House, and they've appeared regularly outside CUH. The penalty for eating them is severe even with excellent medical care. Fatalities and liver transplants result.

Color and several features help identify *Amanita phalloides*. At first they are a puffball look-alike but cut them open from top to bottom to see the faint outline of a mushroom inside. The caps become 1½ to 6½ in. across. They may be white or light brown but are usually green, olive, or tinted yellow. The surface of the cap is smooth, perhaps with superficial white patches. The gills are pale and the spore print is white. Whitish tissue forms a ring that hangs like a skirt encircling the stalk. A buried Death Cup surrounds the bottom of the stalk but may be overlooked or lost with handling. Please get all the identification help you need before eating anything similar.



Amanita phalloides.

WORLD'S BIGGEST CLIMBING ORCHID SPECIES HAS HUGE TASTE FOR FUNGI

Nami Sugiura

<http://www.asahi.com/>, May 22, 2018

SAGA PREFECTURE, Japan - An extremely rare giant orchid species that creeps up the trunks of very tall trees like a vine could literally be eating itself out of existence.

Erythrorchis altissima is already designated on the Environment Ministry's red list as "critically endangered," meaning it is at grave risk of extinction.

The flower has a bizarre biology and is found only in Kagoshima and Okinawa prefectures. It thrives on nutrients from various fungi that grow on trees, which in turn rot the host plant.

This "diet" means the orchid can survive for only limited periods until the fungi finish decomposing the trees, said Yuki Tsujita, an associate professor of applied biological sciences at Saga University here, noting that a new generation can take over only if a large number of other tall trees are available nearby.

"Areas like that are becoming rarer, as primeval forests are dwindling," Tsujita said. "Plants of this type will perish when these forests vanish."

Bizarrely, the orchid lacks leaves that would allow photosynthesis to take

A giant orchid calls this tree home in Kuchinoerabujima island in Yakushima, Kagoshima Prefecture.



Yuki Tsujita

place. Yet, it typically can grow to up to 10 m in height.

While there are a number of plants that do not photosynthesize and obtain nutrients instead from fungi that live in symbiosis in their roots, most only grow to several centimeters or just a few dozen centimeters.



Yuki Tsujita

Erythrorchis altissima flower.

It remained a mystery how *Erythrorchis altissima*, which is believed to be the world's biggest plant in that group, manages to maintain its bulk.

Tsujita and her colleagues identified 37 fungal species in the roots of *Erythrorchis altissima*. Most of them were wood-decaying fungi, such as members of the Polyporaceae family, which decompose the trees that the giant orchid climbs.

Other plants of the group live in symbiosis only with limited types of wood-decaying fungi. No plant of that category was previously known to partner with such a wide range of wood-decaying fungi as *Erythrorchis altissima* does, Tsujita said.

The giant climbing orchid apparently needs a huge mass of fungi to maintain its colossal body.

It remains unknown how the giant orchid manages to live in symbiosis with so many fungi that feed on trees.

"*Erythrorchis altissima* could be compared to a trainer of wild animals who knows how to handle not just tigers but also lions and bears," said Tsujita, alluding to the risk of a mauling.

Tsujita is intrigued by the idea that the orchid species relies on meager circumstances, nutrients from a broad variety of wood-decaying fungi, to flourish.

But she noted that since the plant grows to great heights, it has the ability to scatter its seeds over a considerable area. Even so, it needs a huge pool of fungi to survive.

BRITAIN TO BECOME THE TRUFFLE CAPITAL OF THE WORLD WITHIN 30 YEARS?

Joe Pinkstone

<http://www.dailymail.co.uk/>, May 14, 2018

Growing this truffles has become increasingly difficult in mainland Europe, and exports from the Mediterranean have dropped off, with production set to decline further over the next 30 to 40 years.

Dr. Paul Thomas from the University of Stirling in Scotland, a climate modeling expert and truffle cultivation connoisseur, believes UK farmers should be preparing to exploit the opportunity.

"That drying is a long-term trend in Europe, so the future looks pretty good for British truffles," Thomas told *The Telegraph*.

"We need to be planning now if we are going to shift truffle producing regions [north]. In all the climate models, it looks pretty bleak for a lot of areas of Europe," he said.

Currently, the UK only produces one ton of truffles a year, a measly amount when compared with the 50 to 80 tons that France plucks from the soil annually.

The industry is expected to be worth £4.5 billion (\$6.1 billion) in the next decade or two.

OYSTER PIE

Ron Post

This is a rich pie and can be set in your favorite crust with or without a top crust. I use my standard crust recipe but substitute suet for 30 percent of the butter called for.

Ingredients

2 C oysters with liquid
4 oz. morel mushrooms
2 oz. pancetta
 $\frac{2}{3}$ C cream
2 TBs butter
1 Tsp lemon juice
1 stalk celery diced
1 small shallot diced
 $\frac{1}{4}$ C dry vermouth
1 TBs chopped parsley
1 TBs flour
1 tsp nutmeg
1 egg yolk beaten
Salt (optional)
Freshly ground white pepper



Procedure

Preheat oven to 350°F and prebake crust at least 5–8 minutes. Cool. Melt half the butter and sauté all of the pancetta 4–5 minutes. Cool. Sauté mushrooms in same pan about 3 minutes then add nutmeg and heat 1 minute more, stirring well. Remove.

Dump the oysters into a saucepan with their liquid and heat 3–4 minutes. Remove, saving liquid, and keep oysters warm.

Heat the cream in the saucepan and mix in $\frac{1}{4}$ C of oyster liquid. Continue heating, then stir in the vermouth. Cool.

Melt the rest of the butter and sauté first the shallot, adding the celery after 2 minutes and parsley a minute later. After 4–5 minutes add the flour and stir 1 more minute. Then continue to stir adding cream mixture slowly until sufficiently liquid. If necessary add more oyster liquid. Cool and stir in egg yolk.

Drop oysters onto crust after rubbing it with lemon juice. Sprinkle pancetta over oyster filling and press down gently. Pour cream mixture with veggies and mushrooms over this. Bake for 25 minutes.



**This will be your last *Spore Prints* until September.
Have a great summer!**

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