SPORE PRINTS

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Number 608 January 2025

TRACES OF 10,000-YEAR-OLD RICE BEER FOUND IN CHINA

Enrico de Lazar

https://www.sci.news/, Dec. 10, 2024

The Shangshan culture in ancient China's Lower Yangzi region is central to understanding the origins of rice domestication and early alcohol fermentation. To address these issues, researchers examined artifacts from the early phase of the Shangshan site, dating back to ca. 10,000 to 9,000 years ago. By analyzing microscopic remains, including phytoliths, starch granules, and fungi, associated with pottery vessels, they found evidence suggesting that the Shangshan people not only used rice as a staple food but also as a raw material for brewing fermented beverages, marking the earliest known alcohol fermentation technique in East Asia.

The origins of rice domestication have undergone extensive archaeological scrutiny and discussion in recent years.

Archaeologists generally agree, based on existing data, that the earliest stages of rice domestication occurred in China's Lower and Middle Yangzi River region.

The Shangshan culture in Zhejiang represents a region where early rice domestication emerged.

Although the degree of rice domestication is still under investigation, recent studies suggest that this process began early.

In a new study, Prof. Leping Jiang from the Zhejiang Provincial Institute of Cultural Relics and Archaeology and colleagues addressed issues related to the material and social mechanisms that may have played an important role in the early Shangshan rice exploitation and alcohol brewing.

The researchers analyzed microfossil remains associated with pottery vessels from the earliest phase of the Shangshan site.

"These sherds were associated with various vessel types, including those for fermentation, serving, storage, cooking, and processing," Prof. Jiang said.

"We conducted microfossil extraction and analysis on residues from the inner surfaces of the pottery as well as the pottery clay and surrounding cultural layer sediments."

"We focused on identifying phytoliths, starch granules, and fungi, providing insights into the pottery's uses and the food processing methods employed at the site," said Stanford University's Prof. Li Liu.

The analysis of phytoliths revealed a significant presence of domesticated rice phytoliths in the residues and pottery clay.

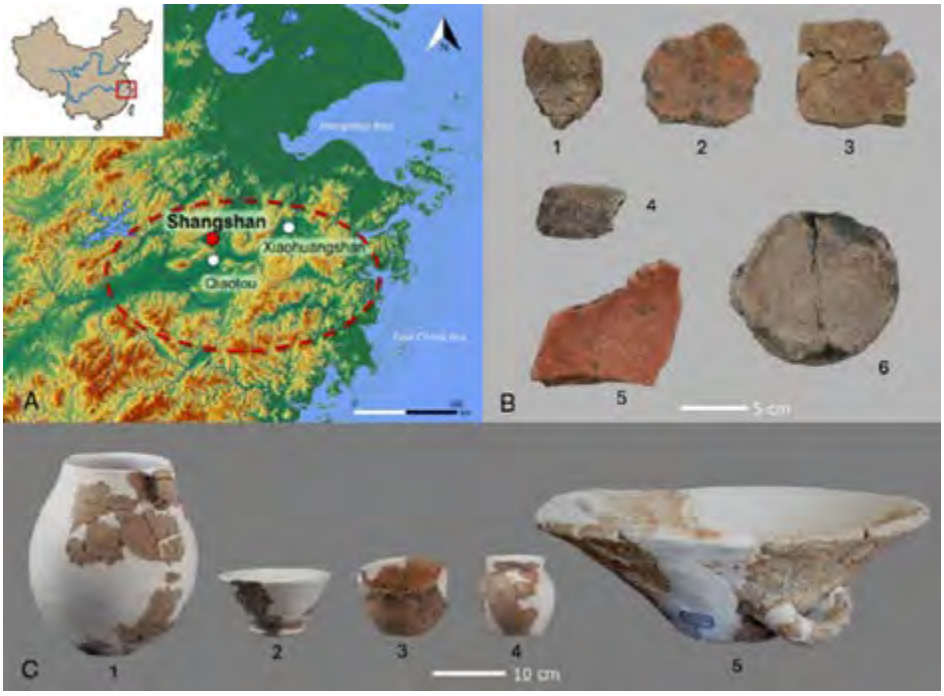
"This evidence indicates that rice was a staple plant resource for the Shangshan people," said Professor Jianping Zhang, a researcher with the Institute of Geology and Geophysics at the Chinese Academy of Sciences.

"Evidence also showed that rice husks and leaves were used in pottery production, further demonstrating the integral role of rice in Shangshan culture."

The researchers found a variety of starch granules in the pottery residues, including rice, Job's tears, barnyard grass, Triticeae, acorns, and lilies.

Many of the starch granules exhibited signs of enzymatic degradation and gelatinization, which are characteristic of fermentation processes.

The scientists also uncovered abundant fungal elements, including *Monascus* molds and yeast cells, some of which displayed developmental stages typical of fermentation.



Liu et al., doi: 10.1073/pnas.2412274121.

The site locations and artifacts of the Shangshan culture: (A) locations of the Shangshan, Qiaotou, and Xiaohuangshan sites (dots) and the distribution area of the Shangshan culture (red circle); (B) selected pottery sherds analyzed: 1 – cup sherd; 2 – jar sherd; 3 – jar sherd; 4 – rim sherd from sand-tempered cooking pot; 5 – large basin sherd; 6 – base of the ring foot bowl; (C) corresponding complete vessels: 1 – globular jar; 2 – ring foot bowl; 3 – cup; 4 – flat-based jar; 5 – large basin.

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CALENDAR

Jan. 14 Membership meeting, 7:30 pm, CUH
Jan. 20 Board meeting, 7:30 pm, CUH board room
Jan. 21 *Spore Prints* deadline

BOARD NEWS — Carolina Kohler

On Monday, December 16, the board held its last meeting of 2024, touching on several issues that will be instrumental in the shaping of our club in 2025 and beyond.

After the customary approval of the previous meeting minutes and treasurer's report, the board addressed some recent and upcoming financial decisions aimed at making the best use of our available resources to fulfill PSMS's mission in our community. This ranges from recurring donations to fellow organizations, to more efficient investment of our assets. Our **Finance Committee** is tackling these topics and bringing their conclusions back to the board for further discussion.

This was followed by a conversation regarding the space rental for our **2025 Wild Mushroom Show**. Derek Hevel reported that the Shoreline Community College is happy to have us again next year, and he will work on providing the board the details of the proposed contract to finalize an agreement.

Next on the agenda was a recap by the **Strategic Planning Committee**. The group shared the results of the strategic planning retreat that took place in 2018, and of the follow-up in 2020. The intent is to build on this earlier effort, and the committee has asked the board to study which of the tasks and goals identified back then should be, or should not be, picked up from here onward to inform our strategic plan.

The final item on the agenda was presented by the **Election Committee**, which has been very busy these past few weeks putting together a healthy roster of candidates for our upcoming elections. If you are interested in becoming part of the board, or know of someone who would, there is still a little time to contact the committee and let them know. Being a board member is a fantastic way to gain a deeper understanding of all it takes to make our club work, so don't miss the opportunity!

We hope you have all had a wonderful holiday season and an exciting start of 2025! May this year keep our hearts, and our baskets, full of all things joyful!

Happy New Year!

MEMBERSHIP MEETING — Joseph Zapotosky

Truffles, Truffles, Truffles—Celebrating their Diversity


Heather Dawson & Rye.

We are rapidly approaching truffle season here in the Pacific Northwest, and Heather Dawson, our January speaker, is a Ph.D. candidate at the University of Oregon studying truffles. With her dog Rye, Heather not only searches for the edible truffles in the forest, but is also endeavoring to get a handle on truffle diversity in our region.

Now more than ever, truffles are gaining in popularity. Our Oregon white and black truffles are highly sought after for their culinary value. But the Pacific Northwest is a hotspot of truffle biodiversity, and home to over 350 species of *non*-culinary truffles. Heather spends much of her time in the woods with her truffle dogs looking for hypogeous fungi—not just the edible ones but the nonculinary ones as well. Their diversity might surprise you.

So, please join us at 7:30 pm Tuesday evening, January 14, at the Center for Urban Horticulture/University of Washington to hear more about Heather's exciting research and the diversity of hypogeous fungi (truffles) in our area. The meeting will be both in person and available for viewing via Zoom:

https://zoom.us/j/98938057877?pwd=FLrSlhtOgVPg7F-nIM6C3wV1rbUGbii.1

APPLICATIONS OPEN FOR THE BEN WOO SCHOLARSHIP FUND

Pei Pei Sung

The Ben Woo Scholarship Fund supports research and education on fungi in the Pacific Northwest, helping to advance mycology as a hobby, a science, and a community effort. Named in honor of Benjamin Woo, a founding member and first president of the Puget Sound Mycological Society, this program provides financial assistance for projects that further understanding of fungi, with a focus on mushroom-forming species—the heart of PSMS's mission.

Anyone conducting mycological research or educational outreach that benefits the Pacific Northwest mycological community can apply. Scholarship applications are due by March 1, 2025, and individual awards can be up to $3,000.

To learn more about application requirements, eligibility, and allowable costs, visit psms.org/scholarship.

THE PLURAL OF FUNGUS

Brian S. Luther

You may have heard different people pronounce the plural of fungus in several ways. I'll review them all here. There are two correct spellings for the plural of fungus: *fungi* & *funguses*. Concerning the word *fungi*, there are four different pronunciations I've heard over the years, mentioned in some dictionaries, which I've phonetically arranged below.

1. *Fun-jeye* - This is the most common way the word is pronounced by most mycologists.
2. *Fun-jee* - This is less frequently used by mycologists, but is the first in PSMS. PSMS Scientific Advisor Dr. Daniel E. Stuntz *always* pronounced it this way.
3. *Fun-gee* - Only rarely have I heard the word pronounced this way, and it's usually people unfamiliar with the subject or mycophile beginners.
4. *Fun-guy* - Also only rarely heard and by the same folks as #3. Of course I'm sure you've heard the joke related to mushroom enthusiasts: "He's a fun-guy."

As long as you spell the word *fungi* correctly, you can pronounce it differently, but pronunciations 1 and 2 above are clearly much more conventional. There are many other related examples, such as the genus *Amanita*, which can be pronounced "aman-eyeta" or "aman-eeta"; both are correct just as long as you spell the genus correctly.

The word *funguses* is totally correct for the plural of fungi, but almost never used in modern literature and the pronunciation does not vary. It's seen in much older British publications related to fungi.[1]

The word fungus was first used much earlier, in 1527, but the word fungi as the plural was not used until the early 1800s.

[1]One example: Hussey, Mrs. Thomas John. 1855. Illustrations of British Mycology. Containing Figures And Descriptions Of The Funguses Of Interest And Novelty Indigenous To Britain.

10,000-Year-Old Rice Beer, *cont. from page 1*

These fungi are closely associated with qu starters used in traditional brewing methods, such as those used in producing hongqujiu (red yeast rice wine) in China.

The team analyzed the distribution of *Monascus* and yeast remains across different pottery vessel types, observing higher concentrations in globular jars compared to a cooking pot and a processing basin.

This distribution suggests that vessel types were closely linked to specific functions, with globular jars purposely produced for alcohol fermentation.

The findings suggest that the Shangshan people employed broad-spectrum subsistence strategies during the early phases of rice domestication and used pottery vessels, particularly globular jars, to brew qu-based rice alcoholic beverages.

The emergence of this brewing technology in the early Shangshan culture was closely linked to rice domestication and the warm, humid climate of the early Holocene.

"Domesticated rice provided a stable resource for fermentation, while favorable climatic conditions supported the development of qu-based fermentation technology, which relied on the growth of filamentous fungi," Professor Liu said.

To rule out potential contamination from soil, the authors analyzed sediment control samples, revealing significantly fewer starch and fungal remains in these samples than in pottery residues.

This finding reinforces the conclusion that the residues were directly associated with fermentation activities.

Modern fermentation experiments using rice, *Monascus*, and yeast further validated the findings by demonstrating morphological consistency with the fungal remains identified on Shangshan pottery.

"These alcoholic beverages likely played a pivotal role in ceremonial feasting, highlighting their ritual importance as a potential driving force behind the intensified utilization and widespread cultivation of rice in Neolithic China," Prof. Liu said.

"The evidence of rice alcohol fermentation at Shangshan represents the earliest known occurrence of this technology in East Asia, offering new insights into the complex interplay between rice domestication, alcoholic beverage production, and social formation during the early Holocene in China."

The findings appear in the *Proceedings of the National Academy of Sciences*.

Tree

—Janeen Samuels

Lichens, mosses and fungi—
these flourish on this rock ridge,
a delicate crushable tundra:
bracket, star, cup, parasol,
gilled, pored, spored, membraned,
white, chestnut, violet, red.

INFECTED BAT POOP MEANT TO FERTILIZE MARIJUANA PLANTS KILLS TWO GROWERS IN NEW YORK

Irene Wright

https://www.thenewstribune.com/, Dec. 17, 2024

Two marijuana growers in Rochester, New York, died after contracting a deadly fungus from bat poop intended for fertilizing their plants, doctors said.

A 59-year-old man and a 64-year-old man were hospitalized after suffering months of weight loss and worsening breathing issues, doctors said in a Dec. 5 case report published in the journal *Open Forum Infectious Diseases*.

They tested positive for *Histoplasma capsulatum*, a fungus that causes histoplasmosis, or an infection of the lungs, doctors said.

Paul Chinn/The San Francisco Chronicle via Getty Images

Field workers spread locally sourced bat guano fertilizer on marijuana plants in California in 2017.

The Two Growers

The 59-year-old had a history of emphysema, a condition that damages the air sacs of the lungs; heavy tobacco use; and marijuana inhalation, according to the report. He was previously diagnosed with rheumatoid arthritis but was taking a medical injection for the symptoms.

The man was losing weight for six weeks and had a sore throat when he was admitted to Strong Memorial Hospital, doctors said. It was becoming increasingly difficult to swallow, and scans showed a mass on his larynx, or voice box. Doctors suspected carcinoma, a cancer of the tissue, and took a biopsy, which revealed the histoplasmosis infection.

"On exposure assessment, he reported the use of bat guano (poop) from an online store as a fertilizer for cannabis plants that he cultivated and smoked, but he denied other potential exposures," doctors said.

The 59-year-old underwent treatment, but after two weeks, he continued to have extreme difficulty breathing, and "he ultimately transitioned to comfort care and died," according to the report.

The 64-year-old arrived at the hospital after losing 35 lb over several months. He had low sodium content in his blood and was having difficulty eating because of poor dental hygiene, doctors said. He had a history of tobacco, marijuana, and alcohol use, and previously underwent a bypass surgery to redirect blood flow to his legs.

Like the younger man, he was battling a chronic cough, but his exposure to bat poop didn't come from an online store—it was in his own home.

"Remarkably, the patient reported a heavy bat infestation of his attic with a thick layer of guano that he inspected on multiple occasions intending to use it as fertilizer for his cannabis plants," doctors said.

The man was also treated for a histoplasmosis infection and was able to go home, but one month later, he returned to the hospital with pain in his abdomen. Blood flow to his intestines ultimately stopped, and he died from intestinal complications.

"Bird and bat droppings provide an ideal medium for *Histoplasma* growth and serve as a source of the fungus in the environment," doctors said.

Bat guano is also being used more often in fertilizers, both in agricultural and home-growing situations, according to the report. "Outbreaks of histoplasmosis related to agricultural fertilizers have been detected in Latin America," doctors said.

"Natural Superfood"—Not

"Remarkably, numerous media articles promote bat guano as a 'natural superfood' for cannabis plants because of its richness in nitrogen, phosphorus, potassium, and organic compounds." Both Rochester men were growing their marijuana for personal consumption legally, but as more cities allow recreational marijuana, the doctors emphasize speaking with growers about potential exposures in more "natural" fertilizers.

The fungus *Histoplasma capsulatum* can live in soil in most parts of the world, including across the U.S. While it is most commonly found in bird and bat poop, it can also live in the soil, waiting to be inhaled, according to the Cleveland Clinic. Doctors estimate that as many as 75 percent of people that live in areas where the fungus lives have been infected before, even if they never show symptoms.

In the vast majority of people, about 90 percent, an infection doesn't show any symptoms or the symptoms resolve on their own, but in cases of preexisting conditions or lung diseases, an infection can be fatal, the Cleveland Clinic says.

Early symptoms include fever, cough, sweating, shortness of breath, chest pain, headache, muscle aches, and a rash or bumps on the lower legs. The highest chance of exposure comes from spelunking, or cave exploration; farming; keeping chickens or birds; and demolition and construction where the spores in the soil can become airborne. Seek medical treatment if you experience these symptoms following a potential exposure activity, doctors say.

NEWLY NAMED PSYCHEDELIC FUNGUS POINTS TO AFRICAN ORIGINS OF WORLD'S MOST POPULAR "MAGIC MUSHROOM"

Peter de Kruijff

https://www.abc.net.au/, Dec. 15, 2024

The fungus *Psilocybe cubensis*—colloquially known as cubes, gold tops, or gold caps in Australia—is the most prolific hallucinogenic mushroom on the planet.

Its psychoactive compound psilocybin is an illegal drug in most parts of the world, so research into where the species came from and how it spread is limited.

But a new study, not yet peer reviewed but published on the biological sciences repository bioRxiv, suggests an ancestor of *P. cubensis* could have come from Africa before spreading far and wide.

The study unveils a psychoactive mushroom that looks like *P. cubensis* but is new to Western science.

Samples of the unnamed species were collected in Zimbabwe and South Africa and their genetic blueprint compared to that of *P. cubensis*.

Study co-author Bryn Dentinger, the mycology curator at the Natural History Museum of Utah, said the new species, provisionally named *Psilocybe ochraceocentrata*, is the closest wild relative to *P. cubensis* discovered so far.

"We estimate they diverged [from a common ancestor] around 1.5 million years ago," he said. "So, by comparison, they are roughly the same relatedness as chimps and bonobos are to each other.

"Knowing the closest wild relative of *P. cubensis* provides information on its origin and evolution."

Australian mycologist Alistair McTaggart, from the private company Psymbiotika Lab and who was not involved with new research, said the study supports the hypothesis that *P. cubensis* could have an African origin.

Cathy Sharp

McTaggart and Dentinger agree that if the new species could be bred with *P. cubensis*, the hybrid offspring may lead to the development of new psilocybin therapies.

P. cubensis (top) and P. Ochraceocentrata (bottom). The name of the new African species Psilocybe ochraceocentrata means pileus (cap) with a yellow-ochre center.

HOW DID PSILOCYBE MUSHROOMS MOVE AROUND THE WORLD? Peter de Kruijff

https://www.abc.net.au/, Dec. 15, 2024

Psilocybe, a genus that includes many species of psychedelic mushrooms with gills, first emerged 67 million years ago.

A common ancestor of *P. cubensis* and *P. ochraceocentrata* could have evolved alongside large herbivores in East Africa as far back as 1.8 million years ago, the study suggests.

"Bovids [cloven-hoofed grazing mammals] in particular were abundant and transforming the landscape to create and maintain grasslands and savannas in parts of Africa," Dentinger said.

And it was about this time that the ancient human species *Homo erectus* started migrating out of Africa and into Eurasia alongside bovids.

Mushroom spores transported on bovid hoofs or dropped in poo could then explain how the ancestral *Psilocybe* species spread then diverged in Africa and Asia.

REAL MUSHROOMERS Ron & Bob Roseberry

Mycelium, Mycological Society of Toronto, July–Sept., 2000

Are you a real mushroomer? Following is a guide to determine whether you are really qualified for entry into this elite society or just a wannabe.

Real mushroomers:

- Can be identified by their funny walk. They walk with their heads down, looking at the ground, until they come to a tree, when their head suddenly comes up and they appear to be looking at the sky. And they frequently look behind themselves just to make sure they haven't missed one. Other identification features include the burrs on their socks, the constant scratching of chigger bites, and either waterproof boots or wet shoes and socks.
- Spend more on mushroom books than on the furniture in the room where the books are kept. When entering a bookstore they always head for the "nature guides" area first. They can identify most mushrooms without a field guide, and have never had a "near death experience" due to misidentification.
- Can be found in the woods any month of the year, in any kind of weather, and with complete disregard for the temperature.
- Would rather spend half a day lost in the woods than be found by somebody who is not lost but is hunting their favorite mushroom patch.
- Can spot a mushroom from their car window at any speed up to 45 miles per hour. The true professionals can sometimes perform the same feat at 60 miles per hour using their rear view mirror.
- Will gladly crawl through poison ivy or stinging nettles to harvest a single choice mushroom, and are as adept as circus performers at the three-person-stack (feet on shoulders) to harvest the high growing edibles.
- Can frequently be seen wandering across the centerlines or on the shoulder of roads with their automobiles because of their habit of constantly evaluating the wooded areas they are passing for their hunting potential and checking in their rear view mirror for poachers who might be following.
- Have half their refrigerator shelves occupied by mushrooms they hope to identify.
- Are careful in identifying anything they intend to eat, but will find some quality in any non-poisonous mushroom. "It adds texture." "It adds color." "It smells like anise."
- Have a real problem enjoying the scenery when visiting parks because they are always looking for mushrooms.

cont. on page 8

ENDANGERED DARWIN FROGS RESCUED FROM DEADLY FUNGUS IN CHILE ARRIVE AT LONDON ZOO

https://www.itv.com/, Dec. 9, 2024

Dozens of endangered Darwin frogs have been rescued and transported to London Zoo after a deadly fungus in their native habitat is putting them at risk of extinction. The rescue of was part of a global effort to stop the amphibians from dying out and begin a breeding and research program to save the species.

The Parque Tantauco forests in southern Chile were once a sanctuary for Southern Darwin's frogs (*Rhinoderma darwinii*), but a survey found the arrival of the chytrid fungus resulted in a 90 percent decline in the population. The fungus causes a skin disease in amphibians called chytridiomycosis which limits a frog's growth.

Starting their journey in Southern Chile, 53 Darwin frogs endured a 6-hour boat ride, a 15-hour drive to Santiago [Chile's capital], and a flight to Heathrow, before being transported to London Zoo.

During a five-day expedition in October, conservationists from The Zoological Society of London (ZSL) located the extremely camouflaged frogs near an area believed to be free of the fatal fungus. A temporary bio-secure facility was built to undertake health checks, monitor and care for the frogs ahead of the journey to the UK.

Once the 53 chytrid-free frogs had cleared health checks and travelled to London, they began quarantine. Each frog was then introduced to its new home, with some immediately making their whistling calls on arrival, indicating they had acclimatized to the new surroundings.

Conservationists from ZSL—the conservation charity which runs London Zoo—organized the rescue mission to bring the frogs to London Zoo. It's in partnership with Ranita de Darwin NGO, Zoo Leipzig, Parque Tantauco, Universidad Andrés Bello, Universidad de Concepción, and the Chilean National Zoo, and with the support of the Government of Chile.

Ben Tapley, London Zoo's Curator of Amphibians, said: "These frogs represent a critical piece of Chile's biodiversity and natural heritage, and their survival hinges on our ability to protect them from chytrid fungus.

"By establishing a population here at London Zoo, we not only safeguard their survival but can also raise awareness of the urgent conservation challenges they face.

"Projects like these underline the importance of conservation zoos in conserving endangered species, like the Southern Darwin's frogs, for generations to come."

Andres Valenzuela-Sanchez, project lead and Institute of Zoology research fellow, said: "Moving 53 Chilean frogs to London was no small feat—it took meticulous planning and more than a few sleepless nights!

"The frogs are settling in fantastically well in their new home, and we're hopeful that this rescued population will thrive.

"Over time, we aim for their offspring to play a crucial role, both as candidates for wild reintroductions and to enrich our understanding of the species and chytrid's impact in Chile."

https://www.pressreader.com/uk/bbc-wildlife-magazine

Darwin's frogs are the only frogs in the world that carry fertilized eggs in their vocal tracts until they are able to venture into the world.

Five Facts about Darwin's Frog

- They weigh less than 2.0 g and are under 3 cm in size.
- Male Darwin frogs carry developing tadpoles in their vocal sacs before they can survive by themselves.
- Biologist Charles Darwin discovered the frog on his world voyage.
- The frogs are native to streams and forests in Argentina and Chile.
- They are extremely well camouflaged and blend into mossy habitats to protect themselves from predators.

GIANT MUSHROOM FEEDS BRITISH FAMILY FOR A WEEK

Danny Fullbrook

https://www.bbc.com/, Dec. 13, 2024

A woman who found a giant 5 kg (11 lb) puffball on a country walk said the mushroom fed her family for a whole week.

Alissimon Minnitt

Alissimon Minnitt found the giant mushroom while out for a walk in the Buckinghamshire countryside.

Alissimon Minnitt, 27, was walking with her father in a field in North Marston, near Winslow in Buckinghamshire, when they spotted the enormous fungus in the grass.

"It fed my family for a week…I've been eating it ever since. I still have three slices left in my freezer. I'll be honest—I'm a little bit sick of it," she said.

Alissimon is a keen forager with "an interest in mushrooms," and said she knew how to identify it and not mistake it for something poisonous.

Ms Minnitt, from Chesham, found the fungus close to where she previously found another giant, but slightly smaller, mushroom in 2017.

"A giant puffball is the most easily recognizable 'forageable' mushroom," she said. "It looks like something from another planet, they are so weird."

The amateur mycologist explained she knew what shapes and colors to avoid. Experts say people without such knowledge should not take any risks.

The fungus was used to cook a meatloaf and mushroom steaks—and a mushroom-based pizza.

THEY MADE THIS WOOD BIOLUMINESCENT TOWARDS A NEW LIGHTING METHOD

Cédric Depond

https://www.techno-science.net/, Dec. 12, 2024

Everything begins with a fungus, the ringless honey mushroom (*Desarmillaria tabescens*), a parasite known for its luminous qualities. Combined with balsa wood, it offers an intriguing mix: a stable material capable of glowing intensely. This biohybrid opens up unprecedented possibilities for sustainable lighting.

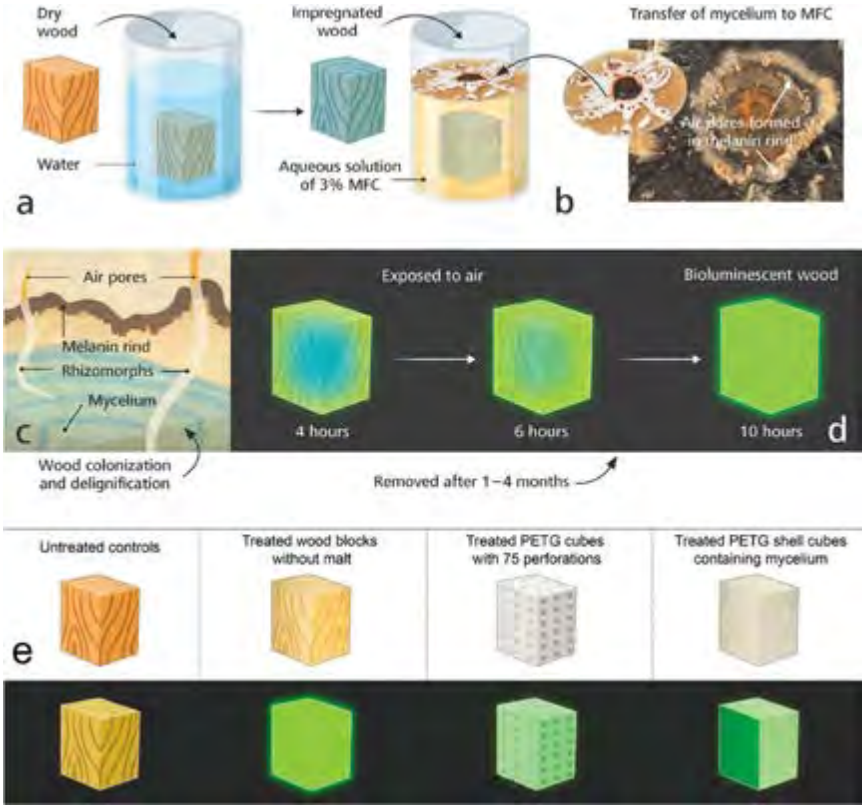
To create this luminescent wood, researchers immersed the fungus and balsa in extremely humid conditions for three months. This incubation allowed the wood to absorb up to eight times its weight in water, a necessary condition for the process to initiate.

The key element of this luminescence is luciferase, an enzyme that, in the presence of oxygen, triggers a chemical reaction emitting green light. This is the same enzyme produced by fireflies. The result: a persistent glow lasting ten days, as detailed in *Advanced Science*.

Despite the degradation of lignin by the fungus, the cellulose in the wood remains intact. This characteristic ensures the mechanical stability of the material, making various applications possible. In-depth analyses, including spectroscopy, confirm the integrity of this biohybrid structure.

Scientists aim to enhance the brightness and extend its duration. If these objectives are achieved, this bioluminescent wood could replace some traditional light sources, offering an ecological and economical solution.

Unlike other studies on bioluminescent living plants, here, "dead" wood broadens the fields of application. Illuminating furniture or walls could revolutionize architecture and design while reducing energy footprints.



a - *Vacuum-impregnated block of balsa wood absorbing water, then autoclaved.*

b - *Growth of D. tabescens in an aqueous medium containing 3 percent microfibrillated cellulose (MFC).*

c - *Submersion colonization of balsa wood by rhizomorphs and mycelium of D. tabescens.*

d - *After 1 to 4 months of incubation, cleaned blocks of wood exposed to air, intensifying their bioluminescence as they dry.*

e - *Comparison of bioluminescence between treated wood, untreated controls, and non-lignified materials (PETG cubes or casings). The strongest bioluminescence observed in treated wood.*

ANCIENT CLAY REMEDY MAY HAVE POTENTIAL TO BOOST MODERN GUT HEALTH

https://www.strath.ac.uk/, Dec. 18, 2024

Scientists have discovered an ancient medicinal clay that could inspire new insights into gut health in the present day.

Researchers also believe the clay, known as Lemnian Earth (LE), was a forerunner to modern pills. As far back as the first millennium Before the Common Era (BCE), it was shaped into a small pellet, stamped with a seal, and taken with liquids such as wine.

This new study, by researchers from the University of Glasgow, University of Strathclyde, and the Technical University of Crete, points to the possibility that the clay's healing properties were the result of a deliberate combination of specific clays with certain fungi.

Collection of Lemnian earths (sphragides) from the collection of Basel University Museum of Pharmacy (16th–18th c.) (a) Lemnian sphragis (red). MA no. 01422/44. (b) Lemnian sphragis (grey). MA no. 01424. (c) Lemnian sphragis (white). MA no. 01432.

Bioactive Compounds

For more than 2,500 years Lemnian Earth—found on the Greek island of Lemnos—has been revered as a medicine to protect against poisons ingested or injected and, in the post-medieval period, even against the plague.

After examining historical LE samples from Basel University, the team grew their own fungus and clays together in a controlled environment to allow the creation of bioactive compounds.

The research, published in the journal *PLOS One*, suggests that combining some clays with beneficial fungi may produce compounds that positively impact gut bacteria, which could help maintain a balanced gut microbiome—a key factor in overall wellness.

cont. on page 8

Ancient Clay Remedy, *cont. from page 7*

The paper says: "Regarding the LE, the precise recipe for its preparation remains, and is likely to remain, unclear and further, it may have been modified over time. Investigating LE, and what has been known about it, has served as a springboard to investigate the modulation of the microbiome in a targeted fashion.

"Our data provide a potential mechanism by which fungus plus clay co-cultures may be a valuable tool for manipulating the microbiota to prevent the progression of inflammatory diseases, and perhaps also limit intestinal infections; it therefore suggests avenues for the further development of ancient LE's potential in a 21st century context."

Analytical Technologies

Analysis using liquid chromatography mass spectrometry by Dr. Nicholas Rattray, senior lecturer (associate professor) in clinical metabolism at Strathclyde Institute of Pharmacy and Biomedical Sciences, revealed a whole host of bioactive compounds.

Rattray said: "Often, liquid chromatography mass spectrometry metabolomics is applied in the analysis of natural product-based medicines but seldom on samples that are so old."

Dr. Simon Milling, Professor of Immunology, Centre for Immunobiology, School of Infection and Immunity, University of Glasgow added: "Our reconfigured 21st century Lemnian Earth shows that this ancient remedy has the potential to support good gut health for people living today."

Testing by the researchers showed that the combination of clay and fungus had broad antibacterial properties and uniquely positive effects on the gut microbiome.

Technical University of Crete colleague, Prof. George E Christidis, School of Mineral Resources Engineering, said: "Clays which include iron and titanium compounds have been known to interact with microorganisms (bacteria) but the role of the clay minerals themselves, which are the main constituents of clays, has not been previously considered important."

Real Mushroomers, *cont. from page 5*

- Give honest answers when asked where they find mushrooms. "In the country." "North of town." "In a pasture." "Down by the river." "Out in the woods."
- Are noted for their distinctive dress. In addition to oddly matched clothing, they frequently carry fancy walking sticks and almost always wear very funky hats.
- Think almost every mushroom is beautiful.
- Can be spotted walking around their yard shaking spores off mature mushrooms or dumping the wash water for choice edibles in the hopes of starting their private mushroom patch. The more ingenious ones use their rotary mower or their garden hose sprayer to distributes the spores evenly.
- Always carry a bag in their automobile just in case they suddenly discover a fruiting in an unexpected location, and carry eight or more concealed bags on their person in case they find the "Mother Lode."
- Can smell "stinkhorns" at 100 yd. Normal people must be within a few feet. (These are considered beautiful and worth collecting, even if they must be strapped to the hood of the car to avoid the odor.)
- Will walk miles through the woods on a foray when they are too sick to sit in a chair at work.
- Will select the "wild mushroom" dish on restaurant menus, which usually contains portobella and shiitake mushrooms.



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PSMS Holiday Social, 2024
Center for Urban Horticulture
University of Washington