
The Boston Mycological Club
Bulletin
Spring 2025 Volume 79 Issue 1

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In This Bulletin

The front and back cover photos were taken by Ari Stamatiou at Haskell Swamp in Rochester.

Contribute to The BMC Bulletin!

The Bulletin is a place for our members to share their creativity and experiences. Our editorial team encourages you to submit stories, articles, experiences, artwork, poetry, and photos of your finds. Please send all questions, concerns, comments, and contributions to editor@bostonmyco.org

We welcome Jess Evans of the Pioneer Valley Mycological Association as a guest editor this year. Jess introduces herself on page 3 of this edition. Our wonderful Beryl Lipton will assist during this transition.

Introducing Jess

JESS EVANS

Thanks so much to BMC for inviting me to help as a guest editor for The Bulletin in 2025! Members of BMC may know me from NEMF 2024 on Cape Cod, joint walks, or even social media. Last year, I co-led a walk for the BMC with Jonathan Kranz at Rome Conservation Area in Gardner, and despite the pouring rain we had a fantastic time!

I'm currently serving as the President of the Pioneer Valley Mycological Association in Western Massachusetts, and this is my fourth two-year term in that role. I am the editor of the PVMA newsletter and am also our club's web administrator. Beyond that, I'm the web administrator for the Northeast Mycological Federation (NEMF) and handle much of the social media for that organization.

I became interested in fungi through my love of nature photography and hiking. As I took photos on my long hikes, I became curious about what I was capturing and felt a need to learn more. I joined PVMA in 2016 after moving to Western Massachusetts and benefited greatly from the mentorship of Dianna Smith and other founding members. Now, my primary interest is in the role fungi play in forest ecosystems and how fungi will change and (hopefully) adapt as climate change affects our trees.

Outside of fungi, I work as a full-time outdoor educator and Assistant Director of Morse Hill Outdoor Center in Shutesbury, which is on the west side of the Quabbin Reservoir. This means that I get to spend most of my days outside, still surrounded by fungi! I'm also a solo parent to a teenager and enjoy gardening, birding, hiking, and asking big questions.

Connect with me on Instagram @immersion_gal or via email at jessicabensonevans@gmail.com.

Cooking Wild Mushrooms

KAREN MONGER, THE 3 FORAGERS

Wild mushrooms can be an excellent meat substitute in many meals for meat eaters and vegetarian alike for a few reasons. Their ability to satisfy hunger due to their protein content and fiber levels (beta glucans and chitins) can often "trick" even the pickiest eaters into feeling full after a meal. Mushrooms, especially wild mushrooms, have a high level of umami--which is described as the fifth taste that humans can detect along with salty, sweet, bitter, and sour; umami is often described as a "meaty, roasted, or brothy" flavor.

Mushrooms get their umami from a complex mix of glutamic acid, purine bases, nucleotides, and the breakdown of fatty acids and monoterpenes. Cooked correctly, mushrooms will have excellent and satisfying flavors for many people, and their textures can be enhanced far beyond the pale, slimy soups and canned sliced mushrooms of our childhood!

The best way to start is at the beginning: pick your mushrooms in a smart manner! Whether you prefer to pull or cut, field clean your correctly identified edible fungi before placing them in their basket. Remove the dirty bottoms, remove any visible bugs or critters, brush away any dirt or debris. If you have small wax bags or small paper sacks, they can be useful to keep your finds organized by species, and then easy to transfer to the refrigerator later. DON'T use plastic, your fungi need to breathe and will degrade quickly if kept in plastic bags.

Respect your fungi--don't collect old, maggoty, slimy, or rotten mushrooms! Remember that it was free food to begin with, there is no reason to collect less than pristine mushrooms for your plate. It amazes me how many people see holes in their wild mushrooms and they shrug it off and rationalize it thinking it's worms and "extra protein", when the reality is that the holes are formed by maggots of fungus flies that eat the mushroom flesh as they burrow, pooping the whole time. Do you really want to eat that?

Now that you have a bunch of beautifully clean, correctly identified, safe edible mushrooms, what are the best ways to cook them? (Keep in mind that how to cook and taste is strictly subjective and everyone has strong opinions about how it should be done, and these are our opinions based on our experiences.)

Prep your mushrooms: If your mushrooms are still a bit dirty, try to brush them clean with a pastry brush or a paper towel. If they are a firm mushroom, you can dunk them briefly in water and give them a spin in the salad spinner, or spray them with the spray attachment on your sink. Contrary to popular belief, they don't actually absorb that much water with a brief wash. We DO NOT ever recommend extended soaking in salty water --if your mushrooms contain so many bugs and sand that you think they need a salt water soak, they aren't worth eating in our opinion. For firm mushrooms like Boletes, chickens, morels, dryad's saddle, and white button mushrooms, we prefer to chop them with a knife. For mushrooms that are more tender like chanterelles, oysters, black trumpets, and hens, we prefer to tear them into pieces, but they can also be chopped if you prefer.

Maitake "steaks" being glazed with a miso sauce before roasting in the oven. Photo by Karen Monger.

To test a mushroom for flavor for the first time, we recommend a simple sauté in a neutral oil (we like sunflower or grape seed oil) over medium heat. Using butter or olive oil is not recommended--butter contains milk solids that can burn, and olive oil has a low smoke point and too much of its own flavor that overpowers the mushrooms.

Remember, we need to cook the mushroom enough to break down the chitins to make it digestible, and we want some flavor from caramelization. Mushrooms contain a large amount of water, so they will give off a bit of juice in the pan; allow it to evaporate. Add as little oil as possible to prevent the mushrooms from sticking, and don't over-crowd the pan. Stir to prevent sticking, but allow the mushrooms to get browned. At the end of cooking, after about 10-15 minutes, add a touch of salt.

When using wild mushrooms in recipes, you don't need very specific, specialized recipes for each individual species of wild mushroom! Think more about the textures or flavor of a wild mushroom, and swap it out in an already known recipe to begin with, then once you have become comfortable with wild mushrooms, you will soon be creating your own recipes.

Final dish of miso-glazed Maitake over rice. Photo by Karen Monger.

When we first started cooking with the chicken mushroom (*Laetiporus sulphureus*), we agreed that it was its texture that mimicked chicken more than its flavor. We still used it in similar ways to regular chicken in recipes and now we are more likely to use chicken mushroom for its own attributes of firmness and mouth-pleasing texture along with its savory flavor.

Consider the tenderness of oyster mushrooms when thinking of recipes, remember the crunch of Lactifluus. The texture and nuttiness of Hericium is what I think about when it's time for dinner. The deep flavor and thin flesh of black trumpets make them pair well with fats like creams, butter, or eggs. You can turn the wonderful diversity of wild mushrooms with their colors, textures, and flavors into an array of dishes that the basic white button mushroom could never accomplish!

BOOK REVIEW

Fungi of Temperate Europe

DAVID BABIK

I seldom get excited about field guides because so many just duplicate the same species that every other field guide covers. Some of the best ones have 500 to 1000 photos. However, this two -volume set is in a class of its own. You really have to see it to believe it!

I first came across these books while visiting Bob Blanchette's mycology lab at the University of Minnesota. I noticed that these colorful hardcover books were sitting out at the workstations. I was surprised to see the topic was fungi in Europe. However, one quick look convinced me that I needed to have my own copies.

This is not your average 500 + photos kind of guide, "Fungi of Temperate Europe" has over 10,000, yes, that was 10,000 illustrations, covering about 1,000 genera and almost 3,000 species. I started asking around and I soon realized that people are using these books all over the country.

The thing that people get excited about is always the "wheels" (See photo). Each section starts with a two -page wheel. The center of the wheel illustrates spore shape. Then the entire diagram is divided up into pie

slices with the interior listing characteristics of each genera and the outer ring filled with illustrations of individual species in full color. These wheels contain so much information, it's hard to believe.

The only bad part is that they are not easy to find and fairly expensive. I searched for weeks and finally found a set in "like new" condition for about $130 on eBay. I have them sitting on my kitchen table so I can browse through them every morning. If you can swing the cost, go buy these. You won't regret it.

Authors: Thomas Læssøe and Jens Henrik Petersen, 2019, Princeton Univ. Press

The Making of Fungitopia: A High Schooler's Journey into Mycology

IDA SANAKTEKIN

Mushrooms have been a part of my life for as long as I can remember. My fascination with fungi began when I was six years old, hiking through Mediterranean landscapes with my family, guided by an expert mycologist. Back then, almost no one around me even knew what mycology was. Yet, for me, the thrill of spotting a hidden mushroom beneath fallen leaves, flipping through field guides, and identifying new species became a passion I pursued instinctively. I still remember being amazed by Caesar's mushroom (*Amanita caesarea*) on our earliest hikes.

The author– photo by Ida Sanaktekin.

When we moved to New England a few years ago, my interest in fungi only deepened. The forests felt different—denser, darker, and full of the unfamiliar. I joined local forays, met experienced mycologists on mycology walks, and spent weekends chasing new fungi species. Moving from the Mediterranean region to New England completely reshaped my fungi encounters. I was used to spotting Caesar's mushrooms under oak trees, saffron milk caps (*Lactarius deliciosus*) in pine forests and finding King Oyster mushrooms (*Pleurotus eryngii*) near thistle plants.

These are nowhere to be found in the wilds of New England. Instead, I now come across Brown Boletes (*Tylopilus rubrobrunneus*), their velvety caps breaking through the leaf litter beneath hardwoods, and Honey Mushrooms (*Armillaria sp.*), forming clusters at the base of dying trees. Even the bioluminescent Jack-o'-lantern mushrooms are different—where I grew up, I might have encountered *Omphalotus olearius* (though I don't recall ever seeing one), but here, I mistook its North American relative, *Omphalotus illudens*, for something else last fall. That moment was a reminder of the importance of proper identification. It's fascinating to realize that New England's hemlocks, maples, and oaks differ from those thriving in the Mediterranean's pine, olive, and oak forests.

The author– photo by Ida Sanaktekin.

That sense of curiosity and discovery led me to pursue mycology beyond field forays. I had the opportunity to work in Professor Jennifer Bhatnagar's microbial ecology lab at Boston University, where I assisted with post-doc research on fungi's vital roles in forest ecosystems. Collecting soil and fungal samples, then culturing spores in the lab revealed to me how fungi quietly shape ecosystems through decomposition, symbiosis, and nutrient cycling.

As I spent more time exploring fungi, I wanted to create a space to document my experiences, share what I was learning, and connect with others who found fungi just as fascinating as I did. Among my peers in high school, I rarely saw anyone with an interest in mycology—it felt like an overlooked field, despite its immense ecological significance. That's how my Fungitopia (www.fungitopia.org) was born—a platform dedicated to the ecological and innovative potential of fungi, featuring educational resources, lists of research institutions and innovators, and articles on fungi's role in sustainability. This journey of discovery, learning, and sharing has been incredibly fulfilling, and I enjoy every bit of it.

Nature's Inspiration: Bruce Orr's Creative Mushroom Display

JANA HARRIS

One view of the exhibit– photo by J. Harris

For those walking or driving through downtown Beverly, MA recently, a striking window display at the old Family Dollar Store might have caught your eye: a whimsical arrangement of mushrooms crafted with care and imagination. The artist behind this mycological masterpiece is Bruce Orr, a local muralist, puppeteer, and educator with a passion for creative reuse.

Bruce's artistic journey began in childhood, drawing cartoons about bugs and snakes, staging puppet shows behind the couch, and building boats from scraps of wood. Over the years, he has worked across various mediums, from self-publishing zines and illustrating for anarchist book publishers to creating large-scale murals and leading community art projects. He founded The Mudeye Puppet Company in Portland, Oregon, where he built puppets from discarded materials and promoted sustainability through storytelling. After moving back to Massachusetts, he continued his work in public art, painting murals at schools and nonprofits. Locally, he has contributed to projects such as the Carlton School mural off Route 107 and the North Shore

Another view of the exhibit from outside– photo by Jana Harris

Children's Museum.

With a deep love for hands-on creativity, Bruce constructs his works using found materials, cardboard, papier-mâché, and paint—breathing new life into discarded objects. I had the pleasure of speaking with him about his recent mushroom display, his artistic process, and his growing interest in fungi.

Jana Harris (BMC Bulletin): Bruce, thank you for taking the time to chat! Your mushroom display really caught my attention. Can you tell us about the inspiration behind the installation?

Bruce Orr: I'm glad you like it! I wanted to create a display that honored the circle of life. Most of the installation is nature-based, representing local flora and fauna. On the left window, I specifically wanted to focus on scavengers and decomposers, so you'll see mushrooms, houseflies, vultures, earthworms, and pill bugs in the display. These elements are vital to our ecosystem, and I wanted to shine a light on them.

I spent about eight months working on the installation, mostly on my own—I wasn't allowed to have guests in the Family Dollar during that time.

The installation is garden-oriented, as Beverly is called Garden City, and I felt like it was important to pay tribute to our local ecosystem. You'll also see animals like the tiger swallowtail butterfly, stag beetles, chickadees, and painted lady butterflies, all native to the area.

I made some of the pieces using styrofoam, while others are carved or shaped from balls. Everything was designed with the local landscape in mind. I wanted it to reflect the vibrancy of our environment here in Beverly.

JH: That's incredible! You've really captured the beauty of our local ecosystem. As you mentioned you wanted to display fauna, flora and you also included funga! How did you go about bringing the mushrooms and other elements to life in the display?

BO: The process was a mix of experimentation and adaptation. I used a lot of cardboard, papier-mâché, and paint. I also incorporated found objects, like cable spools (to make a bee) and five-gallon buckets for the trees. The goal was to make everything feel immersive and magical, almost like stepping into a garden or woodland.

JH: It certainly feels that way when you look at it! What inspired you to focus on mushrooms and fungi in your work?

BO: Mushrooms have always fascinated me. While I don't know a ton about them, I find them really inspiring in terms of their form, texture, and role in the ecosystem. There's a lot of symbolism in mushrooms, too—they're a perfect metaphor for growth, decay, and transformation.

JH: The display is certainly a beautiful tribute to nature. Do you have any other projects in the works?

BO: I'd love to incorporate more nature-inspired pieces into my future work. Right now I am focusing on the re-opening of the Afterschool Art Program.

JH: We look forward to seeing what you create next! Thank you again, Bruce, for sharing your time and your incredible work with us.

BO: Thank you! I appreciate the opportunity to share it with the BMC community.

Two more perspectives on Bruce Orr's work– photos by Jana Harris

Bruce Orr's mushroom display not only adds whimsy and creativity to downtown Beverly but also pays homage to the interconnectedness of our local ecosystem. With his inventive use of found materials and nature-inspired design, Bruce invites us to appreciate the beauty of the world around us.

Don't miss this display—add it to your list of **drive-by fruiting** spots to admire anytime. It's a perfect reminder of the vibrant, living art that can be found right in our own backyard.

Note: Art display can be found at 224 Cabot St., Beverly, MA

To connect with Bruce:
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bruceorr.com

Northeast Mycological Federation 2025 Foray

Thursday Sept 18- Sunday Sept 21, 2025

Camp Comstock, Ithaca NY

More details coming soon at nemf.org or on Instagram at #nemf_fungi

Yes, Virginia, You *Can* (Probably) Digest Chitin

Susan Goldhor

Word on the street has always been that chitin is indigestible and that overindulgence causes severe GI discomfort, if not worse. I've never really understood this, because cellulose is also generally believed to be indigestible to humans and its consumption is regarded as benign; cue the massive ingestion by dieters of celery, lettuce, etc. But in fact, many years ago I was at a nutrition conference where Cornell's brilliant, now deceased, researcher, Peter van Soest mentioned that about a quarter of the population can digest cellulose. It seems to be a function of GI tract length; if your gut is long enough the appropriate microbes get a chance to release their cellulases and do the job.

I've always believed that the same might be true of chitin if we ate it at sufficient frequency. In contrast to most of my beliefs, this is turning out to be true. And in fact, I didn't go far enough. Not only are we able to train our guts to digest chitin, but the ability to produce a chitinase is genetically innate in the majority of humans and not dependent on gut microbes (which is the case with cellulose). Plus, consuming chitin — even to the point of (slight) discomfort — may turn out to be beneficial. And it seems to be most beneficial in those individuals deficient in chitinase. Keep reading.

A study in Italy (Paoletti et al., 2007) found chitinases in 20 of 25 patients, with widely varying activity ranges. The presence of chitinases is thought to be associated evolutionarily with defenses against parasites but also, in the current era, with a diet containing chitinous foods. The authors, lacking genetic analyses, tentatively attributed the absence of chitinase activity in 20% of the subjects to a diet lacking in chitin. (Italians not eating porcini! Or truffles!)

A number of more recent studies have backed up the presence of chitinases in humans, the impetus for the studies being the recent uptick in insect-based foods, rather than the ingestion of delicious fungi. Instead of suggesting that humans have chitinases because they eat mushrooms (which is basically what the Italian paper suggests), these medical

authors suggest that chitinases may be present to attack fungal pathogens, even suggesting that adding dietary chitin might act as a prebiotic. (Other researchers suggest that chitinases may be in our genome as a way to combat the parasitic helminths, etc. that have been our longtime companions.). (Rafael et al., 2022)

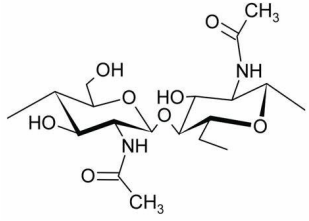
A 2023 paper from Washington University (Kim et al.) is to me the most intriguing. I'm sorry that it was done on mice, rather than humans, but the experimental setup (requiring both germ-free individuals and individuals lacking the gene for chitinase production) would have been impossible to duplicate in humans. Feeding a diet containing chitin caused the stomachs of the mice to expand. This distention triggered an immune response in the stomach and small intestine and — less intuitively — in fat tissue. One effect of the immune response was to boost chitinase production, which then (duh) enhanced chitin digestion.

Now comes the most unexpected result (quoted from an NIH report on the research): "To test the metabolic effects of eating chitin, the researchers fed mice high-fat diets that contained either chitin or another fiber. In addition, some of the mice lacked the ability to produce AMCase (acid chitinase), so they couldn't break down chitin. All the mice ate similar amounts. However, chitin-fed mice had better insulin sensitivity than those fed the other fiber. Those who ate chitin but couldn't break it down had the strongest immune response, gained the least weight, and had the least body fat."

In other words, a) you can probably digest chitin, especially if you eat it regularly, b) dietary chitin may help fight metabolic disease, but c) it fights best if you're chitinase deficient and can't digest it, and when it causes you to experience a bit of gastric distress.

It's complicated.

[Author's Footnote: After all these years, Peter van Soest's work has just been validated (sort of). "Cryptic diversity of cellulose-degrading gut bacteria in industrialized humans", S. Moraïs et al., *Science 383: 1197 (2024)]*



Chitin: It's complicated.

MEMBER PHOTOS

Clockwise from upper left: Mixed mushroom soup courtesy of Elizabeth Dowd, Photogenic species in Allendale Woods courtesy of Ana Crowley, Ornament from Harvard Alpaca Ranch from Deborah Taylor, and Galerina marginata *with Jonathan Kranz courtesy of Corie Costantinto*

MEMBER PHOTOS

Twenty members of the BMC were treated to a tour of Harvard's Ware Collection of Blaschka Glass Models of Plants, with a particular emphasis on the new exhibit The Blaschkas at the Microscope: Lessons in Botany. *Julie Duncan of the BMC programs team organized the tour.*

"We explored the exhibit with the expert guidance of Don Pfister and Jenny Brown. In addition to spotlighting the life cycles of non-flowering, spore-forming plants and fungi, Don and Jenny gave us the inside scoop on how the collection is presented and maintained."

Mystical Spectacle

ARI STAMATIOU

In shadowed woods where secrets lie,
Mushrooms glow beneath the sky.
Like stars they twinkle, softly gleam,
In midnight's cloak, a whispered dream.

Their luminescence, ethereal hue,
Guides lost souls, both meek and true.
Amidst the darkness, they dance and sway,
A mystical spectacle, night turns to day.

Beneath the canopy, where moonbeams play,
Mushrooms as stars, a celestial display.
They light the path for wanderers bold,
Through forests ancient, and stories untold.

In their glow, magic does reside,
A realm where wonders never hide.
So, let us marvel at nature's art,
Mushrooms that glow, a celestial heart.

North American Mycological Association
2025 Foray

Thursday Sept 11– Sunday Sept 14, 2025

Potash Hill, Marlboro VT

More details coming soon at

https://namyco.org/annual-foray/

CAUTIONARY TALE

The Time I (Almost) Poisoned My Grandparents

SANJAY SARATHY

Strolling down the slope from the forest through thickets of fruiting blueberries, on a path of brown, dry summer leaf litter, the shady breeze of June started to sing.

Nearing the weathered steel wind chime, an unsynchronized chorus of clinks moved through the pine scented air as leaves rustled and swayed in the arms of the wind- the occasional pinecone crunching down from above.

Trudging down stone steps marked by faded green lichen, my presence garnered a glance from the bench. Untying his garden boots, my grandfather (my Jeda) leaned back as I neared. Sizing me up and down with military scrutiny, an unmasked jolt of alarm quickly passed over his face.

My Jeda is an orderly man who adores his home with dedicated fervency. Evening Brotzeit regularly commences with communal prayer to whatever god is responsible for preventing soup spilling or instructions on how to properly take a shower (everyone forgets). Unnoticeable specks of dirt and dust are regularly inhaled by the highest setting of a banshee of a vacuum which is walked more than most city dogs.

Needless to say, my appearance brought him to the verge of panic: A couple steps closer and there would be no conceivable option but to wrestle me away from the door.

After foraging for 8 hours in the forests around the house, my face and arms were thoroughly reddened by the June sun, and flecks of dry dirt and dust peppered my shirt. My damp drying hair told tales of tussles with ferns, young pine trees and spider webs. A customary summer schwitz outlined my collar while black soil dug into the creases of my hands and nails.

A dusty black school pack was draped over my shoulders: discolored, scraped, brittle from cycles of decayed hibernation in the damp cellar and sudden hefty meals of various mushrooms, leaky water bottles, chipped jars of forest berries, and

odd animal teeth and feathers that jiggled about like pennies in a wallet. One of my hands waved and greeted him “Hallo!” while another brandished an especially large flat, gilled mushroom.

Unaware of my state and grinning ear to ear in glee- I must have directly resembled a plump forest hobbit. Cleaning up and showering, I proceeded to duly present my findings to my grandmother (my Jarka).

It was a great day in the woods! A whole pan of Chanterelles, several differently sized Porcinis (one especially beautiful one I was fortunate enough to notice in a blueberry thicket), a Scarlet Bolete or two (magical), and the giant Parasol I had carried in my hand. She agreed to make a meal of it, and I retired to the bench outside.

The soft grass welcomed my aching soles, beaten to jelly by hours of excited dancing with the Nymphs of Bohemia. Later in my room, bad news greeted me with a knock on the door. The mushrooms were bitter and inedible! The parasol too. They had been tossed.

I was super disappointed and quite stunned. For context, my family, and me by extension, have been foraging for mushrooms for a long time. Long before I was born, my mother collected mushrooms as a job in college, and long before that my grandfather did as well. The rules of identification and picking were inculcated in me with tremendous love by my mother and aunt who took walks as an opportunity to connect me with nature and my heritage. Hobbling around very close to the ground back then, tactile lessons mapped out a conservative but surprising spectrum of colors, stems, gills and spongy surfaces.

Summer sunshine has always meant savoring the incredible fruits of the forest, which rise when, and only when, humidity, temperature and the health of the surrounding forest harmonize. From giant white puffballs about the size of a thanksgiving turkey to stems that turn from red to blue when sliced, mushrooms have always been magical to me. Their mystique is added to by an unpredictable growth cycle, and the daunting possibility of a fatal pick.

This past June when I brought back what I now know is a bitter joke of a porcini, and a probably poisonous cousin of the yummy parasol, I was shook. Not only did so many yummy edible mushrooms get wasted, but I also clearly made a mistake. I didn’t know my mushrooms.

Jeda and Jarka were quite forgiving at our Brotzeit. Conversation flowed over bitter golden brew and homegrown pickles on Rye to inquisitions over the direction of the trail I had walked.

Slowly working his way through a slice of bread, Jeda turned to me and

Said you know, it's not unusual for people to mis-pick mushrooms, I remember the Russians did that quite a bit. Some of them died.

"What?" I thought and said at the same time.

Ok let me call a timeout right here and fill you in on some historical context you should know:

During the cold war, living in Eastern Europe wasn't fun. The Russians or their communist puppet governments controlled every aspect of life making life dismal at best. Czechoslovakia had one of these incompetent governments.

In 1968 Alexander Dubček, a revolutionary thinker, proposed that Socialism was possible with a "human face", and that economic liberalization would not infringe on the spirit of communism while benefiting the population.

The Russians, in character, invaded, restored their puppet government, got rid of any opponents, and 200,000 Czechs fled across the border to the west. Typical week's politics in the 20th century.

During this invasion and occupation, it was normal for different occupied villages to refuse food to Russian soldiers stationed nearby (many Czechs from this generation bitterly hated Russians and do to this day). The Russians didn't have enough supplies, and couldn't Doordash, so a lot of soldiers ended up foraging and hunting to stay fed.

Since foraging for mushrooms is a skillset that is often local, many ended up poisoned and in hospitals due to their mistakes.

This highlights the important point that mushrooms vary quite a bit in their geography and distribution, and knowledge doesn't always transfer from place to place. For instance, the Paddy Straw mushroom which is commonly grown and foraged in Southeast Asia looks very similar to the Death Cap Mushroom found in Europe and the US in its button stage which has in the past led to unfortunate cases of poisoning by newly settled immigrant families.

The Czechs were thought to have had a bit of a laugh over these mishaps and even put up satirical posters mocking the Russians. The one below displays five poisonous and potentially fatal types with a caption that reads "To soviet occupiers! We know you're hungry. We offer you "edible" mushrooms from our forests. Pick them up, you'll diversify your meals. Bon appetite!"

Fungal Disease: Should We Be Worried About a Fungal Pandemic?

ELLEN PENSO

Human cases of fungal pathogens have been surging worldwide, and experts have stressed that better means of detecting new and evolving fungi are needed. The World Health Organization issued a "Fungal Priority Pathogens" list in 2022 and recommended "a global initiative to identify and prioritize 19 fungal pathogens." Even if a fungal pandemic does not directly impact human health, it could devastate human existence by wiping out the vegetation we on Earth depend on.

There are 5.1 million species of fungi worldwide and only 148,000 identified species, according to Emily Monosson Ph.D., an environmentalist and toxicologist at University of Massachusetts and the author of "Blight: Fungi and the Coming Pandemic." There are 1.6 million human deaths annually from fungal diseases, and eighty percent of plant disease is due to fungi.

Historically, vertebrates have been protected from fungal infections. Their large size, their well developed immune systems, the diversity of their body micro niches, and their higher internal temperatures have helped to shield animals like humans from fungal threats. Despite what one might see on the television show "The Last of Us," Cordyceps remains host specific and is not a threat to human health at this time. Other fungi, like Orbiliomycetes, produce toxins and mucilaginous traps (such as nematophagous fungus), and can kill and parasitize nematodes, allowing the mycelium to invade and consume the host; these, too, are host-specific.

Still, the threat of fungal diseases to humans is growing. Global trade and travel have expanded, the number of immunocompromised people

as increased, more people are being exposed to non-human reservoirs (e.g. birds) of disease, and there is growing fungal adaptation to global warming — all contributors to rising rates of fungal diseases.

Life forms reproduce, maintain an internal homeostasis, evolve over time, and metabolize. Bacteria (prokaryotes) developed 3.5 billion years ago, followed by plants, fungi and animals (eukaryotes) developed 2 billion years ago, and there appears to be a common ancestor that split approximately 1.1 billion years ago. It is believed that Fungi originated as marine organisms or as part of marine plants, but there is still a "missing link" in their move to being terrestrial organisms. This move for the Fungi (mushrooms, molds, mildew and yeasts) involved acquiring the capacity for hyphal growth and the loss of flagellum, the little wispy appendages that help cells, bacteria, and other microorganisms move around. (For comparison, viruses are believed to have evolved 4 billion years ago. They may be precursors of life on earth, genetic elements that escaped from other life forms, or remnants of cellular organisms that predate bacteria. Viruses have no metabolism and are obligate intracellular parasites. Viruses are 0.025 to .35 micrometers. Bacteria are .3 to 5 micrometers. Fungi are 3 to 10 micrometers.)

Fungi are opportunistic pathogens; they invade other organisms only when the host's immunity is lacking. They do not have the capacity for phagocytosis (the ability to surround, ingest, and eliminate other entities, like cells or diseases) and have chitinous cell walls. The capacity for different "lifestyles" in some species can result in their becoming saprophytic (the ability to absorb nutrients from decaying matter) when the host is under duress. The fungi then survive the host's own immune system by evading phagocytosis. Fungi have the ability to penetrate solid surfaces and digest cellulose and other biopolymers. They can secrete digestive enzymes and express abundant membrane transporters.

There are fungi that are known to colonize mammals and cause disease. Black fungi (*Tinea nigra*, the cause of Athlete's Foot) exhibit extreme melanization and adaptation to growth, even when facing almost total desiccation. They can tolerate ionizing radiation, extreme pH, mechanical force, heavy metals and other toxic compounds due to their low metabolic rates and slow growth. They can survive in highly hydrophobic conditions and irradiated environments such as rocks and human nails. It has been proposed that these fungi are prime candidates to colonize other planets.

Despite the protective characteristics of vertebrates, more fungal infections are being found in humans. The WHO, in its Priority Fungal Pathogens list, has designated three invasive fungal diseases as having "critical priority." The three predominant invasive disease genera are Candida, Cryptococcus and Aspergillus.

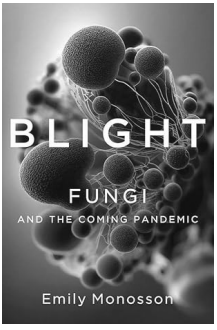
- *Candida auris* - This yeast was first reported in Japan in 2009. It has recently emerged independently and simultaneously on three continents, not as the result of worldwide dissemination of a dominant clone. It has evolved to tolerate warmer temperatures. It is possible that birds are a reservoir. Mortality in critically ill and immunocompromised hospital patients is 30 - 60%.
- *Aspergillus fumigatus* - This mold is found in soil, air and organic matter. It can enter the body through the sinuses or lungs. It can cause chronic pulmonary aspergillosis or an aspergilloma (a pulmonary mass). Invasive aspergillosis has a mortality rate of 50%.
- *Cryptococcus neoformans* - This is an encapsulated yeast which causes a potentially fatal infection of the lungs (pneumonia), or of the brain, causing meningitis.

Other highly infectious fungi are:

- Mucormycetes, a rare mold, which is found in decaying organic matter.
- Coccidioides, the cause of the respiratory condition "Valley Fever." It can lead to disseminated disease in some individuals.

As was learned from the COVID-19 pandemic, animal hosts and changes in their habitats, mutations, and laboratory manipulation can lead to new diseases. Fungi are adapting to a warmer environment and the protection afforded humans due to their higher body temperatures may be lost over time. Humans need to make more of an effort to protect themselves against the possible risks.

Editor's Note: For more on this topic, readers may *Blight: Fungi and the Coming Pandemic* by Emily Monosson.



Mycotourism

GARY GILBERT

Mycotourism is the act of traveling the world to identify, photograph, and possibly to eat mushrooms in exotic lands. It is a mixture between citizen science, exotic vacationing and gastronomic exploration that is not all that different than bird hunters traveling to, say, Guatemala in search of the exotic Quetzal. However, the bird hunting tourists don't eat their prey.

Mycotourism has gained considerable popularity in the last two decades. Its beginnings were as simple as people hiring guides in Italy to hunt truffles. Few tourists would know where to look for them and fewer still would want to risk the anger of local residents by hunting fungi on private lands. Excursions with truffle guides would inevitably end with some fine wine and truffle-covered appetizers in someone's delightful home or in an *Agritourismo Inn*, rural Italian inns serving food grown on their own land as well as providing lodging to guests.

Today, one can hire local guides to escort you into the woods just about anywhere in the United States, or you can join expeditions to international locations such as Colombia, Tibet, Ecuador, Bolivia, Italy, Turkey, and even Mexico. The latter two locations I had the sheer pleasure and joy to experience this past year.

The NAMA-sponsored mycotourism trip to Mexico was located in the mountains west of Mexico City, at a place called Valle de Bravo. It was a wonderful, rainy, mid-summer excursion filled with exotic mushroom discoveries, accompanied by Mexican mycologists as well as chefs from Mexico City. Mexico City has gained popularity recently in the worldwide press with its restaurant scene fusing French, Italian, and other cuisines with traditional Mexican fare, often with mushrooms added. There is even one restaurant that brews 15 kinds of mushroom-infused beers.

We were led to Valle de Bravo by Zack and Kim Hunter, proprietors of a three-year-old company *Fungivore* that leads trips to Oaxaca and central Mexico with a heavy emphasis on mushroom dishes, Mexican cuisine, and the use of natural mushroom dyes for weaving. Fungivore teamed up with the North American Mycological Society (NAMA) which is the country's largest mushroom organization. They sponsor a big annual foray each year and have recently been sponsoring local, regionalized ones of which this Mexico trip was a good example. They led us into forests

controlled by the local Mazahua people. Mexico, it is said, is actually a country composed of 65 other countries. Over time the government is increasingly recognizing the indigenous rights, heritage and control that local peoples have over their lands; regions they have lived in for centuries. The Mexican government recognizes 68 distinct languages, a surprising fact if you are still trying to get your own Spanish under control. Their words and sounds are completely different than that of the Latin -based language of Spanish and it adds to the shear exoticness of traveling there. One of the reasons we visited the Mazahua is because they regularly include about 60 different kinds of mushrooms in their diet. An astounding number!

Some of the species we found do not exist in our northern part of North America. Mexico, as you may recall, is also part of North America. It is simply the southern portion of it. Some of the species we found have not yet been named by science. One exotic, and recently very popular mushroom we found was a Cordyceps mushroom. You may recall the recent show *The Last of Us* where these fungi were taking over the world? In actuality, these parasites spend literally millions of years developing the ability to infect just one specific species of insect which they attack and kill. In this case, a local beetle species.

Another absolutely beautiful mushroom we found was a Tylopilus, from the Porcini family, with very brilliant lilac-colored pores under its cap. It is currently an unnamed species. We also found a very robust and distinctive species of Leccinum, another mushroom from the large Porcini family, with its scurfy brown stem, also an unnamed species at this time. All of our finds are being sent out for DNA analysis to learn what species they are, or if we stumbled upon a brand new one.

Our group included Mexican mycologists as well as several chefs. Joaquin, for example, spent a dozen years in Paris cooking at a Michelin star restaurant and made some phenomenal mushroom filled tamales. His restaurant, *Loup Bar* in Mexico City, offers a variety of mushroom dishes paired with wines. Another restaurant, *Expendio de Maiz* focuses on the many uses of corn in Mexican cuisine. They do not offer a menu. Instead, they say that if you go to someone's house for dinner, you would never be offered a menu, so they also do not offer one. The way they operate is to bring alternating vegetarian and meat dishes to your table, some including mushrooms, and you simply tell them when to stop serving once you are full.

It is delightful.

Other mycotourism adventures can be joined by contacting my good friend Daniel Winkler, a Bavarian Seattle-based mushroom expert. His company *Mushroaming* (www.mushroaming.com) has been around for 20 years offering trips to Colombia, Bolivia, Bhutan and Tibet. The Neotropics and the Himalayas are Daniel's areas of special interest. He has taught people in Bhutan to collect King boletes that were traditionally believed to be poisonous. As he has said, "Mushrooms, as a shared interest, is a perfect filter for meeting great people and establishing long-term friendships." Daniel's taxonomy and photography skills are unparalleled and his ethnomycological knowledge impressive.

Whatscookin' is another company, based in Italy, and led by fine hosts Marco Giusti and Claudio Bernardoni, (www.whatscookin.it). They offer mushroom hunting and eating sojourns in regions such as Sicily, Tuscany and Piedmont, often including some memorable wine 'research', so to speak. The editor of *'Fungi Magazine'*, the Scientific American of the mushroom world, Britt Bunyard, regularly joins them on their annual excursions. We will be joining him on the first mycotourism adventure to Turkey, one that he has created, this coming October. Yes, Turkey has forests, mountains, and fungi!

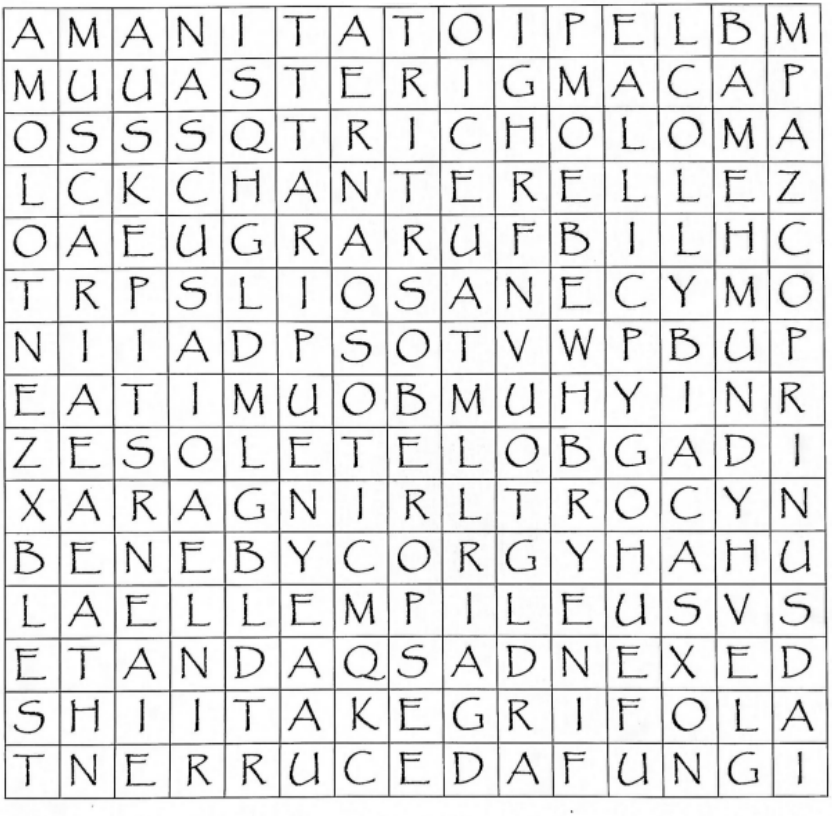
And finally, there is our local Cristiano Bonino, a native Italian who lives in Somerville, MA, and who has a great company, *Food.Stories.Travel* (https://www.foodstoriestravel.com). We have experienced 3 truffle hunts in the Piedmont region of Italy with him, all with wonderful hosts and their faithful truffle hunting dogs. Truffle dogs are not necessarily the handsome bird dogs that one poses for a portrait with. Often, they are simply mixed breeds who happen to have a great nose for the wonderful truffle aroma and who want to please their master while being rewarded with a piece of bread, or perhaps a special meal in their bowl. We went to the famous Alba Truffle Festival with him where the whole city has a two-week-long party with lots, and lots of mushrooms to enjoy, medieval festivities, and a joyous atmosphere.

So, if you are interested in a theme-based vacation filled with exotic and interesting foods and people, consider joining in on a mycotourism adventure of your choice. Who knows, you might just love it.

Gary Gilbert is a member of the Executive Committee of the Boston Mycological Club. He is also the author of *"Mycocards", flashcards for learning mushroom identification (www.mycocards.com).*

Clockwise from upper left: Amanita caesarea*,* Clathrus ruber, *Ruth Rosenblat with a huge* Macrolepiota procera*, Eugenia Bone holding* Ganoderma lucidum *with a basket of* A. caesarea

FUNGAL FUN



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LBM
Lepiota
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Morel
Muscaria
Mushroom
Mycena
Pileus
Pore
Ring
Russula
Sac
Shiitake
Spore
Sterigma
Stipe
Tricholoma
Umbo
Veil

This lovely word search was created and sent in by member Lena Sanentz.

Potluck Placemats

MICHAEL KING

I created the placemats for last year's BMC Potluck Dinner using an AI program called Dall-E 3. This artificial intelligence model generates images from text descriptions. OpenAI developed Dall-E, and the program can be accessed via its website, ChatGPT.com.

Using Dall-E 3, I wrote a text prompt explaining what I wanted to generate. At first, the program returned images that varied from my concept. However, after an iterative process of making minor adjustments to the prompt and generating subsequent images, I arrived at an acceptable result.

I am sure the technology has significantly improved since last May when I asked it to help design the placemats. My experience talking to DALL-E 3 reminded me of my time doing business in Japan in the 1980s. Back then, everyone I spoke with knew English, but often they did not grasp the meaning of the words.

I wanted an image of the Potluck Dinner, where all the attendees were mushrooms. After about ten iterations, the program and I came up with the following prompt and resulting image. The description that resulted in our potluck placemats was this:

"A whimsical and vibrant illustration of mushrooms carrying dishes to a potluck dinner in a forest. The mushrooms are anthropomorphic, with realistic textures and colors. Each mushroom is holding a different dish, such as a casserole, a salad, a cake, and a pie. The scene is set in a magical forest with trees, flowers, and a stream, with sunlight filtering through the leaves. There is a large table set up in the background with more food, and other mushrooms are gathered around, ready to enjoy the meal. A banner above the scene says 'BMC Pot Luck Dinner'. The drawing should have detailed line work, shading, and vibrant colors, creating a lively and enchanting atmosphere."

The final placemat image– by AI and Michael King

Mystery Hodophilus

JESS EVANS

I spotted these tiny, waxy-gilled fungi while co-leading a walk for the Boston Mycological Society last year with Jonathan Kranz. These were fruiting gregariously in mixed woods, and I confess I was specifically looking for them (and other waxy caps.) They're tiny enough that they are very easy to miss, as you can see in the photos below.

Along with a few other samples, I sent this dried specimen to Mycota Lab (led by Stephen Russell) for DNA sequencing, as part of his Summer Continental MycoBlitz. The sequencing results revealed that my specimen was a new record for Massachusetts; something that falls within *Hodophilus* but does not match sequences from other areas with that name!

It's been given the species name *Hodophilus hymenocephalus-NY01,* and can be seen on iNaturalist at https://www.inaturalist.org/observations/236613106. These may be tiny and frequently overlooked, but they are well worth finding.

Two view of the specimens collected– photos by Jess Evans