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The front cover photo was taken by Simon Gurvets and shows *Chaetomium* sp. on rabbit dung. Back cover photo of *Encoelia furfuracea*, spring hazelcup, by Jess Evans.

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

Tamworth 2025: Food and Foray Journal

ARI STAMATIOU

Friday, July 25, 2025:

For weeks before the annual foray in Tamworth, NH, the “roomies,” eager for the event to arrive, engaged in frequent chats, foreshadowing the wonderful conversations to come. Our discussion revolved around foraging, must-visit places, plans for meals and the activities between them, and we agreed that each party would contribute a main dish and a dessert. The check-in date approached, and our collective excitement intensified.

On the day of our arrival, Léna and I pulled up to the driveway and found Wacia and Barbara already there. We had not met before, but the moment we greeted each other, there was an instant connection. Shortly after we moved our items in, Claudette and Jonathan arrived. Enthusiasm and common purpose permeated the mood.

Barely settled, we drove to Chapman Sanctuary and Visny Woods for a scheduled 3:30 PM foray, led by



Roomies R to L: Jonathan, Claudette, Barbara, Wacia, Léna, Corie, Ari

Professor Chris Neefus and joined by Dave Babik (BMC President), and Gary Gilbert. This first walk yielded a variety of mushrooms: *Hygrocybe coccinea* (scarlet waxcap), *Hygrocybe chlorophana* (golden waxcap), *Pleurotus ostreatus* (oyster mushroom), *Entoloma strictius* (straight-stalked Entoloma), *Clavaria amethystina* (violet coral) and *Clavaria vermicularis* (fairy fingers or white worm coral).

It was lightly raining as we made

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our way back to the parking lot, and through the drops, someone spotted a cluster of oyster mushrooms on a tree, too high up, beyond anyone's reach. Fawn was determined to get them. What followed was perhaps a first-of-its-kind strategy. Fawn asked for a volunteer to lift her high enough, so she could reach the mushrooms. Cayman obliged, and it was a teamwork tour de force, as Cayman lifted Fawn, who used both hands to collect as many as possible. The whole thing was very enthralling to watch, an exciting final finding before Dave explained the next day's plans and the group dispersed.



Fawn lifted by Cayman to reach the oyster mushrooms

Once back at our Airbnb, we were happy to see that Corie had arrived, and we soon shifted our discussion to dinner and descriptions of what each party had brought. The list of

dishes could have come out of the pages of *Food & Wine* or *Gastronomica*, and it was fun deliberating what to eat first. We decided on several main courses: beef shank with black trumpet risotto; baked Atlantic salmon spiced with fresh rosemary, dill, coarse sea salt, and pepper; cooked cabbage leaves stuffed with rice and mushroom. Our side dishes included mesclun salad with radicchio, homemade currant vinaigrette, and homemade garlic hummus with Aleppo pepper and cumin, paired with several white wine varietals.

We were now ready for dessert. The unexpected realization soon sank in... each party had, independently, made banana bread. There were three distinct types, each with their own flavor and textural profile. And if that was not enough, we had also brought fresh bananas!

While we ate well that weekend, the most gratifying part of our shared space was the conversations. They ranged from the light to the esoteric; most of them centered on what had brought us all together, of course: mushrooms.

Saturday, July 26:

We had two scheduled walks for the day. Fueled by nuts, berries, and more banana bread, our group arrived at the designated meetup location at Brook Trail. It was a relatively

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comfortable 78°F with about 65% humidity.

Coltricia perennis (tiger's eye) were everywhere on the trail, by far the most frequent mushroom we encountered. Other fungi included *Suillus spraguei* (painted bolete) and *Leotia lubrica* (jelly baby). The gradient of the trail (upslope) gradually increased as we followed the course of Claybank Brook to our left below.

At the highest elevation of ~100 feet, the declivity (downslope) measured from the path to the bank of the brook was quite steep. Further along, the elevation gradually dropped to ~20 feet. It was at this point where the trail divided and we veered off towards the water, following Chris Neefus. Had we continued on the main trail, it would have taken us to Mount Chocorua (elevation 3488 feet).

Once at the brook, I stood on a fallen tree that partially extended into the water, and I absorbed the surrounding views, which were amazing. One could easily observe that the water level and flow had considerably dropped, the result of prolonged dry conditions. The outline of the rounded-smooth rocks lying exposed was indicative of the reduced water level. During favorable rainfall, these features would probably be inundated.

The group had about 10 minutes

of quiet time to enjoy the calming sound of the flowing water before picking up the trail again on the other side of the brook. The craggy trail ascent, after crossing the brook, slowed our pace. Eventually, the trail became comfortably level and the closer we got to our starting point, the more quickly we moved.

The plan was to have lunch in downtown Tamworth before heading out to Brook Path Trail for our scheduled second foray. Once back on Main Street, we visited the Tamworth Farmers' Market. At the Goat Barn Farm ice cream stand, we had lavender, ginger, and vanilla, which were all decadent. Then, we walked to the Tamworth Distillery. They had an amazing display of different spirits and bitters. We sampled several. They were all good, but the much talked about standout was the "hand foraged" Black Trumpet Cordial — it was quite aromatic. We then walked a short distance to what appeared to be a historic house, next to the library, to join other BMC members who were resting there. It was a laid-back atmosphere. The half hour of leisure time ended when Dave signaled we needed to be underway for the second foray.

Since the parking area at the Brook Path Trail was limited and the dirt road was undeveloped, people were encouraged to carpool. Laura

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was kind enough to accommodate us in her Subaru Forester: Claudette, Léna, Laura's friend Suzanna, Ruthie Ristich, and myself.

As Laura negotiated the depressions and obstacles of the dirt road, Ruthie described to us that she had found an unusual fungus on a branch during the earlier walk. She put it in her collection basket to be placed at the ID table later. We arrived, stepped out of the car, and Laura opened the trunk to retrieve our collection baskets. We were all curious to see the fungus that Ruthie had found.

At first glance, it looked unremarkable. But under the hand-lens it was anything but. It appeared white, round, and filamentous, measuring less than one cm across. I took multiple photos to use to try to identify it after our foray.



The cordyceps that Ruthie found, *Gibellula pulchra* (beautiful *Gibellula*), parasitizing an arachnid

Based on the photos, I was able to identify the genus as *Gibellula* and the species, most likely *pulchra* (beautiful *Gibellula*). It is an ascomycete in the family Cordycipitaceae. It is known to parasitize arachnids; a beautiful fungus with white, feather-like filaments that appear wavy. You can clearly see how the fungus has enveloped the spider. The spiderweb appears like a membranous mat extending beyond the diameter of the *Gibellula*. This feature may be a valuable clue in determining what kind of spider is being parasitized.

The afternoon hike felt hotter than the morning one; there was less tree cover, and it was not breezy. The trail was noticeably much wider as well, as if it had been a functioning road at some point in the past. The trail, with a few exceptions, was relatively level with some short sections with moderate steep inclines. Ruthie, Suzanna, Laura, Léna and I found ourselves in the company of Robert and Karen, a couple from Connecticut (The 3 Foragers), while Claudette connected with a different walking group.

En route we collected *Amanita flavoconia* (yellow wart), a number of boletes, including one of my favorites in terms of its robust stipe and ornamentation: *Sutorius eximius* (lilac-brown bolete). Along the way, Robert and I discussed mutual

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interests, including foraging for edible plants.

During the course of our conversation, Karen had gone off trail, and she was looking at a fallen tree. We all walked over for a closer look. Karen directed our attention to *Fomes excavatus* (formerly known as *Fomes fomentarius*), the tinder polypore. There were at least ten of them in varying sizes and stages of development, spread out on the tree. What was most unusual was that the underlying pore surface of the tinder fungus had been parasitized by *Radulomyces copelandii* (Asian beauty), a saprobic crust fungus native to Asia but now found in North America.

Karen posited that this observa-

tion may represent the first time it has been documented. We all took photos as well as samples. The extent of parasitism was extensive and dramatic. The crust fungus was also resupinate on the bark of the tree. This deserves further study.

We continued our hike back to the parking area and reunited with Claudette. The plan was to drive to White Gates Farm for the ID table presentation.

Laura was once again our ride back. Inside the car we joked that it felt like we had more legroom than before. The punchline was that we had lost weight from all the hiking.

Ruthie, during this drive, captured everyone's attention with a story

about her dad, Dr. Samuel Ristich, who had earned his PhD from Cornell University in 1950. He studied entomology, taught biology, and mycology, and specialized in slime molds. He was also the founder of the Maine Mycological Association Inc., which traces its beginnings to a workshop called "Mainely Mush-

rooms," which was held over two days in September 1984 at the Audubon Society's



L: *Radulomyces copelandii* (Asian beauty) behaving like a saprobe R: *R. copelandii* possibly behaving as a parasite on *Fomes excavatus* (tinder polypore)

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Gilsland Farm in Falmouth, Maine. Sam's contributions to mycology were impressive; Ruthie mentioned, with some justifiable pride, that her dad was first to describe a Maine mushroom, which is now named after him, an amanita: *Amanita ristichii*, also known as Ristich's Caesar. "It's his claim to mycological immortality," Ruthie told us. She was kind enough to direct me to more information online: mainelymushrooms.org and samristich.com.

In my journey to learn more about Dr. Ristich, I came upon what has become a favorite research resource of mine. I obtained the unique Taxonomy ID number for *Amanita ristichii*: Taxonomy ID 1004517. If you Google "Taxonomy ID 1004517," you will be directed to the National Center for Biotechnology Information: www.ncbi.nlm.nih.gov. Typing the genus and species into the search bar at the top of the page — in this case *Amanita ristichii* — it will lead you to technical information on the genetics and DNA sequencing that has been done so far. I am now convinced that confined quarters inside a car make for amazing conversations.

By the time we made it to White Gates Farm for the collection table talk, the table had already been filled with mushrooms. It was clear that

we were going to need more space, and we unfolded another table. The fungi were then segregated, labeled, and described by our distinguished panel, which included Chris Neefus, Dave Babik, Robert Gergulics, Gary Gilbert, and Corie Constantino.

I am personally fascinated by observing the quantities of each species on the table, the most numerous versus the least. Over the years, some fungi dominate in certain places and times of year and on other occasions, at the same place and time of year, they may fade into the background, while other fungi seemingly have their turn to dominate.

The winner of the most numerous species on the table was the bolete, *Harrya chromapes* (yellowfoot bolete). And, tied for the least numerous in terms of size, stature, and culinary appeal were *Amanita jacksonii* (Jackson's slender caesar) and *Hypomyces lactifluorum* (lobster mushroom); each represented by a single specimen. The lone *jacksonii*, however, was very impressive, both in size and quintessential features.

Following the collection table talk, as we were walking to the parking area for the drive back to our abode to have dinner, we saw Robert, Christina, and Carson in the front yard of the cabin where they were staying. Robert was in the process of positioning firewood under a caul-

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dron. We chatted for a while and they invited us for dinner. We responded in kind, extending a dinner invite to them. Before parting we mutually left the invites open-ended.

By the time we “roomies” made it back to our Airbnb, we were all very hungry. The dinner menu included the previous day’s fare, as well as an eclectic variety of vegetables like asparagus, bicolor (yellow/green) zucchini, quinoa tabouli, and an incredible leafy-green salad with celery. The main dish was Indian Masoor Dal (red lentils) with delicious spices (turmeric, cinnamon, ginger, coriander, cumin). In the category of foraged mushrooms, we had *Hygrocybe coccinea* (scarlet waxcaps), *Hygrocybe chlorophana* (golden wax caps), and *Amanita brunnescens* (star-footed Amanita).

To better judge the flavor profile of each foraged mushroom, all three species were cooked the same way but in separate frying pans. The ingredients were simple: extra virgin olive oil and coarse salt. Barbara volunteered to prep and cook. She was amazingly adept in putting everything together. All three mushrooms were semi-caramelized, perfectly cooked and placed on the kitchen countertop with the intent to have them with dinner.

They never made it to the dining room table. We ate them right then

and there while standing.

The waxcaps, even though cooked extensively, had amazingly retained most of their color. The flavors were very mild with subtle hints of sweetness and a soft texture similar to oyster mushrooms. Once drizzled with fresh lemon juice, all agreed that the flavors intensified. Texturally, *brunnescens* was similar to the wax caps. Beginning with the first bite, a pronounced flavor of the best fried potatoes imaginable came through along with an umami after-taste. This is one of the best tasting mushrooms I have ever had.

A most enjoyable and long-lasting dinner followed. For dessert, yes, more banana bread, along with a watermelon and grape medley; the perfect refreshment to close out the day. We then turned off all the lights and stepped out onto the deck overlooking an open field. It was a clear night sky, and the stars were shining bright. Our timing was perfect; it coincided with the beginning of the Perseid meteor shower. We saw many shooting stars as well as numerous satellites. Once in a while, we were approached by bats, which occasionally swooped within three feet of us. We concluded the day dazzled by the wildlife and the celestial sights.

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Sunday, July 27, check out day:

We all enjoyed the last of the banana breads. Wacia and Barbara decided to attend the planned BMC foray at Brook Path Trail. The rest of us “roomies” opted instead to go to the Rattlesnake Mountain (Interpretive) Trail in Rumney, New Hampshire, after Corie saw a recent posting of an *A. jacksonii* sighting.

While we were packing, Jonathan wandered off to explore a nearby trail. Much to our surprise and joy, he returned with black trumpets in hand, compelling the rest of us to do a small walk around the property (42+ acres) before heading out to Rumney.

The sky began to darken, and we saw that rain was in the forecast. We drove straight to Rumney. When we arrived the weather conditions were humid but still dry. Beginning at the trailhead, the path was marked by an untold number of steps that stretched uphill beyond the farthest point we could see. Walking on the steps after a while proved to be a greater challenge than avoiding them altogether, which we did at times. The trail was mostly on a steep path of ~0.9 miles with an elevation of 931 feet at summit. The slope (grade) was about 20 percent; a moderate-to-challenging hike.

Finally, the rain arrived. First it was light and then it became steady. We were determined to make it to

the summit and when we finally arrived, it was well worth the hike. We were afforded a panoramic view of Squam Lake with its many islands. We had enough time to take photos before heavy rain began, but we did not avoid it; on the return, we were caught in a downpour. Walking down the steps had become even more challenging. Our clothes soaked up so much rain, it felt that we weighed ten pounds heavier.

Luckily, five minutes after we returned to the parking area, the rain stopped, giving us enough time to change into dry clothes. This experience proved to be one of those rare exceptions when taking along more clothes than necessary was justified. Before heading our separate ways, we all enjoyed some hard-boiled eggs, crispy celery sticks and without hesitation agreed that we must do this all over again.

Tamworth Weekend 2025 afforded us the chance to make amazing connections, not just among the “roomies” but also with so many other BMC members. These connections, based on common interests, can be summed up in one word, as Dave Babik often says: kinship.

Editor’s note: The role of R. copelandii would depend on the condition of F. excavatus (if the host is no longer alive, R. copelandii would be a saprobe.)

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L: *Amanita brunnescens* (star-footed Amanita), R: *Hygrocybe chlorophana* (golden wax cap) & *Hygrocybe coccinea* (scarlet wax cap) combined



Fallen tree occupied by *Fomes excavatis* (tinder polypore)
R to L: Léna, Ruthie, Robert, Karen, Lauren, Suzanna, Barbara

Fungi Guilt: The Kingdom That Ate the Apocalypse

NATALIA JOHANNA

A friend saw a man turn up at a woodland near London with a group of kids, getting them to indiscriminately pick mushrooms into buckets, then sort out the edible ones and leave a big pile of the rest in their wake. It really got me thinking...

Firstly, let me be clear: I'm uncomfortable with the foraging gang type of behavior where the woods can be stripped bare. The indiscriminate picking and lack of concern for others, feels selfish, greedy, rude – the human equivalent of turning up at a shared table and sweeping everything into your own plate. I absolutely think we should forage in a thoughtful, respectful way: remembering that we're part of nature, not outside it.

But if I'm honest, most of that feeling is about people, not fungi. When I stop and look at the ecology, I don't actually believe that one rogue, thoughtless, arrogant individual or even a whole large family stripping a patch is likely to do any serious,

lasting damage to an individual mycelium, let alone to the structure of the local microbiome. In fungal population terms, the effect size of that behavior is vanishingly small.

If you ever feel that little flicker of guilt or experience pick-shaming, I'd like you to remember that they've been here for a long, long, long time.

Fungi were the first of the big three land-dominant eukaryote lineages – fungi, plants and animals – to colonize land. Fossil evidence suggests fungi were living on land something like a billion years ago, long before land plants appeared and long before animals ever crawled out of the water. While the ancestors of plants and animals were still mostly in the sea, fungi were already out on bare rock, slowly turning it into the first soils and quietly running the planet in the background – and there's an extraordinarily good chance they'll be here long after we've gone.

They flourished after the K-Pg

asteroid impact 65 million years ago. In that mass extinction event, skies darkened, plants crashed, and almost every single land-dwelling dinosaur died. Only a small lineage of avian dinosaurs survived, and those are the birds we see today. For almost everything else, it was the end of the world.

For fungi, it was a giant catering event. There's evidence of a huge post-impact fungal bloom: forests collapsed, ecosystems burned, and the fungi moved in, carpeting the planet and digesting vast amounts of dead plant and animal matter. While the dinosaurs lay rotting, fungi quietly recycled the entire catastrophe back into soil and set the stage for the next wave of life on planet earth. When the world ended for the dinosaurs, the fungi simply got to work and ate the apocalypse.

Fungi are absurdly adaptable – some fungi literally eat radiation. In places like Chernobyl, scientists have found dark, melanin-rich fungi happily growing on the walls of ruined reactors and around highly radioactive material. Instead of being destroyed by the radiation, they grow towards it and seem to use the energy from ionizing radiation to fuel their metabolism – a kind of fungal “radiosynthesis.”

The same pigment (melanin) that colours these fungi appears to help

them harvest that energy a bit like a twisted version of photosynthesis, but with gamma rays instead of sunlight.

Where plants and animals would be obliterated, these extremotolerant fungi quietly move in, colonize the hot zones and start turning fallout into biomass. If a kingdom can turn ionizing radiation into lunch, well...?

They can be enormous – and unbelievably old. We tend to treat each mushroom as if it's the whole thing, but the fruitbody is just the tip of a very big, very patient iceberg. A single fungal individual can spread over huge areas. In some species, what looks like “lots of mushrooms” in the woods is actually one genetic individual, quietly knitting through the soil and wood for metres, tens of metres, even entire hillsides. As many of you know, the largest known single fungal organism, a honey fungus in Oregon, covers several square miles and is estimated to be thousands of years old, possibly around 8,000.

There's nothing particularly magical about that individual and, quite possibly, there is a similar one living much closer to you.

Once you know that, picking one fruitbody starts to look a bit different. At that scale, normal foraging is like taking home a single fallen leaf from an ancient forest that's been there for

millennia and worrying you've damaged the forest. You could spend your whole life picking honey fungus fruitbodies in that Oregon woods every autumn and, from the fungus's point of view, your entire lifetime of collecting would register about as much as a change in the weather. The mycelium goes on: vast, old, and almost completely unaffected by the fact you existed.

Now, zoom all the way back down to our scale again: you, a basket, a frying pan.

At that level, you're removing a tiny sample of fruitbodies from one micro-patch for one short season; the mycelium is still there under your boots – metres wide, years or dec-

ades old – quietly feeding the ecosystem and throwing up mushrooms and spores in countless other places. The fungus barely even notices you were there.

If we're going to talk honestly about harming fungi, we have to zoom out to the global scale and focus on things like habitat loss, particularly clear-cut forests (we're currently losing roughly 10 million hectares of forest a year worldwide), drained wetlands, dead soils, intensive factory farming, polluted air and a rapidly shifting climate. That's where fungi are really taking a hit, not in anyone's frying pan.

So, if you ever feel guilty about having a few common edible mushrooms in your basket, remember what you're dealing with: not a fragile ornament, but Earth's oldest, toughest, recyclers – they ate the apocalypse. They'll eat you. And they'll still be here for a very long time after you've gone.

Editor's Note: This article was written by Natalia Johanna (left) of the British Mycological Society and submitted to us with editing by Gary Gilbert, with permission.

You can connect with the BMS on their website: [Home: British Mycological Society](#) .



Gifts of the Fungi

SUSAN GOLDHOR

Like all kingdoms, the fungi giveth and the fungi taketh away. Most folks focus on the fungal downside — the rusts and blights that wipe out crops and impoverish our forests; the pathogens that threaten frogs and bats and even the spaces between our toes, while we mycophiles see the upside: bread rising, beer brewing, wine fermenting, deliciously stinky cheeses; to say nothing of truffles and morels, porcini and matsutake; delights fed by the mycelia moving nutrients through the forest floor — I could go on, but you know the litany as well as I do.

And since, if you're reading this, you're in that second category, you're probably aware of huitlacoche and the fungal role in producing chocolate, coffee, soy sauce and (for a special treat) psilocybin. To say nothing of penicillin and a ton of other pharmaceuticals, plus, for us true believers, the *A. muscaria* connection to flying reindeer and the otherwise inexplicable Santa. But, here are three gifts from Kingdom Fungi that you might not know about, presented in order of the decreasing likelihood that you know about them.

CHILI PEPPERS: Hot, spicy foods and hot climates are pretty common partners, and I've heard all kinds of arguments for why this is the case.

Hot pepper is an anti-microbial and a preservative, keeping foods from spoiling in the heat. Spicy foods stimulate appetites depressed by heat. But these are human-focused results and rationales; not causes. Leaving humans out of the equation, why do hot, spicy foods tend to grow in hot climates?

There is only one genus of "hot" foods — chili peppers or *Capsicum* species — and only one class of chemicals — capsaicinoids — that causes that heat. But if all chilis are capable of making capsaicinoids, the fact is that the hotness of chili peppers is variable. Not just according to the species or variety of pepper (we've all heard of "ghost" peppers that are so hot they're dangerous), but within even the spiciest chili species or varieties, some fruits are hot and some are not. And while the proportion of hot to not is variable and changes according to geography, in any particular place the two types may grow side by side. Why is this?

It turns out that the answer lies in the interactions of three different kingdoms: plant, animal, and fungal. The fungus wants to attack the chili fruit seed but can't penetrate the tough seed coat. The plant, having expended evolutionary ingenuity and energy on that coat, now needs to protect its seeds with its most powerful chemical weapon (capsaicinoids) but because weapon production is very expensive (see our national budget), it doesn't ramp up production unless there are beetles around, because the fungus in question — *Fusarium semitectum* — can't enter the chili seed unless it's introduced by beetles drilling through the tough seed coat.

Using a wild Bolivian species of chili (*Capsicum chacoense*), a 2008 P.N.A.S. paper by Tewksbury et al. answered the question of variability in the proportions of hot to not chili plants by demonstrating this three way relationship and showing "that variation in hemipteran foraging pressure among chili populations predicts the proportion of plants in a population producing capsaicinoids."

How do the plants know how many beetles are around? Well, I'd be willing to bet that it's because it's common for plants to respond to attacks by emitting biogenic volatile organic compounds (BVOCs), which act as warnings to other plants to

beef up their defense mechanisms. (That lovely smell of fresh mown grass is a great example of such a chemical.) The concentration of BVOCs would be a reasonable way for intact chili plants to estimate the size of the threat. (Mancuso & Viola, 2015)

There are more twists to this story. The seeds of wild chilies like *C. chacoense*, rely largely on birds who eat the fruits for its dispersal. A problem faced by plants relying on animal dispersal is that the chemicals they produce to combat pathogens (like *Fusarium*) are often repellant to their potential dispersers. How brilliant of chilies to have developed (albeit at significant metabolic cost) a contra-fungal weapon that has no effect on seed dispersal, because birds lack a taste receptor for heat!

Well... there actually is a secondary effect on seed dispersal which increases the costs of capsaicinoid production; the coats of seeds from hot plants are less sturdy than those from the not hot individuals, and thus less likely to make it through the bird's digestive tract unharmed. (Tewksbury et al., Ecol. 2008) But it's an overall win.

The fungus-capsaicinoid battle turns out to be a great example of the types of weapons and defenses developed during an evolutionary battle between a plant and a patho-

gen. And a great example of how, when you start pulling apart any biological relationship, it turns out to be connected to everything else. For example, what are the mechanisms by which capsaicinoids hold off fungal attackers? Well, one of their most impressive weapons is their ability to inhibit or destroy part of their enemies' mitochondrial enzymatic oxidative mechanisms. In general, this would result in death. But, it turns out that fungal pathogens of chili peppers have evolved alternative respiratory pathways. Sure, this exacts a fitness cost but it's still better than the alternative. However, since the defense is costly, the fungi may have an offense; they seem to be able to synthesize enzymes that can break down capsaicinoids. I say "may" because these can be demonstrated in vitro, but we don't know how they work in vivo. And of course, the peppers turn out to have yet another weapon; it turns out that capsaicinoids can break down cell membranes. The victims may die but the arms race lives on. (Adams et al., 2020)

Drugstore shelves offer capsaicinoid creams for relief of a variety of human ailments, and capsaicinoids have been used as treatments for certain cancers. At this point, it probably won't surprise you to learn that the question of whether chilies are

helpful or harmful to our health is up for grabs. Personally, testing one's manhood by eating quantities of the hottest peppers grown, seems a bit risky to me. But then most of the tests of manhood fall on the risk side of the equation.

SCENT: Perfume and incense are highly regarded across multiple cultures, with their value in the Middle East exemplified by the biblical story of the wise men bringing frankincense, myrrh and gold to the infant Jesus; the implication being that the fragrance of frankincense was as valuable as gold. There's another scent used in Middle Eastern culture (and rapidly penetrating ours), and this is oud. Oud is derived from agarwood, which is the infected heartwood of *Aquilaria* trees. Saying that oud is valuable seems like an understatement; high quality agarwood sells for up to \$5,000/lb. and the global market in oud is estimated at \$6-7 billion. In fact, a recent article from the UK says, "Gram for gram, . . . oud. prized for its heady scent used for centuries in incense, is the most valuable wildlife commodity on the planet – worth up to 40 times more than gold." (Take that, frankincense!) Unfortunately, the value of agarwood has set off an illicit trade, with 13 species of *Aquilaria* now considered endangered.

I first read about oud in the

magazine *Aramco World* (Biswas, 2025), which stated that a fungus is involved in forming the fragrant resin in the tree's heartwood as a defense against an insect pest, the moth *Zeuzera conferta*, which bores tunnels into *Aquilaria*. When I followed up the *Zeuzera* hint, I was led to an entomological article which mentioned in passing that *Fusarium* might be part of the oud picture.

This was exciting! How parallel to the story behind hot chili peppers! Perhaps the duo of a boring insect plus *Fusarium* has been responsible for hundreds of plant exudates or resins long valued by humans for their food, cosmetic or medicinal properties. Well this may in fact be the case, but what further searching really led me to was the uncomfortable knowledge that I knew almost nothing about *Fusarium*.

It turns out that *Fusarium* is a kind of super genus, with over 330 known species. And, some of these species are actually species complexes, with sub-species displaying the sort of life style and metabolic variety that would make them a genus of their own in any less over the top genus. Although I'd pictured *Fusarium* as a sort of plant pathogenic rust, attacking either via airborne or soil-dwelling spores, over 70 species have

been identified as endophytes, living within plant tissues. *Fusarium's* exuberance in speciation is matched by its extraordinary metabolic abilities; while endophytes have long been famous for their production of unique chemicals, *Fusarium* may be in a class of its own. A review article by Ahmed et al., 2023 entitled "The endophytic *Fusarium* strains: a treasure trove of natural products" is worth looking at, even if you simply flip through the dazzling arrays of chemical structures produced by this group of fungi. I read this as meaning that a *Fusarium* might be lurking in *Aquilaria* heartwood, ready to set off resin production if properly activated.

However, when I pulled myself back from the seductions of *Fusarium spp.*, and limited my compulsive googling to oud, my next discovery was that maybe it wasn't *Fusarium* at all. Or at least not only *Fusarium*.

The full story came from an online source; the appropriately titled "Ouddict," whose January 21, 2018 issue offered an article entitled "Agarwood History And Botany" by Sudhir Ahlulwalia, extracted from that author's book, "Holy Herbs: Modern Connections to Ancient Plants."

Offering references for each genus, the author writes, "Dark wood with-

out white streaks indicates the presence of resin, which is produced when the heartwood is infected by a fungus. These fungi include *Aspergillus spp.*, *Botryodyplodia spp.*, *Diplodia spp.*, *Fusarium spp.*, *Penicillium spp.*, and *Pythium spp.*” So not necessarily *Fusarium* but still — a fungus. And, in the hopes of countering the illegal trade in agarwood which is endangering some *Aquilaria spp.*, the experimental production of oud via wounding young trees and applying a fungus to the wounds has not only done away with endophytic involvement but has wiped out the need for *Zeuzera* or any other boring insect as well, damn it. Some day I’ll learn when to stop googling.

INSULIN: This is the most surprising fungal gift, and the most recently discovered (Hill et al., 2025).

We’ve all read about (and we all shelter) the human biome; the thousands of species that live in and on us. These are largely bacterial; I’d accepted that the relatively small number of fungal residents we host are likely to be pathogens, like the yeasts, *Candida albicans*, *C. glabrata* and *C. auris*, which are kept in check by our friendly bacteria (why we get yeast infections after taking antibiotics). But in a surprising development, it turns out that the development of normal pancreatic β cells, capable of producing insulin, is de-

pendent upon the recognition of specific cell wall components of a different yeast, *Candida dubliniensis* at a critical window after birth.

This research was carried out on mice since the dissection of human infants is not (yet) acceptable; however, testing human fecal samples from infants of different ages on the appropriate mouse tissues suggested that we too have a post-natal period (7 to 12 months) of requiring this fungus in order to prevent early onset (Type A) diabetes.

Perhaps most exciting and hopeful is the last sentence in the Results section of this summary publication: “We also tested the capacity of *C. dubliniensis* to mitigate diabetes in mouse models and found that not only could it reduce disease prevalence and severity, but it could also promote β cell restoration in adult animals after ablation.”

And, because I’ve been dazzled by *Fusarium*, I can’t resist mentioning that although some *Fusarium* species can cause serious infections and even death in humans, there’s a recently discovered (Zhou et al, 2025) species (*F. foetans*) that’s a permanent resident in the gut of essentially every healthy human on earth, and offers us significant protection against fatty liver metabolic disease. It doesn’t offer total protection because if you pig out sufficiently on fatty foods, you

FUNGAL GIFTS

can overcome it. Still, it's in your gut and, along with that fleeting *dublinskiensis* hookup protecting you against sweets and alcohol, you'll probably get through the season safely. All thanks to the fungi.

Editor's Note: This article was originally published in Fungi Magazine, and is reprinted with thanks.

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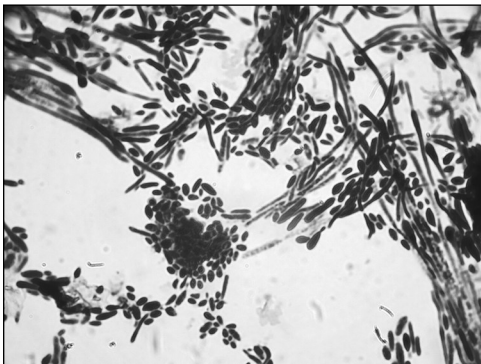
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Gram stain of *Candida dubliniensis* cells (1000-fold magnification)

By Stefan Walkowski - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=44448835>

FUNGAL FUN

Below you will find the solution to this puzzle which was printed in the last edition of The Bulletin. Many thanks to Léna Sanentz for this regular Fungal Fun feature!

Fungi (genus) in Colors of the SPECTRUM

(solution)

H								L							
Y			S	T	R	O	P	H	A	R	I	A			
G								C				A			
R							E	N	T	O	L	O	M	A	
O								A				A			
C	H	L	O	R	O	C	I	B	O	R	I	A	N		
Y					R			I				I			
B		O	M	P	H	A	L	O	T	U	S		T		
E					T			S				A			
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	C	L	A	V	A	R	I	A				E			
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					L		T	Y	L	O	P	I	L	U	S
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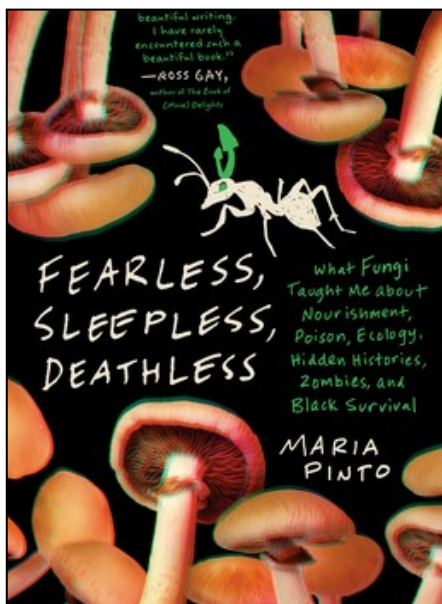
- *Tytopilus felleus* (brown)
- *Stropharia rugosannulata* (wine-red)
- *Hygrocybe punicea* (red)
- *Omphalotus illudens* (orange)
- *Bisporella citrina* (yellow)
- *Chlorociboria aeruginascens* (green)
- *Amanita phalloides* (olive-green)
- *Entoloma virescens* (blue)
- *Lactarius indigo* (indigo)
- *Lepista nuda* (violet)
- *Clavaria amethystina* (purple)
- *Craterellus fallax* (black)

Fearless, Sleepless, Deathless

NATALIE BOWERS

Maria Pinto's *Fearless, Sleepless, Deathless* is a masterful hybrid of memoir, ecological history, travelogue, cultural critique, and love song to fungi, structured to meander through a collection of meticulously crafted essays like a mycorrhizal network built not of organic matter but of language. Using specific fungal species as narrative anchors, Pinto traces intertwined personal, colonial, ecological, and cultural histories while inviting the reader into a voice so personable it feels less like reading a book than walking alongside an endlessly curious and generous companion. Multiple times while I was reading, Pinto seemed to anticipate my exact questions, addressing in the very next paragraph what I'd just been wondering. How did she do that?!

The book resists rigid genre boundaries, much like fungi themselves resist neat taxonomies. Pinto's prose moves with a Jack Kerouac-like looseness, a road-trip sensibility where chance encounters and travels, conversations with friends, and sudden intellectual detours become part of



the method. This feels like Pinto's deliberate style and it is so refreshing and contrary to formula. Her central argument that I took away was that survival, knowledge, and healing emerge through entanglement and "sluttiness" rather than domination, and this is continuously mirrored formally in each of the essays. It's a grand literary display of "walking the talk."

The opening chapter, centered on the Jamaican word for mushroom, “Junjo,” establishes Pinto’s revisionist project. She reminds us that fungi existed in Jamaica for millennia before colonial documentation, challenging the colonial logic that confuses “discovery” with origin. Drawing on a 1958 journal article titled “Mushrooms, Umbrellas, and Black Magic” by Irish anthropologist Robert Wallace Thompson, Pinto exposes how colonial science recorded Jamaican fungi while erasing Indigenous knowledge systems. Her observation that contemporary Jamaican mycophobia is an inherited colonial fear rather than of a cultural origin becomes a powerful case study in how empire reshapes not only land but perception itself.

Immediately the reader is invited to question established cultural norms or universal systems of knowledge without enquiry. Pinto’s memoir voice deepens the analysis. Recounting her personal, family, friendships, and childhood relationship to land, she writes of fungi giving her “home in the way I used to know it as a child; that place where you essay to understand what earth is made of... where the land doesn’t end, but renders you continuous with it.” The study of mushrooms, she admits, taught her to see abundance where she had been taught scarcity, and to move beyond fear when

“there isn’t plenty.” This is nourishment in the broadest sense: epistemological, emotional, and political.

Each chapter introduces a new fungal guide and a new human constellation. In the chapter on the Black Winter Truffle, Pinto visits a friend attempting to cultivate truffles, tracing the fraught history of luxury fungi and ultimately reconsidering her own skepticism about cultivation. Elsewhere, friendships with fellow mycophiles become sites of shared inquiry rather than expertise hierarchies. Knowledge here is relational, provisional, and lived.

One of the book’s most arresting chapters examines the zombie ant fungus alongside the Haitian roots of the zombie myth. Through an investigation of zombification in scientific and spiritual contexts, Pinto reframes the zombie archetype not as a horror trope but as metaphor for the loss of agency under enslavement. She extends this analysis outward, naming prisoners, Black people, trans people, the colonized, the disabled, the elderly, children, and the global poor as populations living daily with constrained bodily autonomy. The essay’s power lies in its vulnerability: Pinto weaves her own empathy and unease into the analysis, refusing the safety of distance.

Poison becomes the organizing metaphor of the Death Cap chapter.

Pinto details the horrifying efficiency of amatoxin poisoning, how it convinces the body it is healing while shutting organs down, and then turns the lens inward. Asking whether her own encounters with despair stemmed from the realization of her Blackness, she confronts “the endless accounting” and “the nasty lie of the official story.” Here, poison is re-framed not as evil but as a survival strategy. Mushrooms evolved toxins to protect themselves long enough to reproduce. “Not everything is for us,” Pinto writes, a deceptively simple sentence she transforms into one of the sharpest anti-capitalist critiques in contemporary nature writing. I am left wondering, how profoundly changed would our world be if we all understood the real meaning of that short sentence? Mycophiles understand it more than most, and Pinto proudly claims these as her people.

In the chapter on psilocybin, Pinto navigates the ethical tensions of psychedelic medicine in Jamaica with care. She documents her own experiences with “laughing gyms,” discusses the work of *MicroMeditations* in Jamaica, and remains alert to the dangers of colonial extraction disguised as wellness. While acknowledging efforts to serve local communities and ethical considerations of commercial entities in post-colonial environments, she also honors figures like Miss Brown, who offered similar heal-

ing outside commercial frameworks long before Western interest arrived. The political thread continues, highlighting real solutions to heal sociopolitical divide through fungi: healing veterans, police, and first responders becomes a strategic bridge in the fight for legalization, suggesting that fungi may succeed where ideology fails.

Fire takes center stage in the chapter on *Tinder Fungus*, where Pinto moves seamlessly from Ötzi the Iceman to melanated fungi like *Pyronema*. The revelation that mushrooms, too, are melanated opens a quietly profound meditation on resilience. Fire, she argues, can be cleansing rather than destructive, an idea she extends to political protest. In one of the book’s most devastating passages, she recounts the killing of Tortuguita, a 26-year-old nonbinary environmental activist shot while protesting Cop City in Atlanta. Here, fire becomes both mourning and warning. Here she reflects, “good fire can prevent hellfire.”

The later chapters broaden into explicit calls for collaboration across difference. Referencing Anna Tsing’s *The Mushroom at the End of the World*, Pinto rejects rigid disciplinary boundaries in favor of what she jokingly but seriously calls “sluttiness.” To be “slutty,” in her formulation, is to be curious, promiscuous with ideas, willing to enter spaces that don’t

BOOK REVIEW

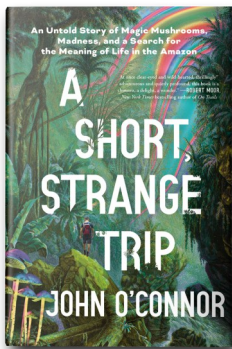
yet make sense. Science, she reminds us, is a story a culture tells based on what it can perceive. Compartmentalization is the real danger. She advocates for cross-pollination of concentrations but stops short of calling it interdisciplinary.

This argument carries feminist force as well. Through figures like Blacki, a self-taught mycologist who built their own lab, Pinto champions forms of knowledge long dismissed as unserious or impure. Nature is not zero-sum, she insists, and neither should we be. Mushrooms, in her telling, are not metaphors imposed on the world, they are collaborators showing us how to survive together.

Fearless, Sleepless, Deathless ultimately imagines a world I want to live in: one where listening to nature is an act of political resistance, where curiosity dissolves false boundaries, and where survival is collective rather than competitive. Pinto does not offer easy solutions. Instead, she offers companionship, humility, and hope, threaded together like mycelium beneath our feet, waiting for us to notice.

Maria Pinto
2025, University of North Carolina Press
ISBN 978-1-4696-8979-1
Paper, \$23.00

COMING SOON



BMC member John O'Connor's new book, called *A Short, Strange Trip: An Untold Story of Magic Mushrooms, Madness, and a Search for the Meaning of Life in the Amazon*, about the late American mystic Terence McKenna and his influence on our current "psychedelic renaissance," will publish in April of 2026.

This book is available for pre-order via several retailers. Or, purchase directly through the publisher, [Sourcebooks](#), in April.

ISBN 9781464218088 368 pp

VOLUNTEER PHOTOS

Club volunteers enjoyed a Fungal Feud game this past fall. Thanks so much to all of our wonderful volunteers for all you do!



Clockwise from left: Jonathan Kranz, Chris Garrity, Claire King, Deborah Taylor, Corie Costantino, David Hibbett



Clockwise from left: Debbie Shore, Maria Pinto, Bridget Harrison, David Babik, Primrose Boynton, Scott Shaffer

VOLUNTEER PHOTOS

Photos from Fungal Feud courtesy of Jana Harris.



Clockwise from left: Jura Strimaitis, Joel Kershner, Ari Stamatou, Léna Sanentz



Clockwise from left: Jana Harris, Isabella Roversi, Karen Monger, Robert Gergulics, Jonathan Beit-Aharon, Claudette Beit-Aharon

Mushroom Eggplant Rollups

GARY GILBERT

Italians love eating eggplants. You will often find thin slices of them roasted, slathered with great Sicilian olive oil and served at room temperature as an accompaniment to your breakfast. It is also not uncommon to find them on your dinner plate, rolled up neatly and topped with olive oil and salt as a side garnish.

Interestingly enough, eggplants are a type of berry, not a vegetable, which is defined as a fruit that grows from a single flower. This includes berries such as grapes, tomatoes, cucumbers and even bananas. The bitterness sometimes prevalent is due to alkaline nicotinoids in the seed coatings of the eggplant. Removing the seeds or soaking the slices in salt, then rinsing, can also reduce this bitter taste as will thorough cooking.

The term eggplant emerged in the late 1700's and was applied to small round white cultivars that looked very much like an egg; both in terms of shape and, surprisingly, in size. In

1811 they were referred to as "Garden Eggs."

This particular dish evolved from a recent trip around Sicily, the football at the tip of Italy's boot. Part of our trip was with the James Beard award winning chef Ana Sortun, owner of Oleana restaurant in Cambridge. Its Turkish influence derives from another trip we took with Britt Bunyard mushroom hunting in Turkey where nuts are found in many dishes and often given as gifts when visiting ones home.

The eggplant is cut into strips, roasted, rolled up, and sprinkled with lightly shaved salt; ideally from Trapani, Sicily. I could not resist the temptation to add just a little bit of sautéed Shiitake mushrooms and crushed walnuts, for a Turkish twist. In other versions I have added pieces of morels cooked in a cream sauce, delicious! The result is a rather unusual side dish that also works well as an appetizer. You can serve these with

nothing inside at all, just the oil and salt. Not too filling, and delightful in its uniqueness.

I encourage people to use the best quality olive oil you can find. Sicily and Crete produce some of the best olive oils in the world, but of course there are plenty of other sources. I recommend shaved finishing salt because it is much lighter than finely ground salts. A pinch of this goes further and will make the dish less salty than an equal pinch of finely ground salt. It is an essential ingredient.

Mushroom Eggplant Rollups (30 mins plus roasting time, serves 8)

2 large eggplants
**4-6 oz Shitake mushrooms, or about
6-9 morels**
1 cup, extra virgin olive oil (EVOO)
1 tsp, shaved finishing salt
1/2 cup walnuts
Aleppo pepper, optional
Paprika

Directions

To prepare, peel about 3 strips of skin off one side of the eggplant. Then place it, peeled side down, on a mandolin, if you have one, to make ¼" thick full-length slices. If you don't have access to a mandolin, use a fine filet knife. Slices any thinner than that might burn a bit while roasting. Any thicker and they will make the dish a bit too filling and take longer to cook. If they do singe a bit, that is fine as long as they remain flexible to roll up. The coating of EVOO will help make them flexible. Place them spaced apart on a sheet pan lined with parchment paper. No olive oil should be used at this stage.

Simply roast the slices at 350 degrees for 35 minutes. Remove from the oven and allow them to cool. You can even do this step the day beforehand. While they are roasting, thickly slice the Shitake mushroom caps, stems removed, and sauté in butter or olive oil until well cooked. Singe them slightly, at the end, to create the Maillard reaction that is famous for mushrooms. This greatly improves their flavor. Remember, mushrooms are in a different kingdom than plants and, in some ways, more closely related to mammals than vegetables, so singeing is a specific chemical process which improves their flavor.

MYCOPHAGY

To assemble, liberally wet each slice with about 1 tablespoon EVOO and dust liberally with shaved salt. Add only a couple of slices of cooked Shitakes, 4 or 5 small broken pieces of walnuts and a slight dusting of Aleppo pepper to each eggplant slice, if you want a bit of hotness. Roll them up tightly, then place them back on the parchment paper for reheating before serving. Before reheating, wet them again with more EVOO and a bit of shaved salt to finish. Serve plated on bed of sliced endives or lettuce. Dust with paprika for color. Serve 2 to 3 rolls per person if as a side dish, or 1 to 2 per person as an appetizer.

This recipe will work well with other, strongly flavored mushrooms such as Hen of the Woods. You could easily experiment with other fillings such as a bit of feta cheese, or a mushroom paté of your choosing, perhaps Black Trumpet paté? Enjoy.



Clockwise from bottom left: Slicing the eggplant, preparing the eggplants with the mushrooms, completed Mushroom Eggplant Rollups. Photos by Gary Gilbert.

Unscramble these Fungi Genera

Léna Sanentz

TEBULSO	B _ _ _ _ _
ULSARICTA	L _ _ _ _ _ _
AUSLURS	R _ _ _ _ _
SHORUPYROGH	H _ _ _ _ _ _ _
MATAINA	A _ _ _ _ _
DUMNHY	H _ _ _ _
SCHENULARTAL	C _ _ _ _ _ _ _ _
RASCIUAG	A _ _ _ _ _ _
ULSUSIL	S _ _ _ _ _
TILANLUNE	L _ _ _ _ _ _
EUCIMIEHR	H _ _ _ _ _ _
AVITACA	C _ _ _ _ _
TESOPURUL	P _ _ _ _ _ _
ELROMALCH	M _ _ _ _ _ _
FAIGLOR	G _ _ _ _ _
POARUORELIS	L _ _ _ _ _ _ _
SUPLIREMI	M _ _ _ _ _ _
HIRACOMOLT	T _ _ _ _ _ _
MONDAGEAR	G _ _ _ _ _ _
LARULSCERTS	C _ _ _ _ _ _

Some Mushroom Rarities

MATTHEW ROZANOFF

About two years after my first specimen was sent to Mycota labs for DNA sequencing, I began to consistently encounter a pleasant surprise: fungi that had not been found before. They ranged from large charismatic species that made me wonder, “How could this possibly be new to DNA studies?” to microscopic ascomycetes that made me feel the exact opposite. So I began to do what any data driven mushroom enthusiast would do: I started keeping track of them in a little Google Sheet.

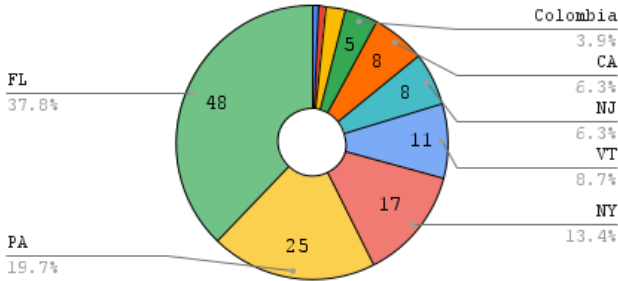
At the time of this writing in early February, there are 128 unique species sitting in that document, 43 of which have been designated new provisional names, meaning they were new to our databases. A provisional name is assigned to a mushroom species when it is distinct enough from all other mushrooms genetically. The caveat is that this doesn’t necessarily mean that they are a new species to science, just to our DNA databases.

The fact of the matter is that science existed way before fungal sequencing, and we can’t always connect today’s data to an old specimen, which may or may not exist due to insect damage, human error, or just good old father time. You could say we are living in a grey area of sorts, with the old scientific world slowly being merged with this data driven modern genetic world. I like to think of it as the golden age for fungal discovery, where endless opportunities lie untouched.

How exactly did I define what counted as a rare species? I made it quite simple. If there were five or less specimens recorded on iNaturalist, I popped it on over to my tracker. This strategy also implies that my ever growing list will also be ever shrinking, as more people find and document more fungi, but that is exactly how I envision it to be. Most of my observations are from the places I frequent the most; New York, Pennsylvania, and Florida (when I go to

FUNGAL DIVERSITY

Rare Fungi Locations



This chart shows the places where most of my 'rare' fungi come from, with Florida being by far the largest contender at almost 40%.

visit my grandmother Svetlana, or бáбушка). I'd like to showcase three intriguing examples from Massachusetts and adjoining states!

Our first candidate comes from the 2024 NEMF Foray at Cape Cod which I was able to attend thanks to the Homola scholarship along with two other recipients! This is a member of the notorious family Cortinariaceae (webcaps), which recently underwent a large taxonomic remodeling that gave us a glimmer of hope at understanding its never ending complexity. Emphasis on 'glimmer'. While there are some colorful and/or distinct webcaps, this little guy falls more so under the category of a LBM ("Little Brown Mushroom"). It still manages to present some interesting trends, such as only being found on Cape Cod and the Southern Coastal Portion of

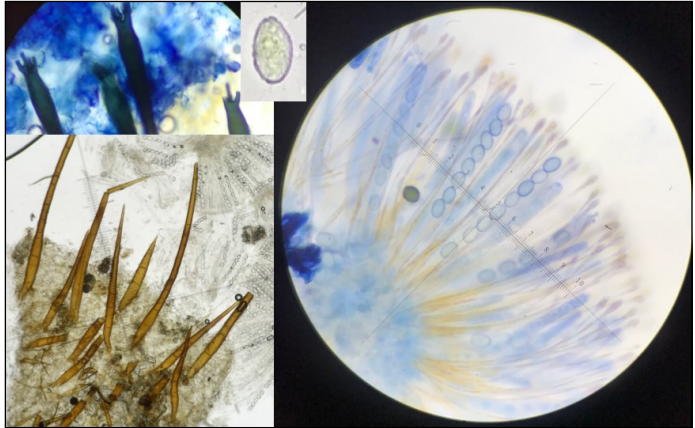
New Brunswick. This immediately makes me wonder if this mushroom could be a coastal species. Additionally, it has always been found under some sort of conifer, leading another early hypothesis to be that it has a coniferous host.



Cortinarius "obtusus-NB01" Oct 2024, MA. The name refers to this provisional name being similar to *Cortinarius obtusus* (which is likely native to Europe), and that it is the first of its kind to be found in New Brunswick

FUNGAL DIVERSITY

The Cape Cod area yielded two other rare *Cortinarius* collections, but for the sake of diversity I will move on to greener pastures, or in this case, red-der.



These extremely recognizable ascomycetes can be told apart by their distinct reddish-orange colour and their conspicuous ‘eyelashes’ on the cup margins. They have been appropriately termed “Eyelash Cups” (*Scutellinia sp.*) and for most, that is where the story ends. Some of us, with a penchant for suffering,

Left: *Scutellinia sp.* Above: On the left we see the eyelashes (setae) magnified, showing their septations and roots (cresyl blue dyed). At the top we see a spore, which can have varying degrees of ornamentation and sizes. On the right we see the eight-spored sacs (asci) dyed by cresyl blue and the brown paraphyses in between.

have decided to look deeper to try to distinguish the species of these beautiful moisture loving organisms. I have used my trusty species finder code to help collect the provisional and non provisional DNA sequenced names, and there are thirty-nine *Scutellinia* species in only the Northeastern United States so far. To say we have our work cut out for us is an understatement, and you can bet most of them look exactly like the above photograph. So how can we progress our understanding of so many species that look the same to the naked eye?

Microscopy.

FUNGAL DIVERSITY

You could spend a lifetime learning ascomycete microscopy, but when it comes to these eyelash cups, they are relatively user friendly. This is mostly due to their large size and that in turn makes them more fun to work with! At least in my opinion. All of a sudden these indiscernible orangish cups have many discernable features to examine: hair length, septation, rooting, spore ornamentation, spore size, ascus size, paraphyses and more! Simply adding microscopy work to the DNA verified observations will allow us to be able to differentiate these fungi, and you will likely be a part of a scientific paper one day! I don't know about you, but that only adds to my motivation to go outside and find fungi!

Our final subject makes up for its small size with beautifully textured cap, and gummy-bear like spore shape. It has only been found three times so far, restricted to the old Appalachian mountains from North Car-

olina to Vermont. Say hello to *Inocybe multicoronata*!

A disclaimer for this *Inocybe* and any other mushroom to exist, is that we can only deduce from what we know. If we suddenly see the first example of *Cortinarius* growing all over inland Eastern America, then it cannot be a coastal species. Or if this *I. multicoronata* shows up on the west coast, it is no longer an Appalachian species. At the same time making these hypotheses help us try to understand the fungi we find, and allow us to have better information on how to find them again.

As for identifying these beautiful little mushrooms, I can only state to be watchful for the white scales on the dark brown caps, the heavily frosted (pruinose) stems and overall small, slender stature. Bonus points if you find it in the Appalachian Mountains!

These were only three specimens in a world of thousands, and I hope I convinced or inspired a few of you to take those careful iNaturalist pictures and send your finds to DNA sequencing (easily done these days!), and maybe even put them under a microscope!

Thank you for reading, and thank you to David Babik for supporting us!



Inocybe multicoronata Aug 2024, VT. In situ photograph on the left, spores up top, and a close up of the cap on the right.

Hunting for Answers in Amphibian Guts: A Profile of Liam Cleary

JONATHAN KRANZ

Should you drop by the mycology labs at Clark University, you may find PhD candidate, Liam Cleary, poking his way through frog poop. His quarry: genetic evidence of *Basidiobolus*, a poorly-understood fungus that is commonly found in the gastrointestinal tract of amphibians and reptiles (herptiles).

Liam describes a complex journey. “Asexual conidia are projected out of herptile droppings and land on nearby leaf litter,” he says. “There, hyphae can fuse, undergoing sexual reproduction to produce hardy zygospores. Hyphae can also produce secondary conidia that have an adhesive bead which helps them cling to mite or insect exoskeletons. When a hungry frog eats an insect carrying *Basidiobolus* secondary conidia, its GI tract is colonized by *Basidiobolus* and its life cycle repeats.”

Why the interest in the obscure

Basidiobolus? In addition to being a human and veterinary pathogen, the fungus produces a “taxonomically unusual abundance” of secondary metabolites. *Basidiobolus* diverged earlier than the mushroom forming fungi, and its close relatives produce very few secondary metabolites. However, Liam’s advisor, Dr. Javier Tabima, initially discovered that “*Basidiobolus* produces lots of them, leading to lots of questions: where do they come from, and what purpose do they serve?”

In general, Liam notes 40% to 60% of secondary metabolite gene clusters come from non-fungal origins, such as bacteria. This means *Basidiobolus* is adept at picking up and expressing DNA found in its environment. Regarding their purpose, Liam suspects secondary metabolites help *Basidiobolus* survive in the G.I. tract. “Maybe it’s to sequester iron in a low-iron

AMPHIBIAN GUTS

environment,” he speculates. “Or maybe they help reduce competition from bacteria; some metabolites seem to act as surfactants that disturb and break up lipid membranes.”

In the short term, Liam has three key goals. The first involves assessing species within the genus. “Species concepts for *Basidiobolus* are morphologically-based [material features visible to the unaided eye], which doesn’t really work well with zoo- and zygosporic lineages of fungi (ZZF). Are the fungi we’re examining truly distinct species? “ “Luckily,” Liam adds, “DNA evidence can help define species boundaries in organisms that lack clearly distinct morphologies and ecologies, like *Basidiobolus*.”

His second and third goals involve assembling “a large phylogeny” for the genus using genome-scale data and investigating the distribution of secondary metabolite gene clusters across *Basidiobolus* isolates from en-

vironmental sources and culture collections. “Are they in all the lineages,” Liam asks, “or just some of them?”

Liam’s long-term goals are more ambitious – and may have greater consequences. Like so many investigators, Liam hopes that he and his colleagues may find “novel compounds” that could attract medicinal or industrial interest. Further, his research points toward an issue with broad implications for the future of mycology. “It’s not just about compounds in *Basidiobolus*,” Liam says. “This research could serve as a model for understanding gene cluster acquisition and the environmental pressures that encourage their expression in new organisms.”



The team out amphibian sampling.



Liam Cleary

Fungacious Jewels

JANA HARRIS

Roaming the trails
along the star moss,
where rocks meet
mounds of coral-like fuzz.

No shoes step across
these winding paths,
sprinkled here and there,
patches of jewel-like tones.

The pale Spinel caps
with suspended crowder gills,
over swelled stipes rooted in leaves.

The intense Amethyst bumps
with specks of yellow
on the liquid surface that shines.

The Garnet tops splitting with age,
buttery and brittle lamellae,
calls to be tossed against the trees.

The conical Carnelian caps
cold to ones touch, dry
yet slimy at the same time.

The funnel shaped Moonstone pileus
the size of human palm
tasting of fresh peppercorns.

Roaming the trails
where coral-like fuzz
and gems grow
just for a moment.

MEMBER PHOTOS



Clockwise from upper left: Ari Evans enjoys the last edition of *The Bulletin*, a gorgeous *Trichaptum biforme* shared by Jana Harris, a *Tremella bouquet* by Brittany Blaney-Anderson, *Tectella patellaris* by Jess Evans

