A Spore-adic Publication of the
Boston Mycological Club
Since 1897

Volume 75, No. 2.
November 2020

The Bulletin

INONOTUS MILLMANII · ENTANGLED LIFE · HOW FAST URBAN MUSHROOMING · FUNGI SONGS · SEVEN VIRTUES OF FUNGI SALEM WITCH PANIC · FUNGI CARDS · HONEY MUSHROOMS MUSHROOM MADNESS · ELIO SCHAECHTER SHARES WORKS · PRANKS MAKE A DRYING RACK · MUSHROOMING FROM HOME · MYSTERY

A publication of the Boston Mycological Club prepared diligently, at times relentlessly, by your faithful Editorial Board

Zaac Chaves
Editor-in-chief

Susan Goldhor
Editorial advisor

Lawrence Millman
Editorial advisor

CONTENT WANTED
Generously submit your contributions to:
BulletinBMC @gmail.com

As the calendar year comes to a close we bring you the following compilation. As you may have heard I(Zaac) have moved to Connecticut. You won't be loosing me, however we amateur mycologists are too few to be too far. I will help support *The Bulletin* until there is a local member to step up; my ongoing regret is that I can't produce enough of these to better support our most loyal and esteemed contributors.

The following issue contains articles, stories, and a diagnostic key to keep you and your friends amused. Remember to always keep *The Bulletin* out in the open for others to peruse. It ought not be stored away somewhere. If you must part with one, tuck it into a magazine stack at a nearby business. This will help us get many new members (and possibly more colorful letters to the editor.)

And you have continued to keep us impressed and, candidly, a little perplexed with the unique contributions in this issue. We have endeavored to fit this varied content in this *Bulletin* to the best of our abilities and hope you will enjoy the range of pictures, poetry, art pieces, and articles. Thank you everyone for your sustained diligence in doing your part to make *The Bulletin* thrive.

Our cover image shows the newly named *Inonotus millmanii*, named in honor of our own Lawrence Millman. Read more in the corresponding article on page 6.

Credits
Printed locally by South Shore Printing of Scituate, MA.
All uncredited images depicted are sourced from BMC archives and artists/photographers who made an explicit request to remain anonymous. To source any material please reach out to original authors if specified. Otherwise items may not be used unless explicitly stated so in caption.
Project Gutenberg (PG) sourced images include the following caption:
This eBook is for the use of anyone anywhere in the United States and most other parts of the world at no cost and with almost no restrictions whatsoever. You may copy it, give it away or re-use it under the terms of the Project Gutenberg License included with this eBook or online at www.gutenberg.org. If you are not located in the United States, you'll have to check the laws of the country where you are located before using this ebook.

The Bulletin

November 2020

Letters To the Editor

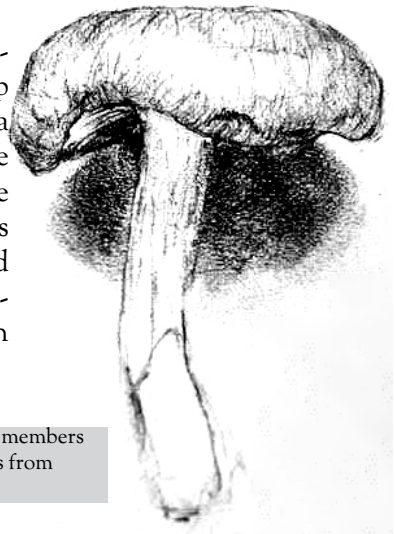
Dear Editors,
When you credited Scott with creating the club's website (P. 30 of the last Bulletin), you were in error. In fact, a team of Jeramy Webb, Jason Karakehian, and I created it. Jeremy was the tech person. I wrote the text and designed the navigation. Jason brainstormed on content and graphics and compiled the Resources page. When the website was completed, Scott took over from Jeramy, and I stayed on as editor for about a year; then I handed the role to Scott.
Scott has done yeoman service in keeping it going, but the original creators deserve credit for their work, and I'm sure Scott would agree.
Andrea Ignatoff

Thank you for pointing this out and I will make this correction going forward.

Dear Editors,
Personal library of mushroom literature for sale in Belmont MA. Collection includes books, periodicals, field guides, reports, cookbooks, and more, published between 1897 and 2000, mostly between 1970 and 1995. Condition varies but most are good. Most are hardbound though few have dust jackets. Prices range from $3 to $30. Buy the entire collection (55 volumes) for $450. Interested parties please contact Geoff Dutton for a complete catalog at geoff@spatial-effects.com.
Geoff Dutton

Thank you for offering your collection here Geoff. I hope that this will help our members avoid more increasingly centralized avenues of commerce. Good luck.

Dear Editors,
I took Erica Beade's BMC-sponsored mushroom drawing workshop this past November. It was such a great experience for someone like me who has almost zero experience sketching mushrooms. Attached is one of the mushrooms I sketched (shiitake). I'm not sure if it's bulletin-worthy, but I'm sending it just in case you think you could use it!
Jonathan Ripley



Thank you for writing in Jonathan! I am sure our members will be pleased to see your work. Its contributions from readers like you that help *The Bulletin* thrive.

Dear Zaac,
Let me say once again, your bulletins were the best in the history of the BMC bulletins, bar none. Are you leaving Boston? If so, you will be sorely missed,
Eio Schaechter

Thank you Elio and I could only succeed to the degree I have with my team including our generous contributers and of course a rich lineage of other editors who did extraordinary work before me. Thank you for your ongoing support including you article on page 34.

Dear Zaac,
I can safely say that the very best editor of the Boston Mycological Club's *Bulletin* during the epic period of its existence (125 years and counting) has been Zaac Chaves. Zaac will have stepped down from his editorship by the time you receive the bountiful *Bulletin* that you're now holding in your hands. Let me suggest that you applaud him enthusiastically and, if you're so inclined, raised a dram of single malt scotch in his honor.
Lawrence Millman

Dear Zaac,
I second Larry's letter, while pointing out that with august past editors like Elio Schaechter (some of whose writing is reprinted in this issue), being the very best is very high praise. Now we need to find the next in that series. Zaac has very generously said that he'd help in the transition to the new editor, whoever he, she or they might be. Might that be you? We need one or more volunteers. If the challenge of getting out issues, combined with the satisfaction of creating *Bulletins* according to your vision, and being next in a line of luminaries, is appealing, please let me know. And if you feel that you don't want to take on the entire burden, but could carry out some piece of it, please, still let me know.
Zaac, thank you. It's been great! (and a dram of bourbon is acceptable)
Susan Goldhor

Sending my utmost gratitude back to everyone who helped us make *The Bulletin* what it has become. And what a graciously warm privledge to have so many hard drinks shared in my honor. Even as a life-long teetotaler I somehow like this.
Zaac Chaves

A Polypore Named in Honor of Lawrence Millman: Inonotus millmanii

By Susan Goldhor

Norwegian mycologist Leif Ryvarden has recently named a polypore after Lawrence Millman. The species is called *Inonotus millmanii*, and Larry collected it near Casa Cubuy in eastern Puerto Rico this February. See the pages below for Ryvarden's description of the species in *Synopsis Fungorum* 41 and [the cover for] Larry's photo of that species.

These three sentences are how Larry described this event. But what Larry doesn't say is that having a species named for you is a *big* deal.

This is as close to eternal fame as anyone can manage. It means that Larry's name will take its place forever, alongside the names of Linnaeus, Darwin, and Wallace. This is an honor that is completely international and unconstrained by language; that is independent of publicity agents or voters or bribes. I wish we could gather as a Club to celebrate Larry's fame with toasts (and, knowing Larry, probably roasts), but we can't. At least for now. But we can at least offer congratulations and take vicarious pride in his achievement.

Larry Identifies Collections

Reproduced from *Synopsis Fungorum* 41

Inonotus millmanii nova sp.

Leif Ryvarden
Institute of biological sciences, University of Oslo, P.O. Box 1066, Blindern, N-0316 Oslo, Norway. leif.ryvarden@ibv.uio.no

Abstract. *Inonotus millmanii* is described as new based on a collection for Puerto Rico. It is characterized by presences of large setal hyphae combined with a distinct duplex context. A key to all American *Inonotus* species with setal hyphae is provided.

Introduction.
Lawrence Millman, a well-known author and eager mycological amateur, has over years sent me poroid fungi collected while he was travelling around North America. Among his last samples from Puerto Rico there was an unknown Inonotus species, which is described in the following.

Inonotus millmanii Ryvarden n. sp. Index Fung. 557 650
Holotype: Puerto Rico, El Yunque, near Casa Cubuy, 2. March 2020, on a dead log of unknown hard wood tree, Leg. L. Millman. Holotype in fungarium FH, isotype in fungorum O.
Eytmology: Named after L. Millman amateur mycologist.
Basidiocarps annual, pileate and sessile, pileus up to 1 cm wide, 3 cm long and 8 mm thick, soft when fresh, hard when dry, pileus soft and adpressed velutinate in concentric zones from dark brown at base to yellowish brown along the margin being orange when fresh, pore surface laight brow when fresh, darker when dry, pores round to angular, 7-8 per mm, almost invisible to the naked eye, tubes concolorous, up to 3 mm deep, context duplex, lower part dense, homogeneous, yellowish brown, separated by a black line form the upper part, the latter cinnamon coloured, about 1 mm thick, loose in consistency, forming the pileus tomentum.
Hyphal system monomitic, generative hyphae, pale yellow to yellowish brown, parallel in the trama, 2.5-6 µm wide, in the context wider and mostly 4-7 µm wide with frequent simple septa.
Setal hyphae present, dark brown, thick walled, oriented more or less parallel to the tubes, 50-130 x 5-18 µm, sharply pointed.
Hymenial setae absent.
Basidia 14-18 x 4-6 µm, tetrasterigmatic.
Basidiospores 5-6 x 4-5 µm, subglobose to ovoid, thick walled and hyaline to pale yellow.
Substrata. Large fallen hard wood log.
Distribution. Known only from the type locality.
Remarks. The combination of a distinct duplex basidiocarp with a thin black zone separating lower and upper part of the pileus, small pores, presence of setal hyphae and absense of hymenial setae, make this a very distinct species.

Entangled Life

Book Review By Lawrence Millman

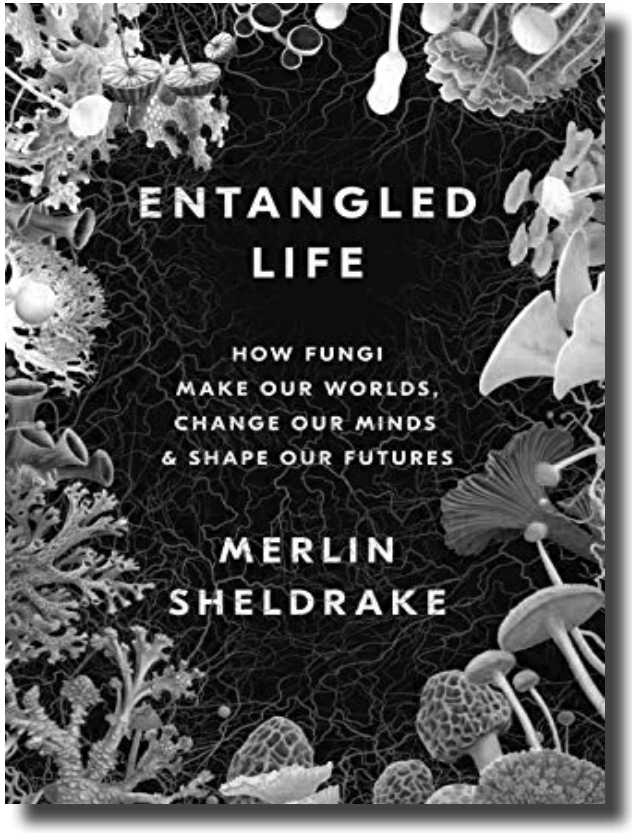
Merlin Sheldrake
2020, Random House
Hardback: 368 pages
$28.00
This review first appeared in *Fungi*

Blurbed by such luminaries as Paul Stamets and Andrew Weil, Merlin Sheldrake's *Entangled Lives* can be regarded as the book equivalent of the recent film *Fantastic Fungi* and perhaps the fungal equivalent of Peter Wohlleben's *The Hidden Life of Trees*. As such, it is destined to become an extremely popular item. Let this review be at once a strong recommendation and a caveat.

Entangled Life ranges far and wide in its enthusiasm for all things fungal. Its chapters cover what Sheldrake calls *the living labyrinth of mycelia*, the evolution of fungi, lichens, psychoactive mushrooms, Radical Mycology (Peter McCoy & Co.), and the transformative talents of yeasts. The book's writing is fueled by Sheldrake's polymath sensibility: he plays the accordion in a UK indie rock band called The Gentle Mystics; he is a keen fermenter who has stolen apples from Isaac Newton's celebrated apple tree and made cider out of them, a fact he documents in the book; and his scientific curiosity is not restricted to mycology. If he occasionally snorts fungal spores, at least he doesn't recommend this potentially hazardous activity to the book's readers.

I especially liked the chapters on lichens and myco-heterotrophic plants such as Indian pipes and coral root (*Corallorhiza sp.*), since those organisms are not not commonly dealt with in books of this sort. Indeed, Sheldrake studied the so-called "ghost plant" Voyria when he left his native England to do fieldwork at the Smithsonian Tropical Research Institute in Panama. This myco-heterotroph from the tropics has a positive aversion to sunlight, so you tend to find it almost exclusively in dark jungles. Sheldrake provides the reader with a very good description of its behavior. Another admirable chapter is the one that discusses how yeasts succeeded in domesticating us.

As befits his magician's first name, Sheldrake often pulls wonders out of his hat, but sometimes he doesn't. He almost never pulls taxonomy out of his hat, in fact. For instance, he doesn't indicate which fungal species any of the myco-heterotrophs he describes like to hang out with, although he says, with respect to Voyria, that its partner "is the most abundant mycorrhizal fungus in the forest." What fungus is that? I wondered. Nor does he mention species names when discussing either arboreal or ectomycorrhizal relationships. And he doesn't distinguish between temperate and tropical mycorrhizal species, the latter of which are far less frequent than the former. It's entirely possible that his editor at Random House gave him this advice: Please, Merliin, no binomials, for such entangled words will weaken your book's sales.



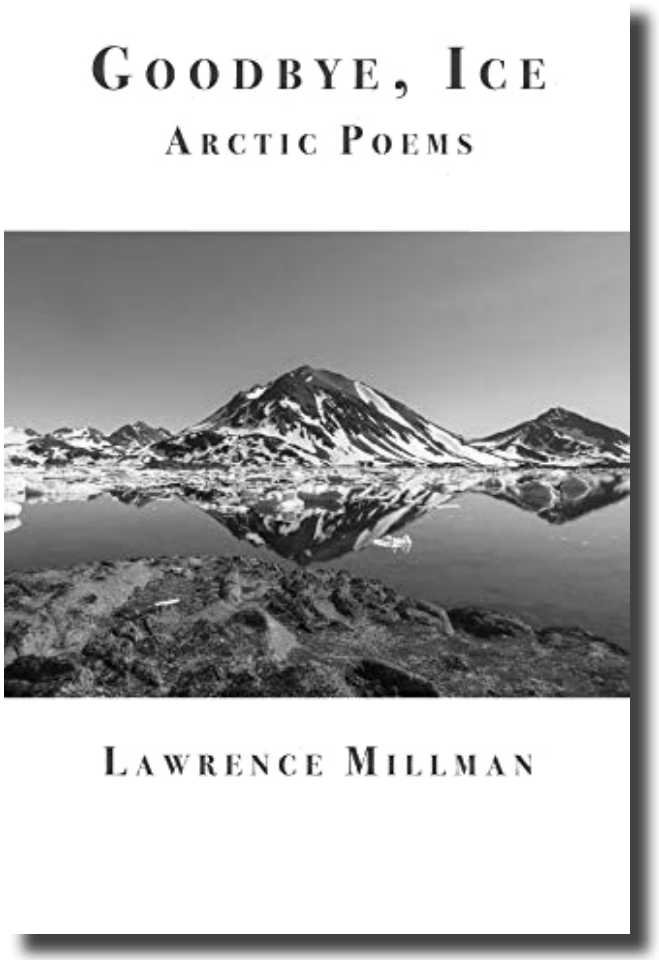
Not only does *Entangled Life* ignore species names, but it often ignores specifics, too. At one point Sheldrake says: "We [*Homo sapiens]* outperform rodents and dogs in detecting certain odors." This surprised me, and I immediately thought, Which odors? He doesn't say. At another point, he writes: "How a [mushroom] is described will depend on the physiology of the person describing it." Does this mean that if a taxonomist has a large head, the mushrooms he or she describes will all have large caps? I was left scratching my own head.

Sometimes Sheldrake suggests that psychoactive mushrooms boast superpowers. "Can these fungi [*Psilocybe* species] be thought

of as borrowing a human brain to think with?" he asks. This comment could have been made by the perpetually spaced out Terrence McKenna, whose name appears in *Entangled Life* perhaps too often. Sometimes, too, Sheldrake seems not to have done his necessary homework...even though the book contains a bounty of notes and a lengthy bibliography. For example, he refers to "a psilocybe-producing lichen that grows in the Ecuadorian Amazon." Here he has turned a speculation into a factoid, for the authors of the paper on this lichen, Dictyomena huaorani, write: "Our analyses were not able to determine conclusively the presence of hallucinogenic substances." (Note: "Psilocybe-producing" should probably be "psilocin-producing.")

But I should also mention that some of Sheldrake's speculations are genuinely compelling. At one point, he's discussing the puppeteering of ants by *Ophiocordyceps* species, and he wonders if, given the putative production of ergot-like alkaloids by the fungus, these alkaloids "might have a role in the manipulation of ant behavior." A very interesting idea. And since those same alkaloids are among the chemicals from which LSD is derived, you could perhaps argue that the ants are taking what amounts to a deadly acid trip.

My complaints aside, *Entangled Life* is just the sort of book I'd give to a citizen scientist if he or she is eager to learn about fungi. Since Paul Stamets is one of Sheldrake's tutors, I'd also give it to individuals who believe that fungi can be used to save the planet. Yet I probably wouldn't give it to an academic mycologist or a fungal systematist. Even so, I did quote the first sentence from the book's next-to-the-last paragraph ("Fungi might make mushrooms, but first they must unmake something else") to an academic mycologist friend, and he responded by saying, "Ah, perfect wording!"



Goodbye, Ice

Unlike most books of poems nowadays, *Goodbye, Ice* by Lawrence Millman has a strong ecological bias. The book offers a window on the natural world of the Arctic and its tradition-bound indigenous people. Climate change, inevitably, raises its ugly head in many of the poems, but the book itself is a lament not just for the loss of ice, but for the loss of the Arctic itself!
To get your signed copy send a check for $15 (postpaid) to:

Lawrence Millman, P.O. Box 381582, Cambridge, MA 02238

How Fast Do They Grow? By David Babik

A common question that is heard in any mushroom related gathering is "How long does it take a mushroom to mature?'

This is no easy question. The best answer is "it depends". Different fungi grow at different rates. Environmental conditions can be a factor also. I have been observing different species to see if it might be possible to shed light on this query. Also, please keep in mind that most people are actually referring to the fruiting body as opposed to the underlying organism. The actual organism or mycelium may live for decades beneath the soil or in wood.

One of the first mushrooms I watch grow each year is a group of trainwreckers, *Neolentinus lepideus* that always appear in my neighborhood around May 15th to June 1st. It is an easy to ID species, due to its rubbery texture and scaley cap and stipe. It earned its name from the fact that it was often seen on railroad ties and could severely weaken the wood. In my neighborhood, they appear on the roots of an old white pine. I have found that these mushrooms appear and grow at a set speed, regardless of rain or drought. I have noticed that in colder temperatures, they may arrive a week late. Here is how fast they grew (see photos 1-3 on opposing page).

Some mushrooms are much more ephemeral. Photo 4 shows a group of Japanese Umbrella inkies, *Parasola plicatilis*. These tiny delicate fungi appear in the early morning after a rainy night. Most days they have completely vanished by Noon. Many tiny lawn mushrooms have a similar life cycle of less than a single day.

Some fungi may grow for years, especially some of the hard polypores such as the Artist's Conk, *Ganoderma applanatum*. In photo 5, an ancient bracket was still surviving on a fallen tree. The fruiting body began to grow perpendicular to the original bracket to correct for the change in relation to the ground.

It is certainly apparent from these few examples that each mushroom grows at its own pace. The best way to answer the question of "how long it takes" is to observe some fungi and record what you discover. It is an interesting project that deserves more study.

Photo #1 was taken on May 18th when the buttons were just starting to emerge (About 1 day old).

Photo #2 was taken on May 25th when the caps were fully developed and just opening.

Photo #3 shows the fully mature mushrooms on May 28th. They are just starting to decay around the edges.

Photo # 4 Parasola plicatilis

Photo # 5 Ganoderma applanatum

Mushrooming in Urban Neighborhoods

By Charlotte Ikels

At first I was going to entitle this piece "Foraging in Urban Neighborhoods", but then I remembered that foraging implies gathering things to eat. And you might not want to eat what you find in your urban neighborhood if you share your neighborhood with dogs..... But you still might enjoy the ID challenge or developing your photographic talents or simply impressing your friends with your expertise.

For urban residents there are several real advantages to urban mushrooming. For one thing it is easy and convenient. Open the door and out you go – no need to drive for miles and then have to look for parking. For another you can do this by yourself without having to worry about predators lurking in the woods or isolated places. And for people with mobility issues sidewalks and curb cuts are generally easier to negotiate than off trail woodlands.

There are obvious places to seek mushrooms in the city: cemeteries, public parks, riverbanks, maybe the local reservoir. I am not talking about these places. I am talking about the really urban parts of urban neighborhoods, i.e. the streetscape. Just walking about the neighborhood (and aren't we doing a lot of this right now with no BMC Walk Schedule?) can yield a lot of surprises. But you can't walk mindlessly. You need to walk with purpose and vision. And you need to consider the weather. Has it been dry and hot (bad) or wet and warm (good)?

As elsewhere trees are key to your success. Trees of all kinds: healthy still standing trees (Figure 1), unhealthy or even dead trees standing or toppled over (Figure 2), and last but not least stumps or places where stumps recently disintegrated (Figure 3) may harbor surprises. Former trees in the form of wooden fences and fence posts should not be overlooked either (Figure 4). And do pay attention to the yards you pass by on your walks, especially if the yard is mulched along the sidewalk edge. Unusual mushrooms will sometimes suddenly arise in mulch never to be seen again, such as this wine-cap (Figure 5) that showed up in my mulch. And the only morel I ever found erupted in a bit of mulch in a gravel-strewn driveway. Most recently, while out for a stroll, I nearly tripped over this beautiful Berkeley's polypore (Figure 6).

A young pink chicken-of-the-woods *Laetiporus cincinnatus*

Out of reach oyster mushrooms *Pleurotus sp.*

A fruitful stump

A fruitful fencepost

A wine-cap (*Stropharia rugosoannulata*) awaiting its turn at a BMC ID session

Berkeley's polypore, *Bondarzewia berkeleyi*

Larger front yards and green spaces such as traffic islands can produce surprises too. One day while waiting for a traffic light to change in Cleveland, I happened to glance off to the side and spotted a fairy ring! And then there was the time I saw what appeared to be a soccer ball on a lawn in Richmond, Virginia. But on closer inspection it turned out to be a pristine giant puffball. Please keep in mind that yards are not the woods, and the mushrooms are not there for the taking. Be sure to get permission from the home owner or tenant before trespassing or attempting to harvest your find. In this case the owner seemed mystified that anyone would want such a thing and willingly parted with it. I sautéed great slabs of the puffball in butter. I suspect a vegan would probably have known how to be more creative.

But there are risks to urban mushrooming. Dog waste for one. The substrate for another as it is likely to be less healthful than that found in the woods. Lead from vehicle exhaust or ancient paint chips may be present around old houses or the tree lawns at the edge of the sidewalk. Pesticide residue may be lurking about too. These issues are relevant only if one intends to eat one's finds. They are not problematic if one's goals are identification or photography

The biggest risk to your successful mushrooming comes from other neighborhood walkers. Urban walkers fall into three categories: the Oblivious (with two Subtypes), the mushroom Hater, and the mushroom Lover. The Subtype 1 Oblivious walkers are focused on their phones – they see nothing outside of a narrow band in front of their noses; the Subtype 2 Oblivious walkers are out for exercise. They are so busy monitoring their steps that they will not see anything off to the side and won't want to lower their steps per hour rate by slowing down if they do somehow see something. The Oblivious are not a problem. The mushroom Hater assumes all mushrooms are poisonous or might be, so to prevent some dog or child from becoming ill, the mushroom Hater kicks and stomps on any and all mushrooms. End of story.

But the biggest risk to your successful urban mushrooming is someone like yourself - another mushroom Lover. He or she will have eyes and appetites as keen as your own. Beware.

Fungi, I Want to Know You

By Jimsey McWhimsey

This piece that I wrote had been brewing inside me for quite some time. It's about that elusive fungi we are all looking for but just can't seem to find. The one that we desperately want to find for consumption or for its beauty, its remarkable form.

I wonder where you are?
Who you are?
And why you want me
to find you?
You are always out of sight.
Beyond reach.
I am always, "Right here",
for you.
Why do you resist?
Fungi, I desire you now.

There is always the shadow
within the shadows,
in the darkness of the deep woods,
that for, whatever reason,
shields you from me.
Why?
Don't you want me to
find you?
To partake
in the wonder and the joy
in the simple act
of a surprise encounter?
I look forward to it
each and every time
I walk in the forest
looking for you.
Always.

Show me your shapes, your colors, your lines
and your special spot in the forest.
I will look for you there.
I know you want me to find you.
You want to be known.
You want to share in the
"other side" of the forest,
the place where you will be easily seen...
to make yourself, "available".
But even I,
with my ultrasensitivity to your needs,
sometimes,
no, many times,
cannot,
nor do I not make the effort to,
plod my way through
prickly, tick and mosquito infested woodlands
in search of you.
But how I yearn to know you...
to learn from you, to respect and love you...
and to have these things return to me.
Again and again.

The Seven Virtues of Fungi

By Susan Goldhor (with thanks to Tom Volk for his Seven Sins of Fungi)

CHASTITY: When the first plants came onto dry land about 450 million years ago (more or less — don't quibble), they came with endomycorrhizal fungi either on their roots or in place of roots, Whichever it was, those fungi haven't had sex since. Beat that!

CHARITY(1): Interpreting charity as giving to one in need, without expecting a reward (although I'm sorry to say that some of the human arguments for this virtue suggest that it will get you to heaven, thus removing some of its purity), I offer up two examples.

First, those mycrrhizal fungi that support the monotropes, such as Pine Saps or Indian Pipes; plants which lack chlorophyll and are (like Blanche Dubois) depending on the kindness of strangers. It's various Russulas that support them and if they get anything in exchange, we haven't yet discovered what that is. Whether this makes them virtuous or foolish is a question often posed to the charitable.

Second; a slightly more nuanced donor: the orchid mycorrhizas. Orchids don't have seeds as we think of seeds; they have "dust" seeds, which resemble spores in their small size and lack of nutrients. Whether or not the seed develops depends upon its landing near an orchid mycorrhizal fungus which can attach and nurture it. One could of course claim that this is not charity at all; merely forethought, since the orchid will likely develop green leaves and pay the fungus back with sugars. However, orchids are flighty, vain and ungrateful beings, and very apt to throw their early saviors over, or at least limit their access, for more attractive fungal partners once they've gotten through the orchid equivalent of adolescence. Can we think of those fungal orchid specialists as foster parents? Or the fungal equivalents of wet-nurses?

1 Some of you may share my confusion about differentiating charity and kindness. Wishing to be both accurate and impartial, I consulted Catholic and Jewish authorities. Amazingly, they agreed, with all the guys (and yes, they were all guys) saying that charity refers to giving to those who need it, while kindness refers to a benefit conferred on anyone. Charity often involves money (in religion; not in mycology), while kindness is more likely to involve deeds. As with all aspects of religion, one could produce arguments and counter-arguments forever. I'm going with the simplest interpretation.

The Queen of Playing Cards Cavalier Deck References the Virtues of Prudence, Justice, Temperance, and Fortitude

Goldsmid, Edmund. *Explanatory Notes of a Pack of Playing Cards, Temp Charles II. Forming a Complete Political Satire of the Commonwealth*. Edinburgh: E. & G. GOLDSMID. 1886. via Project Gutenberg

PATIENCE: So many examples of this! Starting in my very own body, I think of Candida lurking in my microbiome, waiting for years in hopes that an antibiotic will clear the way for it to blossom into a yeast infection. Or plant pathogens in the soil, waiting for the right conditions to spring forward and destroy the crops. Is patience a virtue if applied to an evil end? Maybe not. But almost all fungi have patience in spades. Indeed, what is a spore after all but patience objectified? How about spores in soil activated by fire? How long must they wait? (Not that long if they're in California.) And lichens! Squatting on the most unpromising surfaces, slowly, patiently carving out their turf. I could go on but you get the picture.

TEMPERANCE: Because recent humans have limited the meaning of temperance to giving up alcohol, it's easy to forget that the original (virtuous) meaning was moderation in all of one's appetites. Again, we have a plethora of examples in the fungal kingdom, but I think I shall restrict myself to those secretive species that carry out some of the small chores of rot. Without DNA analysis and the painstaking work of researchers, we would not even know how many previously unknown fungi were chipping away in the later stages of a large log's decay. Norwegian researchers showed that for a spruce log to decay, hundreds of fungal species were required. As decay advanced, more species came forward to do their part that were previously unknown. Not the big flashy wood decayers, taking massive bites, but hidden species, not only temperate but humble, satisfied to break down the bits and pieces left by the stars. Still, these modest players have a role to play in our ecosystems. I'm sure you can think of further examples. The endophytes, cited for kindness below, are also temperate — indeed abstemious — in their appetites. Which, by the way, cannot be said of every human saint. Think of St. Thomas Aquinas who was so obese that his corpse was rendered for its fat, which was sold to the faithful as relics.

DILIGENCE: Those rotting logs mentioned under temperance are perfect examples of diligence as well. Imagine a microscopic spore alighting on a massive felled tree. Does it look around for a tiny bit of easily digested duff instead? Does it throw up its (figurative) hands and give up the job as beyond its capabilities? No, it digs in, ready to do its part in a task that will take a cast of hundreds over a period of centuries. Now that's what I call diligence! (Also perseverance, but that doesn't seem to be one of the virtues.)

HUMILITY: Although there are literally millions of fungal species that fill some niche and play some role in the world, the mere fact that we know so few of them says much for their humility. However, to exemplify this virtue, I've chosen truffles; the group of fleshy fungi that humans have long sought for purposes of boastfulness, vanity and greed, thus neatly encapsulating contrasting traits of the two kingdoms. Truffles fruit underground, known only by odor to a narrow range of animals (sometimes only a single species) capable of devouring them and spreading their spores. How often have we walked over truffles, unaware of their very existence! Even those humans who advertise themselves as truffle hunters admit that they cannot locate their prey without canine or porcine assistance. Hidden from view, robed in sober blacks and browns, intimate with soil, living cloistered underground, truffles are the very monks of the fungal world. And yet, their role in ecosystems is key, as they induce digging to create waterways in arid soil where there would otherwise be only runoff, and initiate mycorrhizal activity after fires, carried into the ashes by their animal vectors. Alas, the only truffles unable to fulfill their allotted roles are those beloved by humans, who deposit their spores where they can do no good.

KINDNESS: To exemplify this virtue, I choose the endophytes; a group of thousands (we really have no idea how many) of species of microscopic fungi carried by currents of air, feathers of birds. . . random atmospheric disturbances, to enter every leaf, every petiole, and every stem of every plant, providing it with a microbiome of protective chemicals. Slow growing, invisible without a powerful microscope, dying with each falling leaf only to recolonize anew each spring; allowing the growing tree or shrub to relax; never needing to develop the costly manufacture of defensive chemicals but simply able to enjoy those coming from its tiny inhabitants. Of course, the endophytes require something in exchange, but very little. A place to stay out of the drying wind; a few molecules of sugar — almost nothing really. Not only kind but temperate. That's why a single leaf may harbor hundreds of these tiny fungi and be all the better for it.

Did a Fungus Cause the Salem Witch Trial Panic?

By Lawrence Millman
First Published in Fungi

The Salem witchcraft incident is one of the most infamous events in American history. While none of the other infamous events (Custer's Last Stand, the Watergate scandal, the 9/11 bombings, etc.) would appear to have any association with fungi, the Salem incident might, just might have been inspired by a fungal entity. Stay tuned.

Beginning in February of 1692, certain residents of Salem, Massachusetts, found themselves suffering from hallucinations and delusions as well as feeling intermittent pinpricks on their skin. A girl named Abigail Williams threw a fit in which she got down on her hands and knees and barked like a dog. The sufferers were mostly, but not exclusively girls and young women. Those who didn't undergo hallucinations or throw fits became worried, no, horrified that they would soon be exhibiting this same behavior themselves. "The town's gone crazy," declared an outside observer.

It wasn't long before good citizens of Salem came to the conclusion that the aforementioned sufferers were (in the lingo of the time) "behagged" — transformed into the hags known as witches. Who or what was responsible for this transformation? In all likelihood, the Devil. After all, this was Puritan New England, where anyone whose behavior was even remotely out-of-the-ordinary would have been considered a follower of that cloven hoofed fellow. Those who exhibited truly idiosyncratic behavior might be Satan himself. Salem would seem to have had a plethora of Satans in 1692.

In the end, a number of locals were accused of being witches by other locals, many of whom shared the same symptoms. After a series of facile trials, 19 people were hanged, and several — including a 71 year old man named Giles Corey — were crushed to death by rocks. A 5 year old girl named Sarah Good was thrown in jail, a possible Guinness record for the youngest imprisonment. An accused person might be considered innocent if he or she pointed a finger at another person, declaring that other person responsible for their weird behavior. This is not unlike Stalinist Russia, where a potential enemy of the people could quickly become a good Soviet citizen

Claviceps purpurea: 1, ergot on rye-grass; 2, ergot on rye; 3, section of a portion of the conidial form of fruit, ×300; 4, a sclerotium or ergot; 5, head of ascigerous form of fruit; 6, an ascus, ×300; 7, a single spore, ×300. (After Massee, Plant Diseases, by courtesy of the Macmillan Company.)
Jordan, Edwin Oakes. *Food Poisoning*. The University of Chicago Science Series. Chicago. 1917. Page 88. via Project Gutenberg

if he or she pointed a finger at another enemy of the people.

The possibility that the putative witches might have consumed a fungus which housed some sort of mycotoxin was first proposed by Linda Caporael in a 1976 paper in Science. In this paper, Ms. Caporael suggested that the victims may have undergone what's known as convulsive ergotism, a disorder whose symptoms include fit throwing and hallucinations, along with feeling hot pinpricks on one's skin. Unlike the gangrenous type of ergotism, which has killed numerous people over the centuries, the convulsive type is less deadly.

The fungus in question is ergot. Specifically, it's the banana-shaped sclerotium of the pyrenomycete *Claviceps purpurea*. While *C. purpurea* doesn't tend to kill off its host — usually rye or barley — it does turn the female sex organ of that host into this sclerotium, the better to have a reliable source of nutrients in difficult times. More relevant to the subject of this essay, alkaloids in the sclerotium are designed to ward off predators, and if eaten by humans, they can play havoc with our behavior. As it happens, Swiss chemist Albert Hoffman famously created lysergic acid diethylamide (LSD) by isolating compounds from some of these alkaloids.

Historically, witchcraft panics have occurred in countries like England where there's a substrate of rye or barley appropriate for fruitings of *C. purpurea* rather than in countries like Ireland, where potatoes rather than grains have been the dominant crop. In the Finnmark region of northern Norway, rye bread was once a staple, so it's not surprising there numerous witchcraft trials and executions occurred there; in addition to sclerotized rye, another reason for the witchcraft madness in Finnmark was that the local population was mostly Samis (Lapps), a then unChristianized people, and their overlords were avid Protestants for whom any heathen might be considered an automatic follower of Satan.

In Salem, rye bread was a dietary staple, too. Wet conditions the previous year would have encouraged the growth of C. purpurea as would the fact that the local crop of rye grew near a wetland area east of the town. As with amatoxins, the alkaloids in a C. purpurea sclerotium can readily survive being cooked, fried, or baked. Mauvais appetit! Let me add that any would-be witch who might have seen dark purple or black sclerotia floating in their milk or water would probably have assumed that they were simply discolored grains of rye and drunk the liquid, no problem. In her paper, Ms. Caporael doesn't mention this last possibility, but she does provide a lot of evidence to support her endorsement of ergot as the witchcraft culprit.

Not everyone supported Ms. Caporael's theory. A few months after her paper appeared, Nicholas Spanos and Jack Gottlieb co-authored a paper in Science in which they argued that the symptoms shown by the witchcraft victims were not consistent with eating sclerotized rye. Without listing what these authors thought were the right and wrong symptoms, let me simply say this: different individuals have different reactions to both drugs and maladies. For instance, some who take LSD see Lucy in the Sky With Diamonds, while others don't see Lucy or the Sky, and they especially don't see Diamonds. With respect to eating *Psilocybe* mushroom species, some folks have their serotonin scrambled up, while the serotonin of others remains completely stable. I suspect it might be similar with ergotism.

Other causes of the Salem witches' behavior have been suggested by more recent theorists. Those causes include the eating of jimsonweed, mass psychosomatic hysteria, and an early outbreak of Lyme disease. As for myself, I'm more or less a fence-sitter with respect to ergotism. I feel it may or may not have been the cause of the witches' behavior. If it was indeed the cause, it would have been magnified by (to cite the title of an 1841 book by Charles Mackay — read it, especially now!) *Extraordinary Popular Delusions and the Madness of Crowds*. Thus a fungus combined with an extraordinary popular delusion may well have turned the 1692 incident into a real life version of Stephen King movie.

A final note. There have never been as many witches in Salem as there are today. They are particularly numerous around Halloween, where their presence brings vast numbers of tourists into the town. Some of these contemporary witches give workshops on holistic medicine, some do palm readings, and some seem to have modeled themselves on the witches in Harry Potter novels. I'm willing to bet that none of them have ever used a fungal sclerotium to enhance their practice.

MycoCards: Boletes of NE North America edition

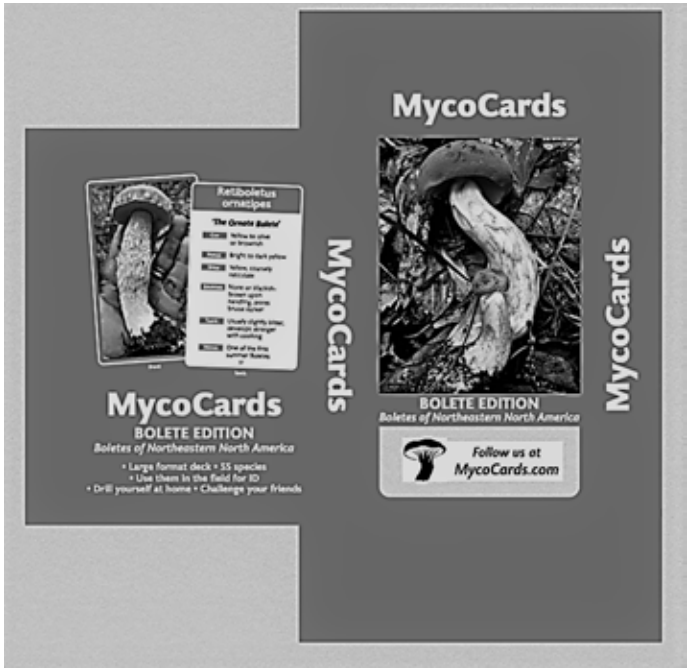
Review By David Babik

William J Neill & Gary Gilbert
56 Card Deck
$28.00

For years people working to improve their ID skills have asked for a series of flash cards to make learning easier. Well, they have finally arrived. Gary Gilbert and Bill Neill, both veteran BMC members and expert identifiers have answered the call. *Boletes of Northeastern North America* has just been released and is available for purchase on Amazon. The deck of flash cards, contains 56 cards (55 Bolete cards in addition to a glossary of terms card). Each card features a beautiful color photo on the front and ID information on the back., including the current name and several points of interest that help to recognize the particular mushroom in the field. Shortly after receiving my MycoCards, I was wandering the woods and found a colorful bolete that quickly turned blue on bruising. Normally I would have searched to ID it with several field guides but the name *Lanmoa carminipes* just popped into my head. It turns out I had been looking at the flash card that morning over coffee. It made me realize just how effective these cards can be.

Bill and Gary have used their vast library of mushroom photos to come up with clear and educational photos to illustrate each species. (Gary told me that they did borrow a few from some other mycologists). The color photos are taken close-up and when possible, include the particular fungi at several stages of growth. I have always found that having an image fixed in your memory is a great help with field ID. Practicing with flash cards can be a real benefit to those who are geared towards *visual* learning.

The MycoCards website (MycoCards.com) list these cards as for both beginner and intermediate level ID people. I think that there are enough unusual boletes included in the deck to please even more experienced folks. Since there are so many boletes in our area, boletes like a logical place to start, although many more sets would be really useful. Gary and Bill are already working on other sets which they have hinted may include, *Amanitas*, polypores and popular edible species. These cards are a "must have" for those of you trying to master this complicated group of mushrooms.



Armillaria mellea Group Matrix By Gary Gilbert

ARMILLARIA MELLEA GROUP MATRIX

	REGION	CAP COLORS	STIPE BASE	VEIL
A. mellea	East, rarely west	Yellow, brownish with age, smooth	Tapers	Thick, yellow edge
Notes	*Honey color; smooth cap; very cespitose;*			
A. gallica	East, rare west	Brown,hairy,not yellow	Bulbous	Very cobwebby
Notes	*Smaller; often alone, gregarious or loosely cespitose; late fruiting; white ring with yellow edge; often black rhizomorphs; white context; hardwoods occasional on conifers; usually on soil or lawns*			
A. calvescens	East	Brown	Bulbous	Cobwebby/thin
Notes	*Identical to gallica except grows in northern regions; also called A. lutea or bulbosa; large clusters; finely fibrillose cap*			
A. tabescens	East	Yellow to white	Equal, slightly tapered	None
Notes	*Often in groups, very cespitose.*			
A. gemina	East, rare	Brown	Bulbous	Thick w/red patches
Notes	*Same as solidipes; Quebec to Carolinas*			
A. sinapina	West (east is bright yellow)	Brown, dk scales	Tapers	Cobwebby
Notes	*Like solidipes; yellow tissue on cap; dark scales; golden univ. veil; single or very small clusters; yellow ring*			
A. solidipes (ostoyae)	West/East US	Brown, dk scales	Tapers or equal	Membranous
Notes	*Conifers, sometimes hardwoods; northern; brown underside of ring*			
A. nabsnona	West	Brown/orange		
Notes	*No scales on cap, brown stem/white at top; not cespitose*			

Armillaria mellea

Cap: Brown or yellow, often with darker center to disk with darker fibrils.
Gills: White, attached or slightly decurrent.
Ring: Thick, yellow edge.
Stem: Often pointed due to cespitose growth.
Habitat: Primarily eastern US. Rare in west.

Armillaria gallica

Cap: Brown, darker at the disk.
Gills: White, slightly decurrent.
Ring: Cobwebby.
Stem: Equal or bulbous at base.
Habitat: Smallish. Grow alone or in small troops not cespitose.

Honey Mushrooms - Armillaria species

*Grow out of wood but it may be buried.
*Have white spores often visible under overlapping caps.
*Most have a partial veil (annulus).
*Often grow in clusters but may be solitary.
*Often have hairy tufts on center of cap or a dark zone there.

Honeys can look like the deadly Galerina.
They both grow out of wood and can be similar in size. Galerina's have brown spores and often a ring that catches them. Check your mushrooms twice before eating.
Photo: Gary Lincoff

HONEY MUSHROOMS

Armillaria solidipes (ostoyae)

Cap: Reddish/brown, bold fibrils.
Gills: White, slightly decurrent.
Ring: Membranous.
Stem: Tapers or equal.
Habitat: Primarily western/central US.

Armillaria tabescens

Cap: Brown, yellow to white.
Gills: White, with pink tones, bruise pink.
Ring: Absent.
Stem: Tapers at base or equal.
Habitat: Grow from the roots clustered.

By Gary Gilbert

Mushroom Madness

A compilation of our greatest mushrooming moments

Curated By Charlotte Ikels

Make Mine Matsutake

By Geoffrey Dutton

For 30 years I've maintained a secret Matsutake garden in plain sight. Well, it pretty much maintains itself down there on Cape Cod, a hundred miles from home. And even after three decades it's still secret, even though the plot is a wooded area surrounded by at least a dozen seasonal and all-year dwellings, within sight of their back doors. See Figure 1. Fortunately for me, not so many of those residents are around in mid-October, and those that are seem totally indifferent to the mycological fairyland in their three-needle pine habitat out back.

I've found Matsutakes in scattered locations in Massachusetts and New Hampshire, but never like in this place, which in a good year can yield 25 pounds of various grades of these prime edibles, plus abundant specimens of edible *Boletus*, *Leccinum*, *Suillus*, and in a good year, those delicious yellow *Tricholoma equestre* hiding in the duff. See Figure 2.

Geoff's secret plot

For a while, I peddled Matsutakes I had harvested there to Asian food markets and a few Boston chefs. Even at $20 a pound I never made much more than gas money. Most of them I ate, gave away, or dried or froze for future consumption. My favorite preparation is to poach slices in sake, soy, and ginger. You can sauté them in butter or oil, but they really seem to prefer poaching or braising, and that makes for exquisite soups. They also broil well for a toothsome treat (marinate first).

These days I don't travel to the Cape to pick Matsutakes as often as I used to. Recent years have been too dry, and choosing the right week to visit my garden is trickier and disappoints more often than in past years. But they are still there, and as nobody in the neighborhood seems to notice their backyard bounty, they're all mine (evil laugh).

Geoff's bounty

My Very First Hen-of-the-Woods I

By Susan Goldhor

I was at a cocktail party on the porch of Endicott House, an estate willed to MIT which uses it for fancy events. (Remember those events where we ate and drank and socialized with a lot of other people?) I was sipping my wine and absently gazing out at the beautiful grounds and their old oaks when I noticed that there were rosette-shaped growths at the base of a couple of those oaks. For once, my memory worked, and I remembered what I'd read. I also knew that there was one other mushroomer at this event, so I went over to him and said, "Lee, do you think those are hens?" He immediately went on high alert. "Yes", he said. "Do you want to pick one?" I asked, thereby cleverly avoiding getting myself wet (it was raining) and dirty. "Yes", he said, and off he went.

We could have picked two or even three but one was plenty for us both. We offered some to the fifty or so other people at the event, and it's a sign of our nation's mycophobia that not a single person wanted any. The looks on their faces were pretty much those observing poisonous snake handlers.

This was my first hen; the first time I got so much choice edibility in a single package, and (like my first chanterelle or my first black trumpet) one of those magical times when I thought, "the books were right! It looks just like its picture!"

Charlotte's first *Grifola frondosa*

My Very First Hen-of-the-Woods II

By Charlotte Ikels

I was attending a BMC gathering at the Herbarium one evening when a late arrival explained he had been delayed by the large hen-of-the-woods in his hands - one that he had just encountered on his way. He generously offered the attendees chunks of his find. Unlike the people at Susan's event, those at the BMC event eagerly pressed forward to get a share.

Up to this point I had never found a hen. Where had he found it? I went into detective mode, thinking of the most likely route that he had taken to get to the Herbarium and mentally (and later actually) retracing his presumed steps. I narrowed the likely source of the hen down to a few specific oak trees. Then I waited. When the next autumn rolled around, I began checking on those oak trees. And then it happened – there it was (See Figure 3) at the base of a tree in plain sight of everyone walking by! How long would it sit there undisturbed or undiscovered by some other forager? Long enough! I waited a few days, and then at 6 a.m.one morning, accompanied by my husband as look-out, set out to harvest the by-then 4 pounder. I cut the whole hen off at its base and popped it into my backpack. It was at its peak – no bugs, no worm holes. Half of it made a marvelous lasagna. The other half – well, let's just say my dehydrating skill set needs work.

Words from a Past BMC President & Bulletin Editor: Elio Schaechter

In my 40's, I acquired a hobby, looking for and studying wild mushrooms. I was helped greatly by joining the Boston Mycological Club, a source of wisdom, insights, and comradery. Mushrooming became a serious avocation, enough to make me want to write a book, "In The Company of Mushrooms", which was published by Harvard University Press in 1997. Why not share its prologue and epilogue?

Prologue: the Hunt

An Excerpt from *in the Company of Mushrooms* By Elio Schaechter

Like most people, I first got interested in wild mushrooms with eating in mind. I was tantalized by the prospect of being able to gather specimens of rare taste scarcely available by other means. I still delight in foraging for edible species, but my horizons have expanded as I have discovered that there is more to mushroom hunting than just looking for those that are good to eat. By now, I have become convinced that a mushroom collector searching only for provisions for the table would be comparable to a bird watcher looking only for quail, ducks, or pheasants. Going on a mushroom walk fulfills all sorts of other yearnings besides the gratification of foraging for natural food. I am excited by the zest of the hunt, challenged by the demands of identification, pleased by the encounter with species that have a special meaning to me, and charmed by especially handsome specimens.

Mushrooms, growing on the ground or sticking out from tree trunks as brackets, seem to color the motif of the forest. Many mushrooms are lovely to look at, varied in hue and shape, smell and texture. As resplendent as flowers, they present us with a range of shades, from forceful brights to subdued pastels. The shiny, lacquer box red of certain bracket fungi, the violet of the eastern Cortinarius iodes, the royal blue of Lactarius indigo, or even the spotless white of deadly amanitas feast the eye of the passerby.

When I lived in Boston, I enjoyed mushroom collecting in the collegiality of a few fellow devotees. Picking wild mushrooms is not the common occupation in North America that it is in most parts of the world where mushrooms can be found in abundance. Still, this is a growth industry: more and more people are getting into mushrooming, especially in northern California and the Pacific Northwest. Because of the abundant rainfall and extensive forests, these are some of the best picking regions on this continent. There seems to be a great deal of latent interest elsewhere as well; I find that laymen, people who never expressed the urge to look for wild mushrooms before, often respond to my passion with curiosity.

Amanita Button

Contributed by BMC member Matt Shreiner

I am often asked if I have ever been in trouble from eating mushrooms. The questions seem to arise mainly from curiosity, but occasionally there is also concern. Some people worry about me, perhaps from an ingrained belief that eating from the wild is a reckless thing to do, akin to keeping poisonous snakes or tarantulas in the house. Many others, however, are truly interested in the topic and ask me, sometimes insistently, to include them in a future mushroom hunt. Often, I am told of grandparents, usually of European or Asian origin, who used to pick wild mushrooms both here and in the old country and who tried to teach this art to their grandchildren, usually with little success.

In many ways, mushroom hunting is very much like another that tends to attract avid followers, namely, bird watching. Both call for a love of the outdoors, considerable zeal, and the ability to put up with frustration. In my mind, however, there are advantages to mushrooming. First of all, the specimens don't fly away; you don't have to be quiet to have a successful hunt; and you need not fear aerial bombardment. On the other hand, starting out on the path of identification is harder for mushroomers than for birders, one reason being that the novice begins with a smaller base of reference. Every fledgling bird watcher knows that sparrows are songbirds, sea gulls shorebirds, and hawks raptors. Most people are more limited when it comes to identifying mushrooms and may be able to discern only that a specimen is of the cap and stem variety, a puffball, or a bracket fungus.

Once hooked, however, mushroom hunters pursue their avocation with enthusiasm, some with an intense passion. They sometimes talk about mushrooms in a charged, nearly poetic language. Here are the words of Larry Stickney, a San Francisco mushroom lover: "Early in the season, hunting in the cool, magnificent redwood forests can produce both many choice edible mushrooms and an exquisite sense of beauty, tranquility, and exultation from the deep silence and sheer size of the trees. Right next to a thousand-year-old, three hundred foot giant, you can find tiny, fragile, elegant Lepiotas, Mycenas, which can set your sense of proportion and perspective atingle."

My sentiments exactly. I wrote this book to share such sentiments for the hunt, for nature, for biology. My expectation is that by telling you stories about mushrooms and the people who study and enjoy them, you too will share my enthusiasm.

Mushrooms surprise us in many ways. Do they in fact burst forth like mushrooms? Are they friend or foe? All of us know that some mushrooms are food, some are poison, and some alter the mind, but many are not aware of the essential role they play in the perpetuation of life on earth. The study of mushrooms is not an unassuming subject. Each encounter with a mushroom is a singular event. Every specimen makes demands of me: Do I know it, and, if not, should I collect it and try to find out what it is? Should I bring it home for the kitchen? Am I to share it with fellow mushroomers? Should I photograph it, sketch it? Should I guess how long it's been around, how long it will last, whether or not it will come back the next week or the next year? What role does this particular species play in human affairs? Has it, or one of its relatives, been used for food, or, in malevolent hands, for poisoning someone? Was it used for altering the mind, for understanding the present, for divining the future?

In this book I present mushrooms as more than a source of food, even though I find that an interesting and rewarding matter. I am intrigued by how mushrooms have been viewed through time and by different cultures. As a biologist, I find the ways they grow and reproduce unique and fascinating. As a lover of nature, I am fascinated by the different niches in which mushrooms and other forms of fungi are found. Ants and termites, for example, have evolved an intriguing interdependence with fungal life. And, lastly, I have found that the people who share my hobby are second in interest only to the mushrooms themselves.

Porcini, *Boletus edulis*, highly prized for its taste

Atkinson, George Francis, *Elementary botany*. New York: Holt, 1905, Page 229. Digitizing Sponsor: The Library of Congress, via Flickr Commons.

Epilogue: The Biologist as Mushroom Hunter

An Excerpt from *in the Company of Mushrooms* By Elio Schaechter

During a vacation taken while I was just putting the finishing touches on this book, my wife Edith and I were walking a trail near Oregon's Crater Lake. She pointed out to me a small collection of mushrooms that were growing out of a shallow snowbank. Edith's ability to spot mushrooms is legendary in our household but finding them in this habitat seemed unusual. The specimens were respectable in size, about an inch across the cap and two inches tall, rosy pink in color, and covered with a shiny layer of slimy material. Baby mushrooms were still entirely encased in the snow. I identified the specimens as belonging to the wax caps (*Hygrophorus goetzei*), a species that is one of the few known to grow in snowbanks.

The realization that life can be sustained at unexpected extremes of temperature has generated much excitement among biologists. Life at high temperatures has generally attracted more attention than that in the cold. Bacteria have been found growing at temperatures as high as 113˚ Centigrade, about 23˚ Fahrenheit above the boiling temperature of water at sea level. Obviously, for water to reach such high temperatures without boiling, it must be under high pressure, such as is found in the depths of the ocean. How can life exist, and even thrive, at such extreme conditions?

Few answers are available to date. It turns out, however, that these "extremophiles" are not just a biological curiosity. They have industrial applications as well. The enzymes of these organisms are themselves resistant to high temperatures and can be expected to be employed in a variety of technological processes. One of these enzymes is used in the reaction that amplifies DNA, known as "polymerase chain reaction," or PCR, a technique that is now used for Covid-19 testing. This particular enzyme, a DNA polymerase, is derived from a bacterium isolated from a hot spring at Yellowstone Park. Our view of what we call extreme conditions is anthropocentric. Any circumstance that we ourselves cannot tolerate is considered extreme. It takes bacteria, mushrooms, and other fungi to show us that this is a parochial view of life.

On the hike with my wife, I had no way to measure the highest temperature to which the mushrooms were exposed in the snowbank. It may well have risen above freezing in their vicinity, at least for short times. However, cold these specimens were. Perhaps the slimy layer that surrounded the specimens served as their antifreeze. It may not be a coincidence that many mushrooms that grow at low temperatures are in fact slimy. Whatever the mechanism, ours was an unexpected sight. I felt reassured that, given such prowess at survival in an unfriendly environment, mushrooms are probably here to stay.

See back cover for Hygrophorus goetzei, The Snowbank mushroom

Just as I started it, I end this book on a personal note. I have known all along that the subject of mushrooms is a rich one, as our discovery of the mushrooms in the snowbank illustrates, but I have nevertheless been surprised as this book unfolded that there is so much to write about it. As I was working, more and more interesting material kept appearing. Sometimes this was in the form of stories, either discovered in books or told to me; sometimes it was experiences of my own that came to mind. I ended up reaping a greater harvest than I had expected, for which I am obviously glad.

I am a microbiologist by profession, now near the completion of my career. When I collect and study mushrooms, however, I do not act as a professional biologist. Most of what I love about mushrooms and how they fit in people's lives is far remote from my research and teaching. My life in science has been spent at the laboratory bench: I study how bacteria make their DNA as they grow. I am of the generation that witnessed the beginning of molecular biology and its offspring, genetic engineering. It was only after my career was established that I stepped into the world of forests, pastures, and mushrooms.

Snow Covered Banks of Crater Lake

OSU Special Collections & Archives Research Center, Item Number: P217:set 065 024, via Flickr Commons.

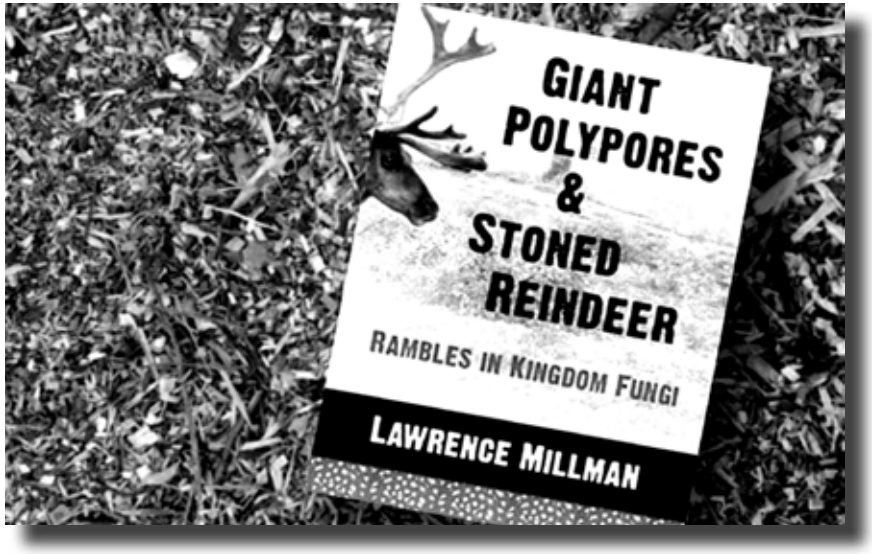
The distance between these two interests—microbiology and mushrooms—may not appear to be very fundamental to a non-scientist, but it is in fact quite considerable. It is true that biology is biology, in the

sense that the basic question is always the same—What is life?—but at the level at which we participate in the profession of biology there are marked differences in attitude between those who study living things in the field and those who work in laboratories.

This gap is of recent origin—it was unknown until the nineteenth century—and, happily, it gives signs of closing. On the one hand, biologists who study the evolution of living things and their place in the environment are coming into the laboratory to take advantage of modern molecular tools. On the other hand, those who study the functions of living cells have found great opportunities in probing the wondrous diversity of the natural world. The rift between the field worker and the lab worker, in the questions they ask and the attitudes they convey, is narrowing, and we can welcome the fact that biology is reemerging as a unified science. It is worth noting that the "history" in "natural history" is derived from the Greek word for "learning by inquiry," which today we would name "science."

For most of my professional life, however, the distinction between "field biology" and "laboratory biology" was quite substantial. My colleagues seemed content to study one or two kinds of bacteria under laboratory conditions and only rarely seemed concerned with the "real world." The view has been put forth that different personalities are attracted to the two approaches to biology. To overstate the point, the "naturalists" are seen as more caring, more accepting of their role as stewards of living things, whereas the "experimentalists" are thought to be more analytical, interested mainly in how things work.

That's the theory, at least. I have always had a hard time with this notion because it seemed, at best, to describe people at the extremes. I feel that I straddled these two worlds. Strange as it may sound, I have developed, if not a love, at least a personal closeness to the bacteria I study. The strains I have worked with are, by and large, harmless to people. To me, they are living things, not just bags of enzymes and DNA. They are, in other words, as alive to me as mushrooms are—and as trees and animals are. So, is the jump from the lab bench to the woodland glade as big as all that? In both places one can find, or make, the opportunity to study nature, to experience life, and it is my hope that this book will lead you at least part of the way toward that end.



Giant Polypores and Stoned Reindeer

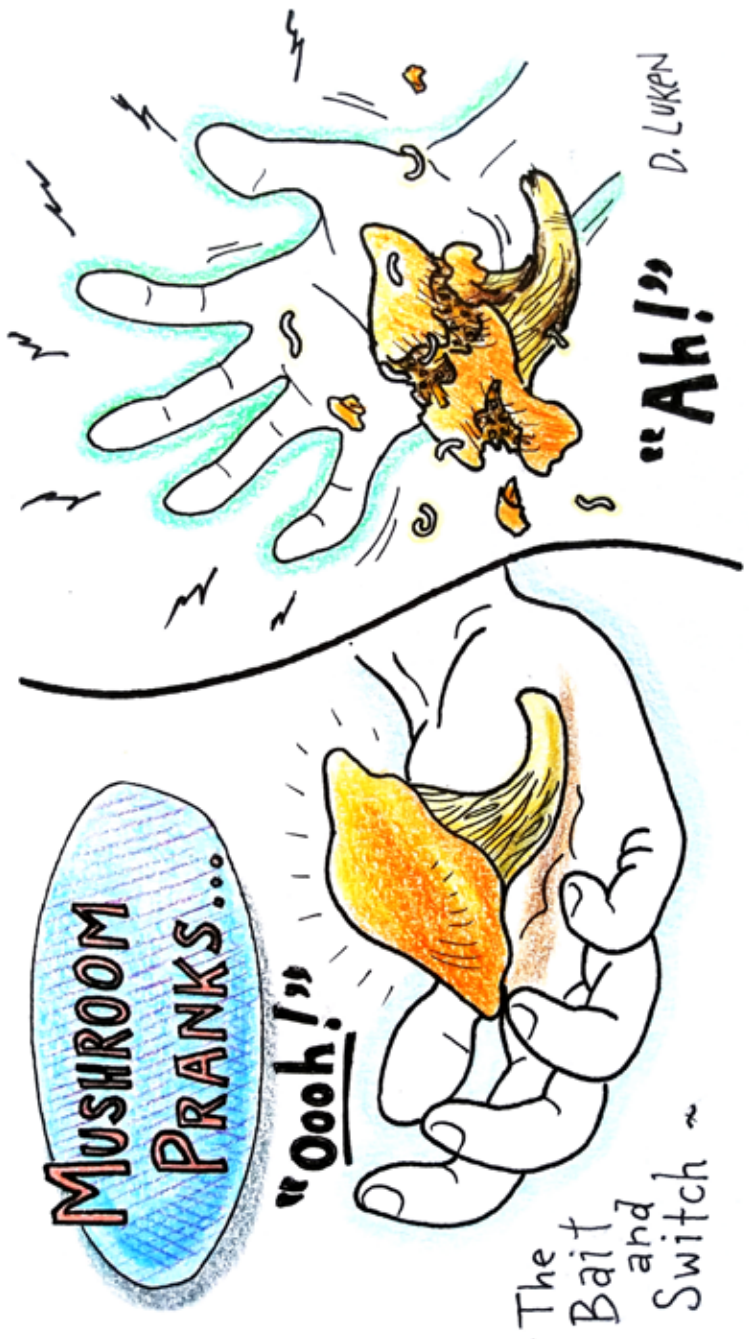
Giant Polypores and Stoned Reindeer has gone into a second edition! To get your signed copy of this remarkable book of fungal musings, send a check for $22 (postpaid) to:

Lawrence Millman, P.O. Box 381582, Cambridge, MA 02238

Eagle Hill Courses

Nov 9	Introduction to Lichens
to Nov 23	Gary Perlmutter

This seminar will introduce participants to the identification, biology, ecology, and human uses of lichens in North America. Participants will learn terminology that describes characters of lichens and their lifestyles and how these characters are used to identify lichens. Participants will learn how to collect and prepare specimens so they can build a starter collection of their own. They have the option to share specimens with other participants so these can be identified and discussed during the seminar.



Mushroom Pranks by David Luken

Fungipedia: A Brief Compendium of Mushroom Lore

Fungipedia presents a delightful A–Z treasury of mushroom lore. With more than 180 entries—on topics as varied as *Alice's Adventures in Wonderland*, chestnut blight, medicinal mushrooms, poisonings, Santa Claus, and waxy caps—this collection will transport both general readers and specialists into the remarkable universe of fungi.

With charming drawings by artist and illustrator Amy Jean Porter, Fungipedia offers a treasure trove of scientific and cultural information. The world of mushrooms lies right at your door—be amazed!

At the time of publishing Princeton University Press priced this book for $16.95. Order your copy today:
https://press.princeton.edu/books/hardcover/9780691194721/fungipedia

"Tar spots! Stinkhorns! Beech aphid poop fungus! What fun to read Lawrence Millman's witty, wry, and wonky compendium of all things fungal."—Eugenia Bone, author of Mycophilia

"Lawrence Millman is a consummate storyteller and the fungi that fill this book run the gamut from the overlooked to the incredible. A marvelous distillation of Millman's obsessions, Fungipedia is peopled with his mycological mentors and heroes, and brims with science, lore, literature, art, music, cinema, and religion—all inexorably bound to fungi. Fungipedia is the next best thing to being on a walk with its author."—Tom Bigelow, president of the New York Mycological Society

"Fungipedia is a most unusual, humorous, and enjoyable book. A true pleasure to read, it covers practically all aspects of fungi and elegantly explains mycology's mysteries. Even seasoned mycologists will find it enlightening."—Leif Ryvarden, University of Oslo

Make Your Own Drying Rack

By Gary Gilbert

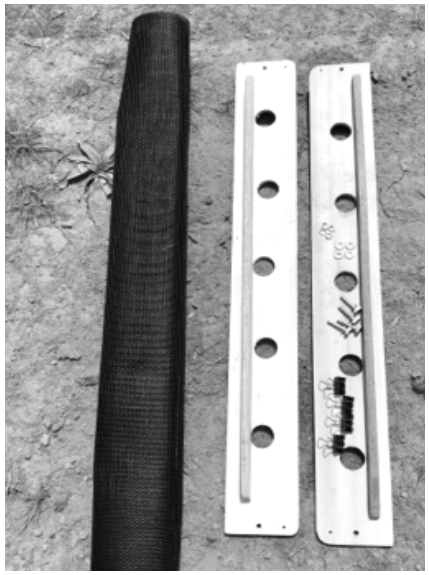
A portable drying rack can come in very handy when harvesting mushrooms and you're far from home. It works great for mushrooms that are good for drying, rather than sautéing and freezing for preservation. Mushrooms such as morels, black trumpets or even the smaller chanterelle cousins, the Craterellus species ignicolor, lutescens or tubaeformis are ideal for this. I developed this rack for my annual flight out west for morel season in the beautiful Cascade mountains of Washington state.

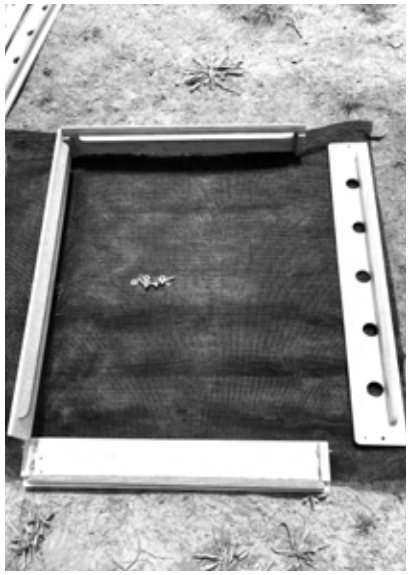
A good day in the sun, and many mushrooms get at least three quarters dry which is often good enough until you get home to your own dehydrator. If you have a passing rain, you can pack all your stash in the car until it passes very easily with these racks. Then pull them back out for sunshine drying action.

The 18" X 24" X 3" rack has two ends that easily detach with thumbscrews and the whole thing rolls up nicely for stuffing in luggage.

Drying Rack Materials

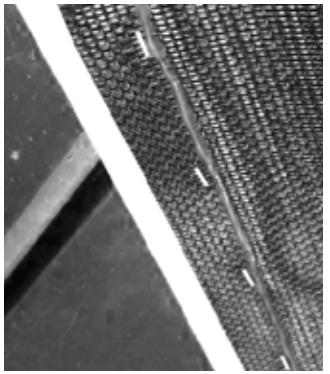
- two pieces 18"x3" and two pieces 24"x3" of ¼"plywood
- pet-proof screening, the tough nylon stuff, about 28"X28", cut it larger than needed, trim it later to size
- four ½"x½"x2-¼" strips of solid wood for corner blocks
- four 8-32 male knurled thumb screws, 1/8"x3/4" length
- four 8-32 T-nut fasteners
- four ¼" washers and lock washers
- four flat head nails around 6d or 8d in size, something with a large, thin head to it
- six small binder clips used for bundles of paper
- small amount of epoxy





To Build

1. Cut the plywood to size and sand all the edges to avoid splinters. Round over the lower corners of the 2 long sides. Drill five 1" diameter holes in the long sides to allow good air flow while stacking or transporting. This is best done clamping it down to another board so when you drill through there is no splintering.
2. Glue the 4 little glue blocks to the corners of the short sides with waterproof wood glue.
3. Once dry, make a paper template or carefully mark every corner of your rack precisely for where the centers of the nails and T-nuts will go. That way all your racks are interchangeable and all sides can go on any rack. Drill a lower hole for your flat-head nail. Insert them to locate the corner together so it doesn't move and then drill for the thumb screws. Match the bit to the shaft thickness of the thumb screw. Now drill a larger hole in the corner block to accept the T-nut fastener. Because the blocks are so small, I had to grind down the flange of one side of the T-nut to fit snugly against the plywood side (see picture).
4. As an added precaution against those corner blocks snapping off (they are only glued to the veneer face of the plywood after all) I added a short flat-head wood screw and screwed into them through the backside of the plywood. I placed it in between the nail hole and T-nut holes and this keeps the glue block tight to the plywood and will never snap off.
5. With small amounts of epoxy and using a toothpick to apply it, glue the T-nut and the nail in place. Be sure not to get any epoxy in the threads.
6. Once dry, snip the nail to a short length so it just sticks through the side piece of plywood when assembled Round over the end of the nail with a file or grinder. Now you have a simple, strong corner joint that can withstand torque and racking and can be assembled with only the twist of your fingers and a thumb screw.



7. Test assemble all four joints with the lock washer going on the thumb screw first, then the washer, then you screw it in.
8. Your screening is much wider than any of the sides. Center it on the short ends of the frame so it overhangs evenly. Using a staple gun, staple the screen in place and just for good measure, add a bead of hot melt glue. This works better than wood glue. Flip it over and bend over any of the staples that may have come through the other side.
9. Assemble the frame and with moderate pressure, stretch the screen to overlap the other end of the frame and staple it in place too. Trim off the excess and add hot melt glue there also.
10. Now you can stretch the screen over the long side and, using three binder clips, attach it to one long side. Stretch it moderately to the other long side and use the clips again. Once done, trim the screening to length so you have an extra 2 inches or so of material on each side to be able to grab on to and stretch when you assemble them.

I built a dozen of these trays so my larger group of hunters would all have some as they process their catch at the end of the day. If you are alone, 2-4 trays is a good number. On my screens I added a thin strip of mahogany as a stiffener because over time the sides of the trays can tend to bow a bit.

Now, go out and hunt mushrooms !

The Inspiration

By Jimsey McWhimsey

So there I was walking in my favorite forest during the middle of February when I noticed a log on the ground, black with moisture. At the butt end of the log I noticed a shiny, white mat that looked liked dry, hardened soft serve frozen dessert. I wondered what it was. I thought, "Larry Millman knows what that is." I then further thought, "I wanna KNOW what Larry Millman knows. I wanna BE like Larry Millman!" Ya know, knowin' what he knows.

Well, one thing led to another, and well, the muse took over. I just couldn't get this outta my head. Even today, the whole thing goes on in my head over and over. It all sounds so cool with the music I'm hearing. I just wish I knew enough musicians who could bring this to life for me. For me this sounds like a collaboration between the Rolling Stones and Metallica!

Ya know I thought, Why not a tribute to a man who many BMC members have come to know and respect. Practically EVERYBODY who's a BMC member has had an encounter or two with Larry Millman and has become a better person because of their encounter. I know Larry somewhat. Somewhat. But ya know, you get to know Larry through his writings. And we are awarded many times over by Larry's constant contributions to The Bulletin and other journals and publications.

After writing "I Wanna Be Like Larry Millman" I envisioned Larry riding on the back of a large, black ant that has a rather large cordyceps rising up from its head looking like the head of a horse and Larry is holding onto the reigns of the cordyceps horse-head all the while shouting out, "Let me hear some Yee Haws out there!"

So here's to you, Larry. Keep on 'Shroomin'!

I Wanna Be Like Larry Millman

By Jimsey McWhimsey

I wanna be like Larry Millman
I wanna know where he's 'shroomin'
I wanna know where he's goin'
So I can stow on with him
To the ends of the earth
Yeah, yeah

He's gone from here to there explorin'
From coast to coast along the shore on
This land onto to the next searchin'
For 'shrooms wherever they are perchin'

He's rumpled and he's ready to go
Of fungi, he's keen, he's in the know
Jellies, crusts, rusts, smuts
He'll find them all, he's goin' nuts

He's lookin' under forest duff
To see if it is the stuff
That makes him halt, shrug and think
Is it nice or does it stink?

I wanna be like Larry Millman
I wanna know where he's 'shroomin'
I wanna know where he's goin'
So I can stow on with him
To the ends of the earth
Yeah, yeah

The books he writes of 'shrooms and travels
Are cool of course with lots of marvels
In those pages of age and wisdom
You will learn of priapism!

Let him talk, let him speak
His listeners are there to seek
His words on fungi, gleam in his eyes
Of his subject he will mesmerize

He's talkin' 'shrooms, he's talkin' spores
In classroom and out of doors
His words are true, his words are Latin
In Cambridge that's the fashion

I wanna be like Larry Millman
I wanna know where he's 'shroomin'
I wanna know where he's goin'
So I can stow on with him
To the ends of the earth
Yeah, yeah

He's pokin' 'round under logs
On dry land and into bogs
Hyphae, hyphal, mycelial mat
You know he knows where it's at

Microscopic, macroscopic
Watch him stop and pause and pick
Xylaria polymorpha
Don't want it grabbing for ya

Cow patties, owl pellets, deer droppings
Won't slow him, keep him stopping
From stranger 'shrooms that are fed
From deep inside an insect's head!

I wanna be like Larry Millman
I wanna know where he's 'shroomin'
I wanna know where he's goin'
So I can stow on with him
To the ends of the
To the ends of the
To the ends of the earth
Yeah, yeah

Mushrooming from Home

By Susan Goldhor

Luke Smithson, Education Chair of the NJMA sent me Tom Bigelow's (Tom's from the NYMS) list of expert talks on fungi that you can access from home, and I'm happy to pass it on to you, with Luke's additional suggestions and resources. These talks are by men (sorry about that, but no talks by women were included) who are well respected and most of whom have already spoken to our club on different topics, or were on our list to be invited. Don't watch them all at once! Spread them out like the treats they are.

When you log onto these, you'll probably be offered many more videos and blogs. Some of those will be terrific; some will be boring, and some will be motherlodes of misinformation. Keep in mind that anyone can put a video on YouTube.

In addition, for those of you with kids at home, I've added a couple of sites at the end especially for them. Or, more accurately, for you to use in home schooling them.

Please remember that along with mushrooms come ticks. It's not fair to have to worry about Lyme Disease and Babesiosis along with Covid 19, but life isn't fair. Tuck your pants into your socks! Consider investing in tick-proof socks and pants! Wash your hands! Keep 6' apart! Stay well!

VIDEOS

Hans Otto Baral - *On Orbiliomycetes*
https://www.youtube.com/watch?v=7U4yI9bQDIs

Bart Buyck - Russula in North America
https://www.youtube.com/watch?v=-wPVppwJqRo

David Hibbett - How Mushrooms Changed the World
https://www.youtube.com/watch?v=jLAHbP-LLFM

Gary Lincoff - On Gilled Mushrooms
https://www.youtube.com/watch?v=B7CGHMySReE

Donald Pfister - On Orbiliomycetes
https://www.youtube.com/watch?v=DPMa1AXNDpw

Donald Pfister - Estimating Fungal Diversity
https://www.youtube.com/watch?v=LXr1Rv5AsRk

Alan Rockefeller - Psychoactive Mushrooms N. America
https://www.youtube.com/watch?v=1tcpJrMbnCg

Christian Schwarz - Mycology into the 21st Century
https://www.youtube.com/watch?v=CFs8aKO8vcc

Christian Schwarz - DNA Sequencing & Citizen Science
https://www.youtube.com/watch?v=sN2yVxENvps

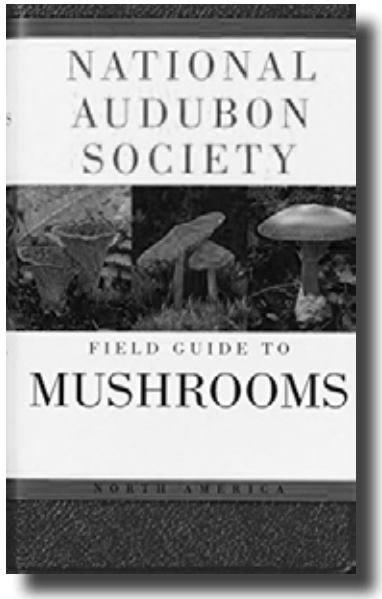
Tom Volk - Cryptic Species
https://www.youtube.com/watch?v=Pl2tEF5GDGY

Bill Yule, Connie Borodenko, Noah Siegel - Mushroom ID
https://www.youtube.com/watch?v=Q7-z_C960DY

Bill Yule - Talking About Mushrooms
https://www.youtube.com/watch?v=pUjX8jdfhjo

ENHANCE YOUR AUDUBON GUIDE

If you're looking for some mycological activities at home, why not soup-up your Audubon Guide by adding current binomials to the plates! To do this, go to indexfungorum and type in the binomial used in the text of the Audubon Guide, click on the "search" button, and the current name comes up in green. You can then double-check the name on iNaturalist - if they disagree, go with the iNaturalist name. If you have a label printer, print out the new name and affix it to the plate - or make your own labels, or simply write it in. Just remember, names are changing frequently and you'll need to update every once in a while!



iNATURALIST

You can also deepen your involvement in iNaturalist by checking out this video tutorial *Explore Nature When You're Stuck at Home.*

https://www.inaturalist.org/blog/31664-exploring-nature-when-you-re-stuck-at-home

ONLINE READING AND RESOURCES

If you're looking for some online reading, or want to brush up on your favorite mushrooms, there are some great websites you can peruse. I'm not including live links; all you have to do is google the topics.

Foray Newfoundland and Labrador. All issues of their excellent newsletter *Omphalina* are available here as pdfs.

Fungi Growing on Wood. Gary Emberger's excellent website on wood-decay fungi (click on "Species List").

Mushroom Expert. Michael Kuo's website - the go-to reference.

Les champignons du Quebec. An invaluable resource. In French - if you don't read French, use Google Translate!

Mykoweb. Michael Wood's excellent website. Check out the "Systematics" page for a huge selection of downloadable mycological literature.

Weird and Wonderful Wild Mushrooms. Jan Thornhill's fascinating mushroom blog.

Cry of the Bolete. A shameless plug for Luke Smithson's own occasional blog about foraging and rewilding your garden. Not all mushrooms, but definitely fungi heavy.

Collection of Polypores. Dr. Josef Vlasak's collection of polypores, many collected in the mid Atlantic region. A good resource to study of on those brackets.

Polypores of British Columbia. A free PDF of North American Polypores, in full color!

Cornell Mushroom Blog. Educational, funny, brilliant blog run by Cathie Hodge. Go there!

MORE VIDEOS. . .

Check out the series of interviews with prominent mycologists available on youtube - search "An Oral History of Mycology." There are over 50 (!) interviews in this ongoing series.

Violetta White Delafield

If you happened to miss this fantastic article on jstor.org about Violetta White Delafield, please read it! Her drawings are stunningly beautiful. All of the links throughout the article lead to papers about the fungi discussed - it's a lovely and fascinating rabbit-hole to get lost in.

Lewis David von Schweinitz

Jstor.org also has an article on the paintings of early American mycologist Lewis David von Schweinitz. The Academy of Natural Sciences of Drexel, located in Philadelphia, has digitized his beautiful paintings and can be found here. (If you are interested in other natural history artwork that the Academy has digitized, go here.

FOR KIDS.

The British Mycological Society has amazing resources for kids, parents and teachers. Would that we had something like it. But they generously make almost all of it available to us via their website. Go to:

https://www.britmycolsoc.org.uk/education

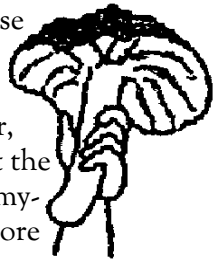
and prepare to be dazzled. Keep in mind that a lot of the British common mushroom names are different from ours. (That's why we haven't thrown out those old Latin binomials yet).

Not mycological but. . . if you're home schooling now, MIT has rapidly responded to the shelter at home order by putting out a website full of educational stuff for kids of all ages on STEAM. It's called (of course) Full Steam Ahead and you can access it at:

https://fullsteam.mit.edu/

It offers a huge amount of material and will come out with weekly packets of new topics. Sign on to it!

CALL FOR SUBMISSIONS



Calling for submissions regarding the pursuits of amateur mycologists: we can receive these in any form from those who write, draw, and capture digital images. We need the utmost generosity of all your expressions to accurately reflect our passion. Remember, *The Bulletin*'s most explicit purpose is to broadcast the grandest expressions of the amateur: those vital mycological pursuits whose motivations are far more various, and often profound, than those who pursue for money.

Generously submit all contributions to BulletinBMC@gmail.com

Help Friends of the BMC

When we plan our weekly forays throughout the year, we need to get permission from the owners of the areas we are visiting. Some of the local conservation groups have been very welcoming to our group and deserve our support. Two in particular have helped us substantially, even suggesting places to explore (Like the old growth forest in Cummington that was the site of this year's bus trip). The Trustees of Reservations and Sudbury Valley Trustees are both excellent organizations that you should support if at all possible.

If you are able, we encourage you to join these groups or at least make a donation. It's a lot of work to keep trails clean and free of fallen trees and invasive plants. They make our trips to the woods much more enjoyable. Sudbury Valley Trustees: www.svtweb.org The Trustees of Reservations: www.thetrustees.org.

Membership for 2021

We invite any interested person to apply for membership. One of the ten best holiday gifts (refer to minutes from the BMC Hygiene Committee, May 11, 1896). Join the BMC online using PayPal or by mailing a completed Membership Application to

Joel Kershner
4 Auburn Ct, #3
Brookline MA 02446-6331

Annual Dues
$20.00 - Individual member
$25.00 - Family membership (all at one address)
$10.00 - Junior member (individual under age 21)

Applications received after November 1st will include membership into the coming year.

Our Website

http://www.bostonmycologicalclub.org/

This is an incredible resource created with the generous patience and extraordinary talents of a team including Scott Shaffer, Jeramy Webb, Jason Karakehian, and Andrea Ignatoff. Jeremy was the tech person. Andrea wrote the text and designed the navigation. Jason brainstormed on content and graphics and compiled the resources page. When the website was completed, Scott took over from Jeramy, and Andrea stayed on as editor for about a year; then I handed the role to Scott.

Scott has done yeoman service in keeping it going and the site is still under construction and in need of helpers.

For now among past lectures and other resources you can use your account to readily view digital back issues of *The Bulletin*.

Since 1897

The front of every issue of *The Bulletin* reads "since 1897" and there has been some confusion over what this refers to. It's not the club. The first Bulletin was published on a single-page type-written document in 1897. To achieve this marvel of technology and organization took the 1895-founded BMC two years.

Mushroom-Log

By Christopher Neefus

$4.99(on iTunes)
Version: 1.10
Size: 20.5 MB
Rated 4+

DESCRIPTION

MushroomLog is a feature-rich iPhone App designed to keep track of when and where you find wild mushrooms. You can log single observations, like when you spot a chicken-of-the-woods during a drive along a back road, or you can use it to track where you go and what you find on a mushroom walk with your local mycological club. In addition to mapping the location of each observation, it lets you record the common name and scientific name of the mushroom, what the mushroom was growing on, the habitat where you found it, how plentiful they were, and how confident you are in your identification. You can save pictures of each mushroom. The App builds a database of your foray locations, where you walked on each foray, each mushroom observation you made, and the pictures you took. Later, you can retrieve and map the track and observations from your walks or search your observation database by species, location, a range of dates. Getting Started tutorials and a complete User Manual are available on the MushroomLog support site.

Mystery Fungus

Dear Mycophiles, Here's a photo of the next issue's *Mystery Fungus*. The first person who guesses it gets a free copy of one of my books. Send your answers to: BulletinBMC@gmail.com

Alas, no one correctly diagnosed the mystery fungus from the last issue. It's *Arrhenia lobata*, a boreal bryophyle not commonly found in the US. I found it in a coniferous forest growing on (of course) moss in the northern part of Vermont. Lawrence Millman.

Hygrophorus goetzei, the snowbank mushroom from a contributed excerpt from the article that start on Page 34: Words from a Past BMC President & Bulletin Editor