

The Potomac

# Sporophore

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## The Fungal Cap

Tom McCoy  
Programs

I believe there must be something innately inside us which makes us want to anthropomorphize mushrooms, that causes us to project the stipe as a simple lithe human form and the pileus, the fungal cap, as a hat-bearing head. I'm not talking through my hat either, because this happens a lot, and far too often for it to be just random chance. At various times we've imagined the fungal cap as a wide-brimmed ladies' hat, a skullcap, a pointed hat, a trilby, a bowler, a helmet, a toque, and even a sombrero. So, hold onto your hat: I've uncovered enough links between fungal caps and haberdashery to hang my hat on, and hopefully the hat fits so in the end I won't have to eat my hat.

Beware: more lame hat clichés ahead.

Let's begin with the technical term for the mushroom cap – pileus – and its etymological origin in ancient Greece, where the word pileus was first coined for the sexy headwarmer on the right.

Yep, the pileus was a Greek conehead, and yet so much more because (personal tastes aside) it's a style that's endured for more than a millenia. Why? Because of its political connotation: the pileus is also known as the liberty cap.

When the Romans adopted the pileus into their culture, it became part of the ceremonial emancipation of a slave. The slave's head was shaved before the owner placed a pileus on top of it in the final act of manumission, thus freeing the slave and turning this simple felt cap into an enduring emblem of liberty.

More than Continued on Page 3



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Top: Greek pileus. Bottom: *Psilocybe semilanceata*, the Liberty Cap

## Morels: 2018 review and 2019 hope

Tim Geho

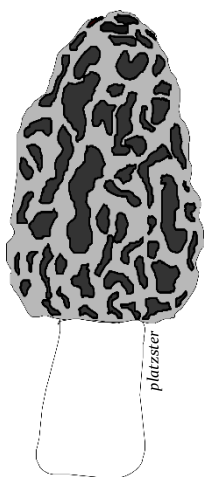
In 2018 I had my worst morel year ever, even when I first began hunting them. There were 2 main reasons in my opinion. One is that most ash trees, which were my first choice for large *Morchella esculenta* (now *M. Americana*) morels were found under, have been killed by the Emerald Ash Borer. One area where we used to find anywhere from 3 to 10 pounds had none at all in 2018. I could not find even one surviving ash tree in the area. We used to walk  $\frac{3}{4}$  mile

and several hundred feet of elevation to get there, uphill on the way back, so we've lost our most productive spot.

I estimate Judy and I found slightly over 1 pound in 2018. Several locals we talked to had not found any at all in the same three-week period. This gave me the impression that it was not just me that had poor luck last year.

The second reason was the very unseasonable cold weather in March and April, extending into early May. In March of 2018 the average temperature in the

Shenandoah to DC to area was 15-25 degrees below normal. In April the local Luray, VA newspaper reported that the April average temperature was a little over 5 degrees below normal. It noted there were only 2 nights with lows above 50 degrees. This did not allow for the soil to warm up or the trees to leaf out quickly as they normally do. Thus, the morel mycelium never was without food from the trees as they would be in a year when the trees leaf out early. Since they were still getting food/nutrition they did not feel Continued on Page 2



platzster

# Mushrooms

## Morels (Continued)

Continued from Page 1 the need to produce morel fruiting bodies in order to propagate. Although this would be nearly impossible to prove scientifically, I base this on over 25 years of careful observations. In commercial morel production they use the food removal source to entice the morels to fruit.

We've rented a house right on the banks of the Shenandoah River the past few years. Normally the Sycamore trees had begun to leaf out by the time we arrived. We also had many wildflowers in bud or blooming when we get there. This year the trees and flowers began to show over two weeks later than in prior years.

I also noted that the tulip trees leaves, even at low elevations, were only about the size of a quarter. They stayed this size for most of our three-week stay. By the time they grew to the size I normally associate with morel growth the season was over. Even the locals failed to keep looking. Rt. 211 crosses over Shenandoah Park from Luray to Sperryville, about 34 miles south of the Front Royal entrance. Both sides of the

road have vast areas filled with mature tulip trees. In most years one can see dozens or more cars parked along the road from people looking for morels. Not in 2018.

I did hear of two reports of large numbers of morels being found, one secondhand and one first hand. Both were from old apple orchards. I hesitate to hunt these old orchards due to the presence of lead arsenate, which likely ends up in the morels.

This year will likely be mine and Judy's last trip to the Shenandoah area due to loss of prime morel producing ash trees and the uncertainty of the tulip tree morels fruitings. Even though one can sometimes find the large morels under tulips, one normally finds the small *M. deliciosa*-type there. There are years when they can be found in abundance but the conditions have to be just right. There have been years when we found over 30 pounds of the small morels but these years only come along on a random basis. Many MAW old timers have experienced years when just about anyone could find loads of these small morels. Judy and I are hoping this will be one of those years when we find many small morels, but



Large morels are becoming rarer in this area, probably because diseases have caused the loss of prime habitat. However, you can still find some large morels if the conditions are right. One productive MAW foray in 2018 produced the morel pictured above.

still haven't given up hope on finding some of the large types.

One other tree that used to produce large numbers of morels was newly dead elms. There are many Elms still living but we've failed find any recently killed elms for a number of years. This may be that some elms have developed a resistance to the pathogen that killed most elms. For instance: there was one 18-inch diameter elm killed about 10 or more years ago, but another elm the same size less than 10 feet away still looks very healthy.

This year we'll hope the tulips produce well but will continue to look in other lesser known habitats. One former MAW member found some very large morels in mid may along the canal tow path under sycamores. I've also heard firsthand accounts of late season large morels found under sycamores in West Virginia. There was a year not long ago when I found them in a mature cedar forest. The forest floor in a mature cedar forest is open with little to no other plants growing and is easy to hunt. I'm still hoping that "perhaps" the dead ash trees will produce an abundance of morels. In past years I've occasionally found large fruitings around very old elm stumps.

Let's all hope that in 2019 ideal morel producing moisture and warmth arrive at just the right time so that everyone can find morels. The only thing we can do is keep looking and hoping. I'll certainly be out this year for what likely looks to be my final Shenandoah foray. 🍄

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Left: *Hygrocybe conica*, the Witch's Hat.



Center: *Lepista nuda*, the Blewit.



Right: *Mycena haematopus*, the Bleeding Fairy Helmet. Photos: Thomas Roehl

## Mushroom Hats (Continued)

Continued from Page 1 a thousand years later, this symbolism would be resurrected and commingled with another hat from ancient Greece called the Phrygian cap. During the French revolution, when republican forces in that struggle identified so completely with this icon of *la liberté*, they named themselves *les bonnets rouges* (the red caps). I guess one could say they had a bee in their bonnets for King Louis [wah wah].

A couple of generations later, one of the most popular mushrooms in the world, a little brown mushroom renowned for its psilocybin content – *Psilocybe semilanceata* – got its common name “Liberty Cap” from its resemblance to the pileus. And now, just for fun, did you know that the Smurfs wear the Phrygian cap, and also live in mushroom houses? So, as Paul Stamets states in his famous Ted talk, there are mycorrhizal connections everywhere and the pileus (with its doppelganger Phrygian) is a headpiece that wears more than one hat: function,



Paul Stamets wearing an amadou hat. Photo: Paul Stamets

fashion, iconic significance and mushroom cap.

Speaking of the world's most famous mycologist, did you know that Paul Stamets often wears a hat which is made from amadou, the material found just under the surface of certain mushrooms like *Fomes fomentarius*. While amadou has traditionally been used to carry slow-burning embers (Ötzi the iceman had *Fomes* with him for this reason) it can also be processed into a felt-like cloth which can then be fashioned into a garment, like say a pretty respectable hat that could also carry a spark, should the need arise.

Then there are three mushrooms – *Lepista nuda*, *Hygrocybe conica* and *Mycena haematopus* – which have common names associated with headpieces. Beginning with the last, this mushroom exudes a crimson latex when cut, hence its most common common name, the Bleeding Mycena. It has another common name though, equal parts fantastic and macabre: the Bleeding Fairy Helmet. The penultimate is the Witches Cap, appropriately named because of its orange and black coloration and conical shape. While it can be found in any of the warmer months, I think of it as an autumn mushroom because for me witches call to mind Halloween. Only natural, right? For the hat trick, the

Blewit is a popular fall edible that got its funny name as a corruption of ‘Blue Hat’, a name change that occurred so long ago, it's become old hat.

Mushroom hats sometimes show up in contemporary pop art too. In the video game Super Mario Brothers, Toad has been rockin' his toadstool toque ever since he threw his pixelated hat in the video game ring way back in 1985. As for gameplay though, he's basically an errand boy - all hat and no cattle.

In the world of haute couture, a millinery fabrication known as the “mushroom hat” was the absolute height of fashion back in the early 20th century, growing so popular it led one wet blanket critic to say, “this growth of felt fungi deserves nothing but condemnation.” It's defining characteristic was a wide downturned brim which was said to ‘resemble a toadstool’ or when taken to extremes ‘a flying saucer’.

By the way, a milliner is someone who makes or sells women's hats and a haberdasher has the

Continued on Page 4



Left: Satirical cartoon of mushroom hats. Right: Actress Dorothy Gish sporting a mushroom hat.



# Mushrooms

## Mushroom Hats (Continued)

Continued from Page 3 same occupation for male clients. These words are a bit antiquated, but still fun to have in your thinking cap.

We'll finish this silly exploration between hats and fungal caps with one final tip of the hat to another women's fashion statement from the Andes, the *sombrero hongo* (literally, "mushroom hat").

In the Bolivian altiplano one can find *sombreros hongos* everywhere one looks. The pretty Cholas (Bolivian slang for mestizo) adopted this style a little more than a century ago when a shipment of bowlers intended for

a British railroad company was errantly filled with hats that were as tight as Dick's hat band. After a bit of creative marketing, the owners convinced the Cholas that this style was the height of fashion amongst European ladies, and at the drop of a hat, a fashion culture phenomenon occurred. The mushroom hat is more than just a fashion statement though, because the Cholas don't keep their social status under their sombreros, they advertise it by how they wear them; on top means happily married, to the side means single, and towards the back means it's complicated. So, in Bolivia, a keen eye can tell one a lot about a woman, just by observing the way she sets her (fungal) cap. 🍄



La Sombrereria

Cholas wearing Sombreros Hongos



## IN MEMORIAM: Jon Ellifritz

Bruce Boyer  
MAW NAMA Liaison

Jon Ellifritz, a long-time member of The Mycological Association of Washington (MAW), Western Pennsylvania Mushroom Club (WPMC), North American Mycological Association (NAMA) and other organizations devoted to mushrooms, died peacefully on March 14, 2019. He was 76. Born September 1, 1942 in the District of Columbia, and raised near Columbus, OH. Jon studied marine biology at The University of Miami in Florida. He was enlisted in the Army (1968-1971), was trained in the Persian language at the American University in Beirut and served a short tour in Vietnam; he worked for the federal government (DoT and GSA, Washington, DC), retiring in the '90s. Jon bought his house in Hyattsville, MD in 1977 where he lived with his partner Anop Juntanaro (Nikki) until he fell ill in mid-2018. Nikki, a native of Thailand, became a naturalized US citizen in 2010 and has returned to Korat, Thailand, where he has several brothers. Jon has no known original family members.

Jon joined MAW in 1986 and was on the Board of Directors in many positions from about 1990 through 2017. He served as Culinary Chair, Program Chair, Vice President, President and many terms as Foray Chair. He held many ad hoc positions: coordinating our annual foray at Sequanota; foraging, lecturing, identifying and ensuring our annual Mushroom Fair was a success; conducting workshops at club monthly meetings & WPMC annual Lincoff Foray. He was lead identifier at numerous MAW Sequanota Forays, set up display tables at the 2011 NAMA Foray in Clarion, PA, and set up and led forays at the 2016 NAMA foray in Front Royal, VA.

One thing that Jon always emphasized on forays when showing newcomers the details of mushrooms – even if they were only interested in collecting edibles – was that as amateur mycologists “we are always collecting for science.” He encouraged them to collect a representative sample of every fungus that they found, and to keep each collection protected and separated because there would be someone at the tables who might know, or be interested in trying to identify even the smallest, most seemingly insignificant species. Anyone who has seen him find or describe a Rooting Collybia will remember the song he made up that included that mushroom's changing Latin names – *Collybia radicata*, *Xerula furfuracea*, *Oudemansiella radicata* and combinations thereof.

There will be a celebration of Jon's life at an evening in the District to be announced by his MAW comrades.



William Needham



# Fungi in the News

Annie Greene  
MAW Newsletter Contributor

*Editor's Note: This article contains summaries of the biggest fungus-related news from July through December 2018. Visit the link following each topic below for a closer look.*

## Hardy Salamanders Help Fight Chytrid Fungus Infections

Scientists from Liberty University found ten salamander species in the Blue Ridge Mountains that are resistant to chytrid fungus infections. Chytrid infections (caused by *Batrachochytrium dendrobatidis*) are decimating many amphibian species worldwide, especially frog populations. The research team found that their local salamanders' resistance to chytrid infections comes from helpful bacteria on their skin. Researchers are studying each of the resistant salamander species to determine which of their resident skin bacteria species offers protection against *B. dendrobatidis*. This research may help scientists understand why some amphibians are vulnerable to chytrid infections while others are resistant, and may lead to the development of a "probiotic" that can be used to help protect vulnerable amphibian species. Read more at: <https://wtop.com/virginia/2018/11/unbothered-by-deadly-fungus-salamanders-draw-researchers/>

## Climate Change and Overharvesting Threaten the Caterpillar Fungus Market

The caterpillar fungus (*Ophiocordyceps sinensis*) is a parasitic fungus that infects ghost moth caterpillars in remote, high-altitude regions of the Himalayas. After this fungus infects and kills moth caterpillars in the soil, its fruiting body bursts through the dead caterpillar's head, then is harvested for its alleged aphrodisiac properties. To understand more about the caterpillar

fungus market (valued around \$11 billion, much of which is black-market trade), Stanford researchers collected data on its harvesting patterns by interviewing locals in the Tibetan Plateau. Their study found that not only are current harvesting patterns unsustainable, but that climate change threatens to warm up the cool areas where this fungus thrives. Many local farmers currently heavily rely on this lucrative fungus for their income, so researchers warn of declining fungus populations and possible harvest territory conflicts in the future. Read more at: <https://news.stanford.edu/2018/10/22/climate-change-overharvesting-may-doom-pricey-parasite/>

## Parasitic Fungus Drugs its Insect Hosts

Cicadas behave strangely when they are infected with the parasitic fungus *Massospora cicadina*, and researchers are beginning to understand why. Scientists from West Virginia University recently found that *M. cicadina* pumps its host insects with an amphetamine (a stimulant) and psilocybin (the hallucinogenic component of some psychedelic mushrooms). The presence of these psychoactive compounds may explain why cicadas infected with this fungus are hyperactive and hypersexual, even though the infection renders them infertile. Infected male cicadas attempt to mate with both males and females and even mimic female behavior to attract other males. These changes in behavior help spread *M. cicadina* spores, which erupt from the rear ends of the parasitized cicadas. Read more at: <https://www.theatlantic.com/science/archive/2018/07/massospora-a-parasite-drugs-its-hosts/566324/>

## GMO Blight-resistant Chestnut Trees Show No Harm Toward Ecosystem

In the 20<sup>th</sup> century, American Chestnut tree populations were devastated by a pathogenic blight caused by the fungus

*Cryphonectria parasitica*. For the past 29 years, scientists at the SUNY College of Environmental Science and Forestry have been working to genetically modify chestnut trees so they can resist this deadly blight. SUNY researchers engineered chestnut trees to express a protein called oxalate oxidase, which neutralizes the damaging oxalic acid produced by *C. parasitica*. Rigorous tests are showing that these modified chestnut trees are indeed resistant to blight, and also show no ill effects on beneficial mycorrhizal fungi, frog larvae, or the germination of seeds they would encounter in their natural ecosystem. If they obtain approval, the researchers' eventual goal is to breed these blight-resistant trees with wild American Chestnut trees to create a new wild tree population that can withstand attacks from blight. Read more at: <https://www.esf.edu/communications/view2.asp?newsID=7402>

## Mini-Generators from Melding Mushrooms and Cyanobacteria

Scientists have been attempting to generate electricity from photosynthetic microbes called cyanobacteria for a while, but these microbes do not survive long on artificial surfaces. Recently, researchers at the Stevens Institute of Technology found that they could prolong the lifespan of cyanobacteria by growing them on top of button mushrooms. The mushrooms' own resident microbes may provide the beneficial boost that extends the cyanobacteria's lifespan. Researchers 3D-printed cyanobacteria onto the surface of the button mushrooms, then added carbon-based nanowires to collect any electrical current. When light was shone onto the system, a small electrical current was generated. Several such mushroom generators could power a small lamp. These types of "engineered symbiosis" strategies may provide us with important sources of renewable energy in the future. Read more at: <https://www.bbc.com/news/science-environment-46127318>

# Events



The three display tables at the August 7 meeting were full of dozens of mushroom species.

## Meeting Files

Tom McCoy  
Programs

### August 7: Diana Smith on Medicinal Mushrooms

Gosh, there are a lot of mushrooms up in August. At the 8/7/2018 MAW meeting, attendees were rewarded with not one, but two display tables to ooh and ahh over. Conditions were prime.

While most families of mushrooms were well represented, I think the boletes carried the day. It was their time of year. In particular, I remember seeing a couple

*Xanthoconium separans*, one of the choicest of edibles, and at the opposite end of the edibility spectrum, a few *Tylopilus felleus*, otherwise known as the bitter bolete.

The stellar attendance that night was, no doubt, in large part due to the lecture topic, "Medicinal Mushrooms: Separating Fact from Fiction." Diana Smith, the chair of the North American Mycological Association's (NAMA) Medical Mushroom group, provided an extensive and sobering lecture on the efficacy of this popular topic. In summary, keep an open yet questioning mind to these claims. There's still so very much we just don't yet know.

Flashing back to July's MAW meeting, when former MAW president Ray LaSala provided an overview of how to properly harvest, field dress and handle your wild foraged mushrooms. If you'd like a refresher on this subject matter, you can check out Ray's From Field to Fridge and Beyond on MAW's website (in the Resources section on MAW's website or at this link: <http://www.mawdc.org/resources/From%20Field%20to%20Fridge%20and%20Beyond.docx>).

### September 4: Mushroom ID

On September 4, MAW enjoyed yet another successful and well attended meeting at Kensington Park Library, and because it was September, we talked about basic mushroom identification.

Club Vice President John Harper got us started with a succinct overview of basic mushroom diagnostics and taxonomy, after which we separated into small groups for additional instruction and Q&A, and that continued right up until our hard stop at 9:30. We just couldn't stop talking about mushrooms!

If you'd like some additional study, read this short article on macroscopic identification by former MAW president, Ray LaSala: <http://www.mawdc.org/resources/Documents/Macroscopic%20Identification%20of%20Mushrooms.pdf>.

## Upcoming Events

The events listed below may change due to weather, speaker availability, etc., so read MAW emails and check our website at <http://mawdc.org> for up-to-date information on events. Exact foray dates and locations will be set closer to the event in order to take weather conditions into account.

### Scheduled Programs

- Apr 2 **Monthly Meeting:** Walt Sturgeon will give a presentation on "Mushrooms of the Central Appalachians." This ties in with his recent book, *Appalachian Mushrooms: A Field Guide*.
- Apr Morel Forays start – look out for emails!
- May 7 **Monthly Meeting:** MAW Foray Chair Matt Cohen will give a presentation on wild foods in advance of the spring culinary meeting.
- May 19 **Culinary Event:** Spring tasting at Sandy Spring Museum
- June 4 **Monthly Meeting:** Ilan Segal on "Mushrooms of South America."
- July 2 **Monthly Meeting:** Heather Hallen-Adams on "Microbiology, Molds and Mycotoxins."
- Aug 6 **Monthly Meeting:** Max Dubansky, owner of Backbone farms in Garrett Co MD, on organic mushroom farming and bioremediation.

### Save the Date

- Aug 8-11 NAMA Foray
- Sept 27-29 Sequanota Foray, guest mycologist: Timothy Baroni
- Oct 6 Mushroom Fair
- Oct Culinary Event (exact date to be determined)

Unless otherwise noted, monthly meetings will be held on the first Tuesday of the month at 7:00 PM in the **Kensington Park Library, 4201 Knowles Avenue, Kensington, MD**. Attendees are encouraged to bring mushrooms for sharing and identification. Members of the public are welcome to drop in.

Special thanks to MAW member Ray LaSala for proofreading this newsletter!





Left: Vice President John Harper gives an introductory lecture on basic mushroom identification at the September 4 ID meeting. Right: David Rust, former NAMA president, provides an overview of fungal forest ecology during the December 4 meeting.



Thomas Roehl

## October 2: Impromptu Armchair Foray

At the October 2 meeting, we had an unfortunate disconnect which left us speaker-less. It happens, but it's not the end of the world, and lucky for us, there were two full tables of mushrooms on display. With that much fungi afoot, the MAW community breezed easily through our allotted time. In the words of Kurt Vonnegut, 'So it goes ...'

A special thanks to Mitch Fornet, Matt Cohen and Martin Livezy for their collective efforts, turning an unplanned situation into an enjoyable and educational improvised lecture with what we had on hand.

## November 6: Psilocybin, Philosophy, and Beyond with Allan Badiner

If you were lucky enough to be among the scores of attendees at November 6 MAW meeting, you got a *real* treat. Our guest speaker Allan Badiner, who has a keen interest in Eastern philosophy and psychedelic mushrooms, kept the myco-crowd enthralled for an hour and a half as he shared his optimistic views on psilocybin and Buddhism, with some amusing anecdotes from his atypical life.

While focusing primarily on the

great potential of psychedelics as a treatment option for PTSD, palliative care, depression and addiction, our lecturer also made an effective case for just how well hallucinogens align with Eastern philosophy. Allan, who practices Buddhism, surely has magic mushrooms growing alongside his path to enlightenment.

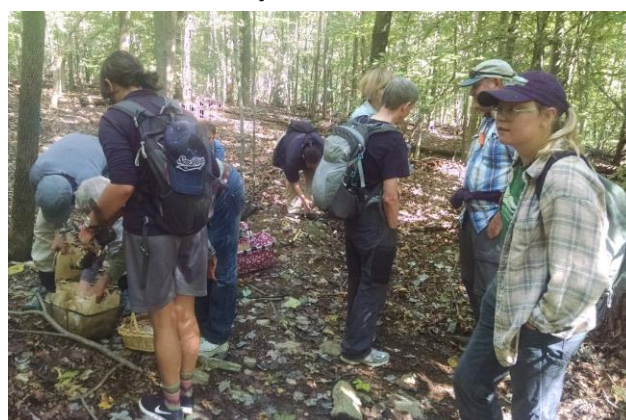
## December 4: David Rust Explains Fungal Forest Roles

The December 4 meeting was the final MAW event of the year, and gosh, what a year it's been for the myco-enthusiast in the nation's capital. Thanks to the persistent rainfall over the past roughly six months, we've held what surely must've been a record number of forays, while also hosting two successful tasting events; a mushroom fair; an entertaining and enjoyable Sequanota weekend; and

a number of absorbing lectures - none of which were more memorable (to my mind at least) than the one provided by David Rust last night.

In the full basement at Kensington Library, our guest lecturer, and outgoing president of the North American Mycological Association (NAMA), kept the membership enthralled for a solid hour with an all-encompassing myco-centric lecture on forest ecology. It was incredibly fascinating, and just in case you missed it, let me skip right to the ending: mushrooms control *everything*.

For a cold December day, our display table still provided us much to talk about, including at least four edible species (Shoehorn Oyster, Enokitake, Yamabushitaki and Brick Caps), and one nondescript LBM that's fatally poisonous: the appropriately named Deadly *Galerina*. It should go without saying, you want to learn to identify that last one best of all. 🍄



Thomas Roehl

Top: MAW helps ID species at Bull Run Mountain Natural Area Preserve. Bottom left: Jared Urchek ID's a mushroom during a foray. Bottom right: 2018 had a lot of rain, which made it an excellent year for mushrooms! Even Black Trumpets fruited in abundance!



# Events



Left: The Mushroom Fair had a wide variety of mushrooms on display, including these *Amanita* (front table) and *Russula* (back table) species. Right: Visitors at the Mushroom Fair peruse the display tables, guided by MAW members.

## Event Recaps

Thomas Roehl  
MAW Newsletter Editor

### Mushroom Fair

MAW's annual Mushroom Fair was held on August 26, 2018 at scenic Brookside Gardens. The warm sunny weather drew hundreds of visitors and the wet weather earlier in the week produced lots of mushrooms. MAW members collected these and brought them to the Mushroom Fair to be identified and displayed for visitors. This centerpiece of the Fair filled eight tables and included everything from deadly *Amanita* mushrooms to edible chanterelles to insubstantial crust fungi. *Amanitas*, *Russulas*, and boletes were the most abundant and spectacular mushrooms on display.

Visitors also enjoyed displays about cultivation and cooking as well as informational tables about MAW and NAMA. William Needham and John Harper also gave lectures on cooking, basic mushroom identification, and basic fungal ecology. Additionally, MAW foray leaders led groups of visitors through Wheaton Regional Park so they could experience real mushroom hunting. Foray participants were rewarded with chanterelles, honey mushrooms, and a variety of other late summer mushrooms.

### Sequanota Foray

From September 21-23, 2018, MAW members gathered in Jennerstown, PA, for MAW's annual Camp Sequanota

weekend foray. After gathering on Friday, MAW Science Advisor Shannon Nix entertained the crowd with Myco-Jeopardy, a fungal twist on the classic quiz show.

On Saturday, the roughly 40 foray attendees fanned out across the grounds of Camp Sequanota and at other local parks to collect as many mushrooms as possible. A total of 154 species were identified, with more that were brought in but not identified. This far surpassed the previous year's total of 85, a reflection of the vastly different conditions between the two years: 2017 had no rain during the week prior, while rain in 2018 was plentiful and it actually rained the night before the foray.

Saturday night featured a presentation on mushroom collection for the Mycoflora Project (an effort to encourage mushroom clubs to sequence the DNA of mushroom species all across North America) by Richard Jacob, former President of the Western Pennsylvania Mushroom Club and Chair of the NAMA Mycoflora Committee. His presentation shared tips on mushroom collection with the goal of producing usable collections for the Mycoflora Project.

Key details of a good collection include: good photos, date, location, habitat, and notes on any features that can't be photographed. Once the mushrooms have been recorded, you should extract the DNA and dry the specimens to preserve them. Records, DNA, and an actual specimen are the three key features for collections in the Mycoflora Project.

After Richard's lecture, some members took over the kitchen and cooked up a few of the mushrooms that had been picked earlier in the day. Between bites of Hen of the Woods, Chicken of the Woods, and other offerings, members had time to socialize or assist in identifying mushrooms from the day's forays.

On Sunday morning, Mitch, Shannon, and Richard reviewed the mushrooms on the tables, singling out some of their favorites. Also on Sunday morning, MAW's Mycoflora Committee met to choose mushrooms to submit to the Mycoflora Project. The Committee looked for mushrooms that were poorly documented, that could not be



Top: Matt Cohen uses a field guide to identify mushrooms after the forays at Sequanota. Bottom Left: Mushrooms waiting to be identified. Bottom Right: The Mycoflora Committee documents and extracts DNA from mushrooms.



identified despite all best efforts, or that were interesting. Committee members photographed, extracted DNA, and dried the chosen mushrooms on Sunday morning. In all, 19 samples were selected for sequencing: two *Ganoderma applanatum* samples, *Elaphocordyceps capitata*, two *Armillaria mellea* complex collections, *Agaricus arvensis*, *Lactarius quietus* var. *incanus*, three other *Lactarius* collections, *Thuemerella cubispora*, *Elaphomyces* sp., *Sarcodon atroviridis*, *Calvatia craniiformis*, *Holwaya mucida*, two *Boletus longicurvipes* collections, *Russula* sp., and some curious white cups found on rotting Black Trumpets.

## Fall Tasting

MAW's fall culinary event took place at the Sandy Spring Museum on November 3, 2018. The event drew about 50 people and 10 cooks, a good balance that ensured nobody left hungry. Most of the mushrooms were cultivated varieties donated by Phillips Mushroom Farms, although these were supplemented with several wild species such as *Hericium erinaceus*. MAW members who arrived early saw the cooks at work and learned some helpful tips about mushroom preparation. After everyone had eaten their fill of mushroom dishes, tasting attendees voted on their favorite dishes.



Rick Silber (left) won the Fall 2018 Waldemar Poppe Culinary Award for his Mushroom Tartelettas.

The 2018 Fall Waldemar Poppe Culinary Award was presented to Rick Silber for his first-place dish, "Rick's Mushroom Tartelettas." Rick graciously provided his recipe (see below), so now you can enjoy this prize-winning dish in the comfort of your own home! MAW's next culinary event will take place on May 19 at the Sandy Spring Museum. 🍄

## Rick's Mushroom Tartelettas

*This recipe won first place at MAW's fall 2018 culinary event.*

### Ingredients:

- 2 tbs unsalted butter
- 3 shallots,<sup>i</sup> finely chopped
- 1 clove garlic, finely chopped
- 1 lb Shitake mushrooms<sup>ii</sup> – stems removed (you can save these for soup or dry and add to anything)
- ½ tsp dried Thyme or if using fresh use more
- salt and pepper to taste
- 2 tbs vermouth
- ¼ cup white wine (whatever you're drinking)
- 1 package frozen Pepperidge Farm Puff Pastry shells<sup>iii</sup>
- 2 cups grated good quality gruyere cheese<sup>iv</sup>

### Directions:

1. Preheat oven to 400°F and line one baking sheet with parchment paper or a non-stick Teflon baking sheet.
2. Melt 1tbs butter over medium heat and add the chopped shallots, garlic and thyme. Add salt and pepper and sauté for 10 or so minutes.
3. Stir in the vermouth until mostly evaporated.
4. Add the second tbs of butter, then the mushrooms. Stir, sprinkle again with salt and pepper and stir occasionally for 10 minutes. You want to let the mushroom caramelize slightly so don't over-stir.
5. Add the wine, scraping the bottom of the pan to pull up all the browned bits and cook until all the liquid has evaporated. Remove from heat.
6. Remove the Puff Pastry shells (cups) and bake as directed (400°F for 18 minutes). Check since oven temperatures vary.
7. Remove the shells from the oven and let cool for a few minutes
8. Using a sharp knife (a clean mushroom knife works) remove the caps and some of the other inner layers from the Pastry shells and set aside.
9. Stuff each shell with mushroom/shallot mixture.
10. Top each filled shell with a tablespoon of the shredded gruyere or other cheese.
11. Return to the oven and bake for 5 minutes or until cheese has just started to slide down the sides.
12. Remove and serve immediately.

### Notes

- i. You can substitute chopped onion for the shallots.
- ii. You can substitute many different mushrooms here: I also made a second batch with *Stropharia rugosoannulata* that had, on the morning of the MAW Culinary Event, burst out of the bed I started this summer!
- iii. There are many other puff pastry products which can be substituted, for example cups, which are smaller which would perhaps work nicely for a passed appetizer.
- iv. If you need a substitute for gruyere cheese, you could try emmental, Jarlsberg, beaufort, comté or raclette.

*Recipe contributed by Rick Silber*

## The Wood Wide Web

William Needham  
MAW President

We take trees for granted as inanimate plants providing shade if standing or wood if hewn; they lack mobility and its attendant suite of sensors that our eyes and ears define as consciousness. The ents of Tolkien's Middle-earth and the combative apple trees that confounded Dorothy and the scarecrow on their way to Oz are at the other extreme; anthropomorphized animation. As is the case with most dichotomies of white and black, reality occupies a gray area that vacillates about a median somewhere in between. While trees don't move from one point to another, the metaphor "putting down roots" is apropos: they extend their reach skyward in search of radiant energy and earthward in search of vital nutrients. Plants are the fount of photosynthesis, the miraculous chemical conversion of sunlight, water and carbon dioxide into carbohydrate compounds. All heterotrophic faunal and fungal life ultimately depends on autotrophic plants. Trees are the apex species of Kingdom Plantae, masters of the canopy that stretches over vast swaths of land. The epigeal world of plants is well known. Water and nutrients are conveyed through the xylem at the center of the trunk and the carbohydrates of photosynthesis are returned to the roots via the phloem at the circumference; a marvel of vascular engineering that extends upward through every stem to every leaf and back again. What goes on in the hypogeal realm of dirt is mysterious, and much more than meets the eye as we shall see.

Not being able to see the forest for the trees is one of the more hackneyed aphorisms used to express the inability to understand the overarching scheme due to the clutter of details. It is nonetheless an accurate appraisal of forestry until the last decade of the twentieth century. Arborists mostly

deal with trees as singular and isolated, their treatment a matter of adequate nutrients and disease mitigation. The suburban manifesto lent some credence to this approach, as individual trees selected from the local garden center are buried to their root tops somewhere in the middle of a lawn of unnatural grass. With nurture in the form of watering and the addition of artificial fertilizer containing the proper amounts of nitrogen, phosphorus and potassium (the three numbers that appear on all fertilizer labels), the transplantation sometimes succeeds. Nature does not work that way. Plants grow from seeds dispersed at random and *en masse* according to the serendipity of where they happened to fall. Starting from an open field, pioneer plants that thrive in open sun (frequently considered weeds) are ultimately succeeded at a slow but inexorable pace by the plants most suited for the soil, sun and rainfall that there prevail. After many decades under the right conditions, a forest will succeed that is comprised almost entirely of only one or two tree types, a process fittingly known as old field succession. [1] But again, that is only the above ground part of the story.

There is a "wood" wide web, literally. It involves plant roots and fungi. This will surely come as a surprise to most, as it did to the world of science when it was first discovered in the 19th century. It all started with truffles, fungi noted for a redolence extolled by epicureans. Part of their mystique is that they are hypogeous; trained truffle sniffing dogs and female pigs (the smell is similar to the sex hormones of boars) are employed to root them out. Considering this laborious process and the rarity of truffles, it's no surprise that they are an expensive commodity (a pound of white truffles currently runs for just over \$1,000). A German botanist named Albert Frank was commissioned by the King of Prussia to attempt to cultivate them. While this was found to



Roots of most plants host mycorrhizal fungi. These mutualistic relationships allow trees to share resources, forming a vast interspecies network.

be impossible (and still is, without living trees), Frank discovered that an inherent relationship existed in nature between some fungi (Greek *mykēs*) and plant roots (Greek *rhiza*) and coined the word mycorrhiza in 1885. [2] It took one hundred years for the idea that plants and fungi were inexorably twinned in the web of life to the mutual benefit of both to become mainstream. It is now universally accepted that roughly ninety percent of all plants are teamed with fungi to provide minerals from the soil, notably phosphorous, in exchange for about ten percent of the plants' nutrients. [3] For almost all trees, this association is obligate; trees will not grow in the wild without their mycorrhizal partners. More on the fungi in a later chapter but for now let us return to the forest and its trees.

The fossil record is a chronicle of what lived and died in sediments painstakingly eroded from uplifted mountains. The transition of life from ocean to land about 400 million years ago is one of its more important testimonials; aquatic trilobites dominate Cambrian sediments with the first land plants appearing over 100 million years later in the Silurian. These pioneer plants faced enormous burdens in their adaptive evolution from aqueous environments with dissolved nutrients and buoyancy to bleak shorelines and the crushing gravity that land life must endure. It is hypothesized that the successful land assault of plants was made possible by the fungi that went with them as partners, dissolving



the rock minerals in exchange for a share of the fruits of photosynthesis. This is supported by the fossil record; mycorrhizal fungi can be seen in the most primitive plant roots dating from their initial littoral incursions. [4] It stands to reason that plants that could not survive without the minerals needed for growth and fungi that could not survive without carbohydrates would coevolve. Lichens, which are a marriage of various fungi with several genera of algae, demonstrate the success of this association; they thrive on bleak mountain tops and frozen wastelands. If plants and fungi got started together, syllogism then suggests that the ensuing evolution of trees involved a mastering of the fungal partnership. And this is what is meant by the wood-wide web: the tree roots and their intermingled fungi.

A forest is more than a bunch of trees. It is a living, respiring and interconnected community that establishes and maintains its own ecosystem. The earth is populated at any given time by those organisms that survived against unrelenting competition for finite resources. Those that managed to eat something else, not be eaten themselves, and meet and successfully mate are what remains. In many species, evolutionary success has been the result of societal collaboration. A single ant is barely a snack for a bird or a spider, but a colony of ants provides a formidable phalanx against predation. The success of *Homo sapiens* is surely a matter of specialization and cooperation. The plant and fungus kingdoms are, if anything, more competitive than our own. Animals have the option of fight or flight that mobility allows; teeth, claws, wings and legs the result. Plants start where their seeds land and must somehow win out over marauding herbivores and taller plants with deeper roots; thorns, toxins, trunks and mycorrhizas the vegetative counterpart. The cooperative behavior of trees in a forest in order to enhance survival is analogous to a city of humans or a hive of bees. Trees need the forest of each other and must somehow work

together to this end. How and even if they are able to do this has been a mystery.

Field experiments that began in the late 20th century provided incontrovertible proof that trees talk. Using their roots and the anastomosis of fungal hyphal connections, they not only send signals, but also nutrients when and if needed. It all started with the observation that the removal of birch trees from a Douglas fir plantation with the goal of enhancing wood product growth resulted in the opposite effect: premature and systematic senescence of the fir trees. As with much of scientific research, it was the anomaly that begged the question, "Were the birch trees beneficial to them?" It is important to keep in mind that these are two totally different species, supposedly competing for the same limited supply of nutrients. Experimentation under controlled conditions using radioactive isotopes (which emit radiation that can be detected at its ultimate destination) found that shading the fir trees resulted in a transfer of 6 percent of the carbon from the birches. [5] This literally ground-breaking study revealed that the deep secrets of the forest were hidden from sight under the soil's blanket cover; trees sustained each other and their individual fungal partners in a quasi-neural network. Work in this area has steadily advanced to the forest scale; a canopy crane was used to mark Norway spruce trees with carbon dioxide using the isotope carbon 13 (vice the normal carbon 12 with 6 protons and 6 neutrons). At the end of the five-year study period, 40 percent of the fine root carbon in adjacent beech, larch and pine trees was isotopic and can only have come from the spruce trees. [6] The forest-fungal ecosystem is a reality. There is much more to learn about this fundamental underpinning of all that grows naturally.

Germany and the German states that preceded its consolidation established a forest management system about 300 years ago, initially as a means of providing timber for

trussing mine access tunnels and fuel to stoke iron furnaces. [7] The keys to sustainability are trained and dedicated forest wardens who oversee public and private woodlands; their expertise and knowledge intertwined with the roots they manage. Peter Wohlleben was employed by the town of Hümel in the Eifel mountains of North Rhine-Westphalia to care for its communal beech forest. During his twenty-year tenure, he gradually became aware that his forest was a family and not merely trees. "When you know that trees experience pain and have memories and that tree parents live together with their children, then you can no longer just chop them down and disrupt their lives with large machines." [8] Treebeard would assuredly concur. The forest of trees and collaborating fungi is the essence of ecology. ♣

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## Tales of the Fun Guy

by Loretta E. Chi

