The Potomac Sporophore

Winter | January 2014 Volume No. 29 | Issue No. 1

The quarterly publication of the Mycological Association of Washington (MAW) | www.mawdc.org

Truffle oil or snake oil? Find out on page 6.

In This Issue

Fungus Notebook 1

Chanterelle Hike 1

Scholarship Update /Species Lists 4

Book Review 5

Recipe 5

Meeting File 6

Upcoming Events 6

Cartoon 8

Fungus Notebook: The Oyster Mushroom, Part 2

William Needham
MAW Secretary

Editor's note: This is the second of a two-part series on the popular oyster mushroom. Read the first installment in the Fall 2013 edition, available at www.mawdc.org.

The oyster mushroom is easy to cultivate, and many companies sell kits to help fungi enthusiasts grow Pleurotus varieties at home.

Common Name: Oyster Mushroom, Tree Oyster Mushroom, Grey Oyster Mushroom, Hunter's Mushroom, Hiratake (Japanese for "flat mushroom"), Píng gū (Chinese for "flat mushroom").

Scientific Name: *Pleurotus ostreatus.*

According to the myco-evangelist Paul Stamets in *Mycelium Running,* "Oyster mushroom cultivation can help alleviate poverty and hunger by recycling waste materials of little economic value and turning them into nutritious and medicinally beneficial products." The implication is that the omnivorous Pleurotus mycelium has a potentially major role to play in ecological remediation, in this case mycoremediation — the use of fungi to remove toxic substances from the environ-

Continued on page 3

Chanterelles' Allure Leads Hiker Astray

Danny Barizo
MAW Programs Chair

Sometimes, a wonderful pastime like foraging for wild mushrooms can turn out to be a terrifying experience. Here's my story.

One sultry summer Saturday afternoon, I decided to go for an afternoon jaunt looking for chanterelles in a state park in Pennsylvania where I had not been before. I planned to be away for only a few hours and decided not to bring my regular hiking gear. My wife, however, insisted that I carry, at least, a flashlight, whistle, and my cellphone.

I entered the woods, passing by a meadow where I found some fresh meadow mushrooms (*Agaricus campestris*), which I gathered. After about an hour of enjoying the woods and leisurely looking for chanterelles, my attention was drawn to an area across a distant creek, which appeared to be a promising place to find these late-summer treasures. I crossed the creek, hopping on rocks, until I got to the spot. To my delight, I found a patch teeming with these orange, yellowish delicacies. I kept on walking to other locations and harvested enough chanterelles to fill my basket. The rich apricot-like aroma of chanterelles from my basket was suffused in the air.

Always looking down on the ground, I had lost my sense of direction and became disoriented. I started walking back to where I thought my car was parked. I had walked for about an hour when realized I had wandered away and was lost. I continued my trek up and down mountains, hoping to find a road and a house where I could ask for help and directions. By then, it was becoming dark, and the big, round moon was starting to hover over me. With the light from my cellphone, I was able to tell the time. It was almost 9 p.m. in the evening. I tried phon-

UGardener

A walk in the woods can be a beautiful experience, but it's easier than you might think to get lost. Remember to be prepared for the unknown, even on short hikes.

Continued on page 2

Miscellany

Continued from page 1

ing home, but no one answered. I called the cellphone of my wife who was then at the mall shopping. I instructed her to go home right away, go to the computer, and check the park website to try and determine where I was and help me find my way out to my car. It was a useless effort since she could not figure out where I was no matter how hard I tried to describe to her where I thought I was.

Hiking Safety Tips (From the National Park Service, Great Smoky Mountains)

☐ Tell someone your route and return time. Have them contact the park if you do not return within a reasonable time.

☐ Always hike with another person. Keep your hiking party together on the trail.

☐ Carry a current park trail map and know how to read it.

☐ Carry a flashlight, even on a day hike.

☐ Take a minimum of 2 quarts of water per person per day. All water obtained from the backcountry should be treated.

☐ Carry a small first aid kit.

☐ Check the current weather forecast and be prepared for changes.

☐ Wear shoes or boots that provide good ankle support.

☐ Avoid hypothermia by keeping dry.

☐ Don't attempt to cross rain-swollen streams; they will recede rapidly rain precipitation stops. The wait can save your life!

It was already almost 10 p.m., and, except for the light of the silvery moon, the place was becoming dark. I started to hear sounds I normally don't hear in the daytime: owl hoots, crickets, and other strange sounds. I had been walking for hours, and my shirt already was soaked in sweat. To assuage my hunger, I reached out into my mushroom pack and started eating the meadow mushrooms I had gathered earlier. I decided to stop to catch my breath and take a rest beside a murky pond. To quench my thirst, I knelt to the ground and drank from a pond.

In the meantime, my wife had called 911 only to be told the police officers could not help as they were not familiar with the forest. She then got connected to the Department of Natural Resources. As luck would have it, the ranger who was familiar with the woods and the rugged terrain was at home, ready to go to bed. It was 11 p.m. Fortunately my cellphone was still working and I was able to speak to the ranger and describe to him my location and certain landmarks I noticed along the way. Because it was already dark, I told him to postpone his search for me until the next morning when there would be more light. I told him I will just try to rest and catch some sleep in the woods. He informed me that there were bears, bobcats, and ticks in the area and, for my own safety, it would be best for me to get out of the woods. He instructed me to blow my whistle every 10 minutes.

Andreas Kunze

Chanterelles are quite attractive — and so tasty they'll have you heading off trail and potentially into danger if you're not aware of your surroundings and wanderings.

After the ranger determined where I was, he started walking in my direction. In the meantime, I tried to build a fire the old-fashioned way by rubbing sticks together. But because the wood was not dry enough and I had very little energy left, I had no success in building a fire. I sat on a log for hours, blowing my whistle intermittently. At about 3 a.m., I saw light emerging from the darkness. It was from the ranger's flashlight. The ranger had found me. I thanked him profusely and we started the trek back. We walked up and down the mountains, crossed creeks, and followed narrow paths by the edge of deep ravines. Halfway through our hike, his flashlight died, and, for a while, it was pitch dark. Luckily, he carried a spare flashlight, and we resumed our walk through the forest until we got to his car where another ranger was waiting for us

We all drove back where my wife and daughters were anxiously waiting. They were, obviously, happy to see me. As soon as we arrived home at about 6 a.m., we offered a prayer of thanks. The following day, I drove to the ranger's office and left some presents for the two rangers as a token of my appreciation for their help.

The above experience taught me some valuable lessons: When exploring unfamiliar woods, it is advisable to take mental notes of landmarks along the way. so you can use them as guide post on the way back; bring food, such as energy bars, clean drinking water, matches, a first aid kit, a whistle, a flashlight, a knife, a compass or a GPS, etcetera; know wild edible plants, fruits, and fungi, which could be sources of food. In short, it is always wise to adopt the motto of the Boy and Girl Scouts: Be Prepared.

It's Your Newsletter

Write for *The Sporophore* or Send in Your Photos, Article Ideas, and More

The Mycological Association of Washington is a volunteer-run organization. Help make *The Sporophore* the best it can be with your submissions.

Review mycology books, films, events, and more. We always need volunteers to provide event and meeting summaries. Email newsletter@mawdc.org for more information.

Get Social

MAW is on Facebook. Find us at www.facebook.com/MycoDC.

Now in Full Color

Many of the bright colors used in *The Sporophore* aren't available when we print in black-and-white. Get the full color version at www.mawdc.org.

Continued from page 1

Stu Phillips

The Pleurotus genus is divided into several major groups that correspond to geography. The *Pleurotus ostreatus* above was found in the United Kingdom.

ment. Oyster mushrooms have an affinity for hydrocarbons, the polymeric backbone molecules of many industrial compounds, notably those derived from petroleum. Mushrooms in general and oyster mushrooms in particular also concentrate heavy metals, affording a means of agglomeration to facilitate extraction.

Stamets continues with a eulogy: "If one mushroom can steer the world on the path of greater sustainability ... . And helping communities integrate a complexity (of) waste streams, oysters stand out." However, it is probably best not to conflate the mycoremediation and food production aspects of the oyster mushroom, as concentrated heavy metals and degraded petroleum would certainly have some deleterious health implications.

The changes in the taxonomy of the oyster mushroom over the last 10 years have been profound. As a benchmark, the 2004 second edition of *Mushrooms* by Chang and Miles provide that "more than 1,000 species of the oyster mushroom have been described throughout the world, in more than 25 related genera. However, only approximately 50 valid species are recognized in the genus Pleurotus." These populations were defined according to the taxonomy of the Linnaean system wherein the generic relationships between living things are determined from their structure. The species to which an individual organism was assigned within the genus was defined by the ability to interbreed — that is to mate and produce fertile offspring.

As it turns out, there are two problems with the Linnaean logic when applied to fungi. The first is that physical appearance is not necessarily an indication of relatedness; DNA similarities are a far more direct indicator — something not known 10 years ago. DNA analysis of fungi has revealed organisms can have the same structure are be found to not be related and organisms that are related can have significantly different structures. The second problem is, in the Kingdom Fungi, interbreeding is not a matter of male and female as it is in (almost) all other living things. According to Nicholas Money in *Mr. Bloomfield's Garden*, "sexual behavior in mushroom-forming fungi spans monogamy and civility, to group sex and slaughter."

So where does that leave the question of oyster mushroom identity? In a 1996 paper entitled "Recent Advances in Molecular Systematics of the Genus Pleurotus," Duke Mycologist Rytas Vilgalys et. al. reported on both the phylogenetic (DNA) and mating compatibility of oyster mushrooms. DNA analysis tracks the evolutionary history and relationships of different individuals by evaluating the degree of matching between genomes. These studies revealed that oyster mushrooms have "considerable genetic diversity," and the Pleurotus genus was genetically divided into "several major groups that correspond to — geographical provenance." The *P. ostreatus* clade was determined to be a major taxonomic subdivision, found mostly in the northern hemisphere and appearing "to have evolved relatively recently, possibly since the Pleistocene."

The mating studies referenced in the review were much more involved. The only way to tell if two fungi are of the same species is to put a spore from each of two different fruiting bodies in a growth medium like agar and see if the hyphae that emerge join together to form a dikaryon. (A dikaryon is a cell with two different nuclei from which the phylum name Dikaryomycota originates; karyon is the Greek word for nut, and, in the lexicon of biology, it is the nucleus of a cell.) The analysis in this case was to demonstrate hyphae that did not interact were different species, members of unique intersterility groups; there are a total of 15 intersterility groups in the genus Pleurotus worldwide (vice the 1,000 — or maybe 50 — cited above in 2002). In addition to *P. ostreatus* found mostly in eastern North America, and *P. pulmonarius* found mostly in western North America (both are also found in Europe and Asia), there are six other North American intersterility groups or species.

Vilgalys concludes with the recommendation that the mating

Continued on page 4

MAW Board of Directors

Oyster Mushroom (cont.)

Continued from page 3

studies be used for the classification in subsequent research and points out that "frequent name changes are inevitable as new information about species comes to light." The answer to the question posed about oyster mushroom identity is that it is still a moot point.

One intriguing possibility as a means of establishing the defining characteristics of oyster mushrooms outside phylogenetic DNA analysis and mating studies has been suggested. According to Peterson et. al. on the University of Tennessee Mycology Lab website, "many visible characters have been used to circumscribe the genus, but few have proven worthwhile." These incomplete characterizations include the location of the stipe or stem (some are centrally located instead of on one side), the white color of the spores (some are violaceous) and the gill attachment to the stem (some are decurrent), extending down the stem (some have a partial veil).

Hiker's Notebook Website
MAW Secretary William Needham publishes www.hikersnotebook.net, a wiki site full of articles like this one, focused on things hikers often will see on the trail. The articles are organized into several categories such as fungi, plants, trees and shrubs, creatures great and small, and geology and earth sciences.

The proffered singular defining characteristic of the oyster mushroom clade is the formation of "nematostatic microdroplets." Nematodes are small, ubiquitous (about 80 billion per acre) roundworms that permeate the soil; a nematostatic compound paralyzes them. According to Bryce Kendrick in *The Fifth Kingdom*, Pleurotus fungi "secrete a substance that rapidly inactivates nematodes, allowing the fungus to colonize their inert bodies. Since Pleurotus species are often primary colonizers of dead wood, a substance notoriously deficient in nitrogen — the nematodes may be an important component of the fungal diet." The toxin has been identified as trans-2-decenedioic acid.

The oyster mushroom as nematode predator is not unique, as there are a number of carnivorous fungi, including *Coprinus comatus* (the Shaggy Mane) and *Stropharia rugosoannulata* (the Wine-Cap Stropharia).

It should really come as no surprise that mushrooms eat worms. Fungi have had to struggle to survive against the difficult odds of being immobile like plants but without autotrophic abilities. Fungi are heterotrophic — they must get their food from another source without being able to go look for it. This has resulted in high evolutionary pressures to forge new chemistries for survival — of which nematostatic acid is only one.

Oyster mushrooms also synthesize lovastatin, a statin-type drug that has been used for cholesterol reduction therapy for cardiovascular disease since its approval by the FDA in 1987; it is marketed by Merck as Mevacor. It is not clear why oyster mushrooms generate statins, but it likely has something to do with survival — to eat and not be eaten. Fungi in general and oyster mushrooms in particular are masters of forging enzymes. They represent a nearly untapped resource of natural chemical experimentation that has endured for millennia.

Renew Your Membership

MAW is now collecting 2014 dues. Don't delay. Dues ensure MAW can book the best speakers and send out *The Sporophore*, among other benefits.

Dues are $20 per person or $30 per family.

Pay Membership Chair Barbara Karpas at a monthly meeting or mail a check made out to "MAW" to: MAW Memberships, 6916 Westmoreland Ave., Takoma Park, MD 20912. MAW also accepts dues online through Paypal. Visit www.mawdc.org/paypal.html for details or contact memberships@mawdc.org.

Scholarship Update

MAW scholarship recipients will speak at an upcoming meeting.

In 2013, MAW promised several members scholarships to complete a mycology course or laboratory at the National Institutes of Health. In the lab, students learned to identify mushrooms in the field and laboratory using identification keys and microscopic features. They then studied samples from these mushrooms and learned and carried out the process for extracting, amplifying, verifying, and analyzing fungal DNA.

As of December 2013, the five students on MAW scholarships successfully finished the coursework; they will soon speak about their results at a club meeting. These members' experience should help MAW develop a better protocol for assisting the North American Mycoflora Project.

Species Lists

Help MAW populate and distribute species lists from forays.

The tagline of the North American Mycoflora Project is "Without a sequenced specimen, it's a rumor." While MAW doesn't yet have the resources and processes to sequence mushroom DNA, a first step in the right direction is teaching members to identify mushrooms and documenting those finds.

Several members teamed up to make MAW's official foray species lists available to the public on the Mushroom Observer website (www.mushroomobserver.com). Here, identifications easily can be updated, changed, referenced against other finds around the world, and used in many other ways. The club invites you to check out the species list from the 2013 Camp Sequanota Foray at http://bit.ly/1deE9rk and contribute your own observations.

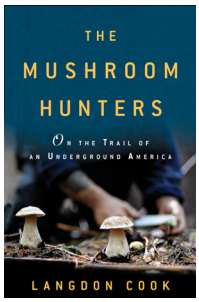
Observation Changed

Cuphophyllus virgineus (Wulfen) Kovalenko (156996)
Camp Sequanota, Somerset County, Pennsylvania, USA
2013-09-29: Mycological Association of Washington (MAW member)

Consensus changed from:
Cuphophyllus (Donk) Bon
last week, 2014-01-03

Review: Mushroom Hunters

Connie Durnan
NAMA Liaison



Did you ever wonder where the morels, chanterelles, porcini, and other mushrooms that reach the market come from and who picks them? These answers and more are in Landon Cook's book *The Mushroom Hunters: On the Trail of an Underground America*. Cook teams up with some very eccentric people and joins them on some risky, exciting foraging.

The knack for buying from pickers and getting mushrooms to the market as expeditiously as possible doesn't come easy. This obviously is a very competitive market. Learn how the buyers race to the strategic locations, outbid each other, package the mushrooms, and get them to the airport for transit. Not all foraging is legal, and one must be careful as to whose territory you are invading (Does this sound familiar?) I found the book a fun, educational read. Thoroughly enjoyable.

Connie's copy of this book soon will be available through the MAW library.

Radio Bonus
In September 2013, The Diane Rehm Show, hosted on local NPR station WAMU 88.5, interviewed Langdon Cook. Check it out at http://bit.ly/1jexQK9.

Inspire Interest in Mycology

MAW and NAMA will host a booth about fungi at the USA Science and Engineering Festival held at the Walter E. Washington Convention Center in Washington, D.C., April 25-27.

Contact NAMA Liaison Connie Durnan to volunteer at this unique event.

MAW will need volunteers to work a table where students and educators can learn about research and applications of fungi. Learn more about the festival, billed as the "most compelling, exciting, educational and entertaining science festival in the U.S." at www.usascience festival.org.

Pidpenky Pierogi

6 cups flour (unbleached "hard winter wheat" works best)
2 tablespoons vital wheat gluten flour
1 egg (beaten in a measuring cup)
water (add water to the egg to equal 2 cups and beat again)
¾ cup vegetable oil
2 lbs honey mushrooms (pidpenky)
olive oil or butter
3 cloves garlic
1 onion
thyme
salt and pepper

First, create the dough. Mix the flour, vital wheat gluten, vegetable oil, and water and egg mixture together. Knead a few times and form the dough into a ball. Allow the dough to rest for half an hour or more so the gluten can develop.

Prepare honey mushrooms your favorite way. Some people prefer to parboil honey mushrooms, though this step is not entirely necessary. You can opt to use the stems or discard them, depending on your taste. Your end product should be a well-cooked and finely chopped mushroom mixture. (I chop my mushrooms first, including many stems, and saute them in olive oil or butter with onion, garlic, and thyme.) It's important to allow the mushrooms to lose as much liquid as possible. Season to taste.

Once the dough is pliable and the mushrooms are cool, you're ready to roll out a pierogi. Cut a portion of dough about the size of a tennis ball, and roll it out into a sausage shape. Cut smaller pieces of dough, about 1 tablespoon each. Roll out each of these small pieces into an oblong or circular shape about 3 inches in diameter.


secretlondon123

To fill a pierogi, cradle the dough in your palm and spoon a small amount of the filling into the center. Fold the dough in half and pinch the edges closed, being careful not to include too much air. Place finished pierogis between two clean tea towels to keep them moist before boiling. (You also can put them in the freezer at this point, later transferring them to zip-top bags.)

To cook, bring a pot of water to a boil and drop in about six pierogis. Stir them gently to keep them from sticking. When they float for several minutes, they are done and can be removed. Toss them with vegetable oil and skwarki (fried bacon and green onions), if desired. Alternatively, they can be pan-fried or deep fried. They're delicious with sour cream.

This same dough recipe can be used to make other types of pierogis, including potato and cheese (just fill with a drier version of cheesy mashed potatoes), sauerkraut, beets, spinach, meat, or fruit.

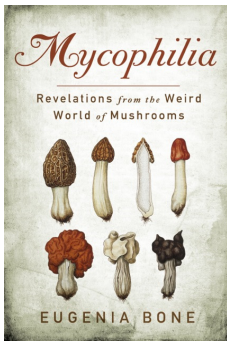
(Recipe contributed by Sporophore Editor Willow Nero, from her great-great aunt Lidia.)

Meeting File

Nov. 5 — Eugenia Bone Shares the Secrets of Mushrooms From an Epicurean Perspective

Willow Nero
Sporophore Editor

Eugenia Bone, a nationally recognized food writer and lecturer and president of the New York Mycological society presented key insights gleaned while researching her forthcoming book *The Kitchen Ecosystem* at the Nov. 5 MAW monthly meeting. Previously, Bone wrote and researched *Mycophilia: Revelations From the Weird World of Mushrooms*, and her familiarity with fungi goes way back with the New York club.



Bone's expertise in mycophagy was evident as she encouraged members to get to know the mushrooms they eat — their habitats, their biology, and the ways they've been hunted and prepared through history.

Bone suggests starting by identifying the type of mushroom you're after — a decayer, a mutualist, or a pathogen.

Most mycophagists don't eat pathogens, with the exception of huitlacoche, also known as corn smut, which is the truffle-like result of a fungi attacking corn kernels. Instead, almost all cultivated mushrooms found in stores are decayers or saprobes, which are easy to grow. "All you have to do is give the fungi their preferred food and temperature and they grow," Bone said. "Agaricus bisoprus [the common button mushroom] turns poop into protein in a matter of weeks." Other examples of common grocery store mushrooms include oyster mushrooms, pom poms, hen-of-the-woods, and royal trumpets.

As many of these mushrooms also are found in the wild, it's interesting, Bone noted, that some of the wild counterparts taste markedly different for good reason. "The wild maitake is accessing a buffet of mineral and organic material," she explained.

The mushrooms that cost the most tend to be those that have developed mycorrhizal relationships with certain types of trees. Commercial growers have tried to mimic these conditions and grow "wild" mushrooms, though they're usually unsuccessful except for with a handful of species. So the hunt continues for forest mushrooms, especially matsutakes and white truffles, two of the most prized varieties in the world. The matsutake, which tastes somewhere "between dirty socks and red hots" at the same time, attracts more than 1,000 growers to the West Coast each season and represents the largest cash business in the U.S. The white truffle has a following all its own.

"In Italy, knowledge of white truffle grounds takes precedence over property rights," Bone said.


Huger Foote

As the most expensive food in the world, it's inspired both food bans and pheromone perfumes. Don't try that perfume though, Bone warns. Instead of making you irresistible to the other sex, it inspires a heady desire to eat truffles.

With the help of an Italian cousin, Bone researched truffle oil and learned the oil is a bit of a scam that didn't exist before the 1980s and the advent of the chemical bismethylthiomethane. Chemists don't even have to touch a truffle when cooking up a truffle oil with this compound. While that makes the $30 oil a rip-off, it's a good thing you didn't shell out for a bottle with the real thing in the bottom. Truffles are really only good for about four days during which they give off a wonderfully potent scent. You can make all the real truffle oil you want during this period, but after three days it's gone.

Once you know what you're dealing with — a naturally delicious wild mushroom or a commercially grown but acceptable type — it takes some biology to learn how to

Upcoming Events

Feb. 4 — monthly meeting. Speaker: Ophelia M. Barizo presents "Fuel from Fungi and other Emerging Fungal Research."

March 4 — monthly meeting and election of new board members.

April 8 — monthly meeting.

April 25-27 — USA Science and Engineering Festival, Walter E. Washington Convention Center, Washington, D.C. MAW and NAMA will host a booth about fungi.

May 6 — monthly meeting.

MAW Tasting Event — This year's tasting again will be held at the GMU Nutrition Kitchen in Fairfax, Va. The date has yet to be announced.

Aug. 8-10 — Third Annual Joint Appalachian Foray, 4-H Center, Front Royal, Va. Mark your calendar, and be on the lookout for registration information.

Monthly meetings are held on the first Tuesday of each month at the Kensington Park Library in Kensington, Md.

Forays

MAW regularly holds forays in the D.C. area. Many forays are announced on short notice. Check the listings at Meetup.com/MAWDC-Public or email forays@mawdc.org to receive email notices.

Next up: morels. Start checking your favorite morel patch in mid to late March. Don't miss an early bloom of these tasty, elusive ascomycetes. Share your photos on Facebook (www.facebook.com/MycoDC), MAW's Meetup.com photo albums, Mushroom Observer, and/or the MAW-Mail Yahoo group.

best prepare fungi.

For starters, think of mushrooms as the fungi's organs of reproduction — the fruit or flower. Find moist, firm, and insect-free specimens.

"Treat them like you would a raspberry," Bone instructs. "Keep them in a dry bag in the fridge until you cook."

In cooking, it's important to remember mushrooms have many characteristics of meat. They contain all nine amino acids, making for a complete protein, and they tend to have an umami meaty savoriness.

"When you're cooking them, I suggest you cook them like meat — grilling, roasating, baking, not adding them to soups or a vegetable saute until the end," Bone said. "Cook them separately to retain that caramelized, savory quality."

Vegetarians do often replace meat with mushrooms, though it takes quite a few to fulfill the dietary requirements meat provides.

"For the rest of us, mushrooms are just a great source of fiber because that chitin's going right through you," Bone added.

"If you understand the biology of the foods you eat, your mycophagy will benefit. It's like taking the locavore movement to the next level. It's marvelous to know the organism itself."

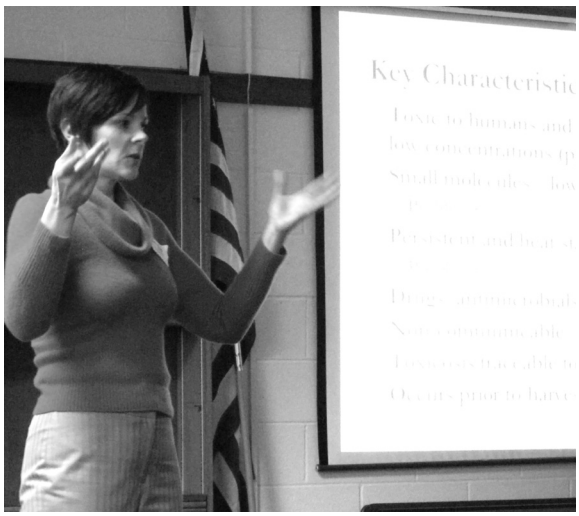
Dec. 3 — Britt Bunyard Introduces Plants and Their Mushroom Partners

Britt Bunyard, the founder, publisher, and editor in chief of the mycology journal *FUNGI,* which has the largest circulation of any mycological publication in North America, presented "Mycorrhizatopia: Enter the World of Plants and Their Mushroom Partners, at the December MAW meeting. His discussion presented the latest understanding of how plants grow and in most, if not all, cases they enter into obligate partnerships with mushrooms and other fungi. Put another way: some fungi farm plants for a living. This is why most of our treasured edible mushrooms are not cultivatable — but knowledge of how they grow greatly increases your chances for success in finding them in the forest.

Jan. 7 — Shannon Nix Reveals the Realm of Mycotoxins, the Harmful Mycelial Byproducts in Our Food Supply

Willow Nero
Sporophore Editor

At the Jan. 7 MAW meeting, Dr. Shannon Nix, , professor of mycology at Clarion University, presented "Molds and Mycotoxins: A Biological & Historical Perspective."



"One of the questions that has intrigued me is how are these organisms so good at their job?" Nix said, explaining her interest in fungi and her research topics in particular.

Nix focused her presentation primarily on mycotoxicoses that are easily confused with mycoses such as ringworm. Mycotoxicoses are caused by secondary metabolites known as mycotoxins. These low molecular weight compounds cause toxic effects at low and concentrations. Think of them as "waste compounds," Nix said. They're excreted into the environment and not used by the fungus directly. They're often confined to a specific species or strain. Hundreds have been identified, some of which have pharmacological importance.

Some key identifiers of mycotoxins include:

☐ they cause toxicity to humans or other vertebrates at a very low concentration;

☐ they're comprised of small molecules with low molecular weights;

☐ they are persistent and heat stable;

☐ drugs and antimicrobials are not effective in their treatment;

☐ they are noncommunicable;

☐ the toxicosis is traceable to food or feed; and

☐ the onset occurs prior to harvest and/or during storage.

Generally, these mycotoxins have shown up in certain crops going back hundreds of years. The feeds most susceptible include corn, wheat, barley, oats, peanuts, sorghum, rye, and cottonseed.

"Fungi are excellent at causing diseases in plants," Nix added, explaining plants unfortunately inhabit environments also favored by fungi: moderate temperatures of 40 to 90 degrees F with humidity higher than 70 percent, moisture levels of 22 to 25 percent in grain, and oxygen levels of 1 to 2 percent. That's almost exactly the conditions most grains are stored under in much of the developing world. In developed countries, grains can be stored in climate-controlled environments and they also are more rigorously tested for mycotoxins.

The ubiquitous nature of many mycotoxins, combined with their acute and chronic health effects makes them a real menace. They're deadly; sometimes teratogenic, estrogenic, and carcinogenic; and they affect 25 percent of the world's crops each year, causing about 1 billion metric tons of crops to be lost each year or $500 million to $1.5 billion in damage each year in the U.S. alone.

Among the most common fungi causing these problems are:

☐ Claviceps purpurea — secondary metabolite: ergot alkaloids

☐ Aspergillum spp. — secondary metabolites: aflatoxins, ochratoxin

☐ Fusarium spp. — secondary metabolites: zeararelenone, fumonisins, trichothecenes, HT-2, diacetoxyscirpenol, T-2, and vomitoxin

☐ Penicillum spp. — secondary metabolites: citrinin, ochratoxin, and patulin

As for the big question as to why fungi produce these deadly extraneous compounds, including many hallucinogenic compounds, "This is really a conversation to have over your favorite secondary metabolite," Nix concludes.


USA
10
So we have four mycology grad students
who want an experience finding mushrooms.
Jim Sherry