



The Toadstool Review

OFFICIAL NEWSLETTER OF THE MMS, A SOCIETY FOR THE STUDY OF MUSHROOMS AND OTHER FUNGI

PRESIDENT'S MESSAGE



By
John Lamprecht

Within this past year we have seen the passing of two of our longest standing members, James Swanson and Doris Johannes. While we grieve at their passing, we also take joy in their legacy of teaching and sharing their knowledge and experience, and in lives well lived. At Doris' memorial service her daughters talked about her love of mushrooms and how sharing her knowledge and enthusiasm has stuck with them...and how she would have commented on all the mushrooms that had fruited, which were obvious to all who walked to the small chapel.

It has been a fabulous fall for variety and numbers. Our Nerstrand foray on Labor Day weekend had greater numbers of attendees and edibles found than any in my experience, and also resulted in many fabulous discoveries and learning opportunities. Many new members and some of our more experienced members took great pains in working to identify what was found, with many edibles, dangerous look-alikes and other interesting fungi classified and safely handled. I want to thank our foray leader, Lee Moellerman, identification expert Ron Spinosa, and all those who took a lead role in identifying and guiding folks to correct identifications, and in providing the necessary healthy cautions about the dangers of "getting it wrong."

This is an area where we cannot let up in providing and reinforcing that healthy

fear of "getting it wrong." I know there are few things I hate more than throwing up, and this, along with diarrhea, are some of the minor results of a mistaken identification. Minnesota is home to a few of the most dangerous mushrooms, and some that may lead to a hospital or emergency room visit. When we start to gain that knowledge of how to go about a correct identification we take joy in that freedom, but also there is a responsibility..."**knowledge is power**" but we need to stay dedicated to learning because "**knowing just enough to be dangerous**" is not where we want to stop.

This brings me back to our forays. Often there are casual observers, hikers, campers and the curious who happen by and ask questions. Politely answer their questions, but always add the cautions. Sure would hate to read about some folks trying wild mushrooms they were told were safe to eat by an "expert" they had just met, and that they got sick, or worse. Be sure and be safe. A healthy fear of eating wild mushrooms is not a bad thing...living in fear I believe is bad. Find that balance and err on the side of caution, and encourage others to do so.

One final reminder...our November meeting has two very important components, the photo contest and the election of officers. Information about both of these can be found in the following pages. Let's have good attendance at the meeting so you can participate in these important aspects of our club.

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FALL 2014

UPCOMING MMS FORAYS

Saturday, October 4, 10:00 am **Lyndon Cedarblade Park**

Go north on Hwy. 65 to Hwy. 22 (north of Ham lake). At the lights turn left (west) and go 8.4 mi to Hwy 47. Turn right (north) and go 8.7 mi to Isanti 8. Turn left (west) and go 1.4 mi and park on left side (south). (Note: primitive woods, no facilities). Alternate route: 169 north to Zimmerman turn right (east) on Sherburne Co.4; at lights follow straight --- when hwy. changes to Isanti 8 go 5.5 mi -- park on right side (south).

Saturday, October 11, 10:00 am **Linwood Lake Landing**

Take I35 north to the Wyoming (#135) exit. Go left (west) on Hwy 22 about 5 miles. Look for a sign for Linwood Lake Landing on the left side of road (before you get to the large Linwood Pizza Man statue and outlet). Turn left into the Linwood Lake Landing parking area.

UPCOMING MMS MEETINGS & EVENTS

October 6th, 7:15 pm

Mushroom identification meeting
110 Green Hall, U of M St. Paul Campus

This will be the last mushroom ID session for 2014. Bring in your mushrooms and learn how to identify them.

October 27th, 7:15 pm

Annual MMS Mushroom Potluck Dinner
126 McNeal Hall, U of M St. Paul Campus

See pg. 4 for details and map.

Please note: This is a members-only meeting

November 10th, 7:15 pm

Annual business meeting, 2014 MMS Photo contest, election of officers, and Golden Chanterelle nominations

110 Green Hall, U of M St. Paul Campus

We will be viewing photos and judging contest entries (see pg. 3 for details). There will also be the election of officers and nominations for the Golden Chanterelle Award

December 8th, 7:15 pm

MMS Holidays Celebration and Sale
110 Green Hall, U of M St. Paul Campus

Treats and bargains! Mushroom books, T-shirts, hats, bags, etc., at great prices. Come and celebrate. There will be a silent auction! Please consider donating dried mushrooms for the auction. You may bring finger food.

2014 MMS Photography Contest

All MMS members are invited to enter the 2014 MMS photo contest. The entries will be viewed and judged by the members present at the November general meeting. The deadlines are: digital entries: Oct. 31; hard copy entries: Oct. 28.

2014 PHOTO CONTEST GENERAL RULES

- All photo entries will be judged as digital images in jpg format (hard copy entries will be scanned first).
- Entries are limited to 5 per category, per member.
- Entries are required to be the work of the member while an active member of the MMS.
- Entries are not limited to a particular locale for any category.
- An entry can be entered in only one category, however a given subject or specimen can be entered in additional categories if the additional photo is obviously significantly different or unique.
- By entering a photo the entrant agrees to allow the MMS to use the photo for MMS purposes, although the photo remains the property of the entrant. Previously copyrighted or published photos, which would violate this agreement, must be excluded.
- Contest coordinator may suggest a change in the category of an entry that appears to be mistakenly entered.
- All entries must be labeled to genus and species for the Technical/Scientific and Pictorial categories.
- First, second and third place winners for each category and division will be judged by the members present during the November MMS meeting.
- Entrants can win only one prize in each category.
- Honorable mention is for other entries in each category that receive particular interest during the voting, but do not place in the top three. Photos and artists will be acknowledged during the award Powerpoint presentation.

SPECIFIC GUIDELINES FOR EACH CATEGORY

Pictorial:

Quality of the photo is the primary criterion, with particular attention given, but not limited to the following:

- Overall composition
- Lighting, clarity, depth of field, etc.
- Aesthetic quality
- Artistic creativity
- A photo worthy of being on a calendar, greeting card or poster

Technical/Scientific:

Entries should provide as much photo information as possible to scientifically identify the fungus:

- Show key features for identification
- Show a typical example of the species
- May show various stages of development
- May be in the form of a single photo, multiple photos in a grouping, or as one entry in a collage
- Rare or unique species will receive extra consideration
- Should be of sufficient quality to be included in a field guide

Other:

- A high quality photo that does not fit well in other categories, or depicts a unique size, shape, grouping or example of a unique mycological phenomenon.

Activity/Humor:

- Photo may depict any mycological event or associated activity, with special consideration given to MMS, NAMA or other mycological association-sponsored activities
- Humorous entries or those showing "oddities" should be of special interest because of the photo content and text applied to the photo
- Quality of the photo is important

Digital images: Email as an attachment, or send a link from a photo sharing website to: Jessica Kohen, Photo Contest Director: photos@minnesotamushrooms.org. Deadline: Oct. 31st

Hard copy images: Mail to: MMS, PO Box 211444, Eagan, MN 55121. Deadline: Oct. 28th

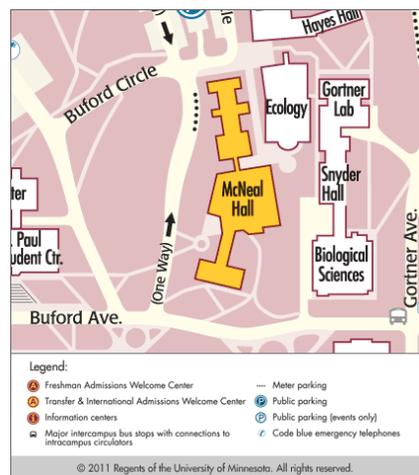
2014 MMS Annual Potluck Dinner

The 2014 MMS Annual Potluck Dinner will be held on Monday, Oct. 27th, at 7:15 in 126 McNeal Hall, on the U of M St. Paul Campus.

In preparing a dish for the potluck, please remember to use only one of the species of wild mushrooms listed below, and only use one wild species per dish. Dishes with any other mushrooms will not be accepted. Commercially purchased mushrooms and non-mushroom dishes are also welcomed. No Honey Caps, please!

Acceptable wild mushrooms (one per dish):

1. Puffball, Large - *Calvatia gigantea*
2. Puffball, Small - *Lycoperdon perlatum*
3. Oyster - *Pleurotus ostreatus*
4. Sulfur Shelf - *Laetiporus sulphureus*
5. Hen of the Woods - *Grifola frondosa*
6. Morel - *Morchella elata & esculenta*
7. Shaggy Mane - *Coprinus comatus*
8. Chanterelle - *Cantharellus cibarius*
9. Black Trumpet - *Craterellus cornucopioides*
10. King Bolete - *Boletus edulis*
11. Lobster - *Hypomyces lactifluorum*
12. Hedge Hog - *Hydnum repandum*



MMS November Elections

Our club is 100 percent volunteer, and the leadership is no exception. Our board is made up of a mixture of officers elected by the membership, and several committee chairs and officers necessary for the smooth operation of the club who are selected by the president. All elected officer positions are up for election at the November meeting. The election is held during the meeting, and all members present may vote. If current officers desire to remain and there are no other nominations, selection can be by simple acclamation; but if there are several candidates, they will be asked to speak on their behalf, and a paper ballot will be used for those positions.

Nominations are encouraged ahead of time, or at the meeting, with the nominator speaking on behalf of the candidate, and with each candidate and incumbent also having a chance to speak. Ballots will be turned over to our General Council and Past President, or at least two board members not involved in the election, for tabulation, and the results will be announced at the meeting.

Board positions up for election are:

President
Vice President
Corresponding Secretary
Recording Secretary
Treasurer
Member-at-Large 1
Member-at-Large 2

If you have nominations, contact John Lamprecht: jml313@aol.com

MMS at the State Fair

Photos by Brenda Harvieux

Each year, we are amazed and delighted by our wonderful volunteers who make the MMS State Fair Display such a success.

This year is no different. The Minnesota Mycological Society wishes to thank these volunteers for contributing to the 2014 State Fair Display...

**Barry Beck
Charles Collins
Glen Creuziger
Betty Jo Fulgency
Bob Fulgency
Jon Gamble
Colleen Haney
Angelika Kat
Keith Kleinschmidt
Delia Lam
Claudette Lamprecht
John Lamprecht
Martha Laudert
Adele Mehta
Steve Netzman
Richard Pizarro
Adi Press
Greg Renstrom
Ron Spinoso
Marek Turowski
Kathy Yerich**



What We Did On Our Summer Vacation II

By John and Claudette Lamprecht

Having lived for some time on various places on the East Coast, we have long wanted to visit Maine. Our nephew and his wife planned on moving back there...Nancy is from Maine and she talked of its beauty. So when we were faced with using or losing a timeshare week, we found a spot on the southern coast of Maine for an exchange. We had months to wait so in that time we were able to make contact with members of the Maine Mycological Society. This is more to the point of this article. Your membership in the MMS makes you part of community of folks with a common interest, and it can be a valuable resource. Pick a spot, find the closest mycological society or mushroom club in the area, and make a contact. It can be a valuable resource and add a fabulous dimension to your vacation.



[Image credit: Claudette Lamprecht]

Upon contacting the Maine society we were given the names of several club members in the area where we would be staying, and it was suggested we contact them. We were also told of the laws and regulations regarding mushrooms, harvesting etc., and given several areas, parks and wildlife management areas as possible foray sites. Let me back up a bit. In my query to the Maine society, I mentioned our visit and MMS membership. I also said we were primarily interested in photos and seeing new things, and were not interested in harvesting vast amounts of anything. We made it clear we were not commercial pickers and were coming for a pleasure trip only. We were tourists who were interested in mushrooms, so posed no threat to their resources. This is important. None of us wants to give up our spots to folks who are going to go in and pick everything in sight.



[Image credit: John Lamprecht]

We contacted Louise Jaubert, a fairly recent member of the Maine society, and she was a great resource for more specific information about possible sites and regulations in the southern Maine coastal region. Better yet, she was free and very interested in going on a couple of forays with us. They had been blessed with some decent rainfall recently so there had been much to see in the past few days.

Prior to meeting with her, we tried out two sites she suggested. One was Laudholm Farm, a donated and converted farmstead with terrain ranging from seashore and tide marsh to mixed forest. A quick talk with the naturalist on staff and we were more than welcomed to survey what we could find, but "please stay close to the trails." We found over 30 species

just staying to the trail, most of which we were somewhat familiar with. Amanitas, russelas and boletes of various types were the dominant species. The second site is a popular hiking area called Mount Agamenticus that offered fabulous views of everything from the coast to the inland forests and highlands. There are several trails to choose from and we tried a couple. The highlight for us was vast numbers of Black Trumpets and a fabulous Frost's Bolete. We really could not walk more than a few feet without seeing something fungal. It didn't seem to matter which trail we took. Many hikers stopped to ask what we were taking pictures of and they too commented on all the mushrooms they were seeing.

The next day we met up with Louise and her Jack Russell terrier, Pinto. We headed off to Alewife Pond, a nature preserve she is fond of, and right away we started seeing mushrooms...and to our delight more black trumpets. Luckily we were going to hook up with our nephew and he had access to a dehydrator, so we started picking in earnest. We did not pick all that many, but it more than equaled all we had ever picked previously. We saw at least 100 different species...it was almost overwhelming. We also checked several other sites with Louise and got some more nice pictures...thank heavens for digital, because we took nearly 500 shots between the two of us.

From our trip it is obvious Maine has a healthy fungal population much like we enjoy here. But if we had not asked a few questions and made some contacts, we likely would not have had the experience. Reach out...the digital age makes e-mail a simple way to bridge the distance and, perhaps, make your trip even more memorable.

Photos from MMS Members

Photos by Denise Zerr, from 2014 MMS Foray at Nerstrand Big Woods State Park



Photos by Andrew Kishel



Leotia lubrica
found at Nerstrand Big Woods
State Park



Coprinus lagopus
found at Wild River State Park



Artomyces pyxidatus
found at Afton

Remembering Doris

One of the oldest members of MMS, Doris Johannes, passed away on Saturday, August 24th. She was 93 and died peacefully, with her youngest daughter by her side. The Minnesota Mycological Society was an important part of Doris' life — and her enjoyment of life — for many, many years, starting in the early 1980s. Below, Anna Gerenday recounts her memories of Doris, and we reprint an interview with Doris written about 10 years ago by Ron Spinosa.



Remembering Doris, by Anna Gerenday...

I will miss Doris. She and I were not close, but I always liked her. She was a straight talker, and you always knew where you stood with her. She was not one to hold back her opinion, and she never held back admitting when she was wrong or made a mistake. She would readily go along with changes in the club, but would let you know that she thought she would hate it, and later tell you how much she ended up liking it.

She loved collecting mushrooms, frequently visiting the property of her neighbor and bringing the edibles to membership meetings to share with the group. She herself did not cook mushrooms; “Dad doesn’t like mushrooms” she used to say. I think Doris did, but she did not want to cook for herself.

In those days MMS had a weekend foray at Deep Portage every September, and Doris was always there, collecting mushrooms, drinking beer and telling stories. When I joined MMS in 1988 Doris was Recording Secretary of MMS, an office that she

had by then already held for a number of years. She remained in that post until about 2003 or 2004. When I first joined the board as member-at-large, the board meetings were formal, based on Robert’s rules, and the meeting started with Doris reading the minutes every time. I remember being impressed by the detailed, accurate records she kept.

When she decided not to continue with the office of Recording Secretary she apologized, and explained that her other club, the one she called “the old ladies club” asked her to run for president; she agreed, she said, because she did not think they would elect her. They did, and we lost her to the “old ladies.” She did continue coming to meetings for many years, visiting her favorite hunting site, Lindbergh State Park in Little Falls, and bringing the edibles, and all that she thought would be interesting.

I will miss Doris. I will miss her stories and I will miss hearing the forest resound with her laughter.

Interview with Doris, by Ron Spinosa...

Doris: I was born in Herman, Nebraska, to Jessie and Delbert Raver. I was 7 years old when we moved from Nebraska to Chakio, Minnesota. I graduated from Chakio High in 1938.

I met my husband-to-be in 1940. He joined the army in the fall of 1940, and we were married at Corvallis, Oregon, in 1942. We had four children—three girls and a boy—and of course, many dogs and cats. When we moved to Ham Lake, where I now live, we had turtles, snakes and any other animals the kids could find.

I had about two and a half years studying to be an elementary school teacher. I only worked a few months, when my husband was going to school at University of Minnesota, sewing at Munsingwear, and as a barker at the fair selling kitchen gadgets. I also worked at American Linen, folding clothes and sorting wet wash. Not really a career, I guess.

Toadstool: Could you tell us about your interests and hobbies?

Doris: I belong to three bowling leagues, and I do a few tournaments. Right now I’m trying to win a Cadillac. I am also a TOPS member, hoping to get my weight down and keep it there. I was there once, so I should be able to do it again! I also enjoy backpacking in the BWCA, bicycling, crocheting, canoeing and fishing.

Toadstool: Tell us about some of your travels.

Doris: We hiked the Rockies in Canada, Banff, and Jasper. We also did many trails in the BWCA and a canoe trip on the Lewis and Clark Trail from Fort Kipp State Park to Fort Benton. Also many trips with the seniors from Ham Lake, including a cruise to Alaska for 11 days. **[cont’d on pg. 10]**

MMS MEMBERSHIP APPLICATION / RENEWAL FORM

Name _____

Name _____

Address _____

City _____ State _____ Zip _____

Phone (____) _____

Email _____

New Member _____ Renewal _____

Individual (\$20) _____ Family (\$25) _____ Student (\$15) _____

Send newsletter via email _____ postal mail _____
(Make check payable to MMS)

Optional: I want to join NAMA at the special MMS member- affiliated rate of:

\$24.00 for NAMA electronic newsletter _____

\$30.00 for NAMA print newsletter _____
(Include a separate check payable to NAMA)

Send application form, check(s) and release to:
Minnesota Mycological Society
P.O. Box 211444
Eagan, MN 55121

RELEASE

I (We) realize that when engaged in wild mushroom activities, serious physical injury and personal property damage may accidentally occur. I (We) further realize that there is the possibility of having an allergic reaction to, or being poisoned by eating wild mushrooms, and that the adverse reactions to eating wild mushrooms range from mild indigestion to fatal illness.

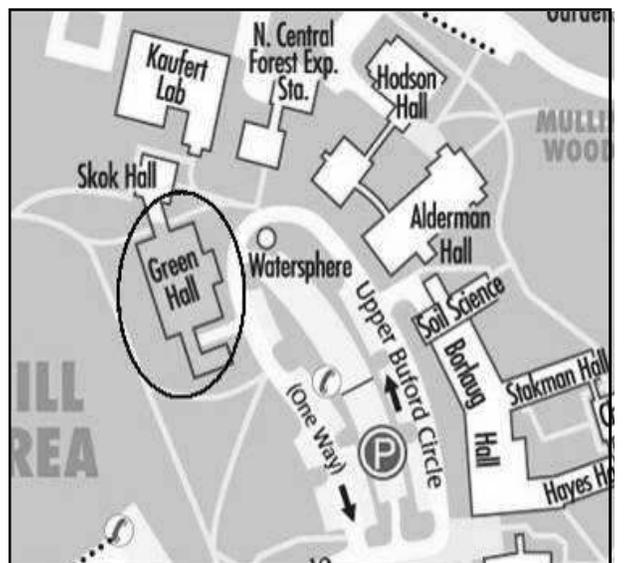
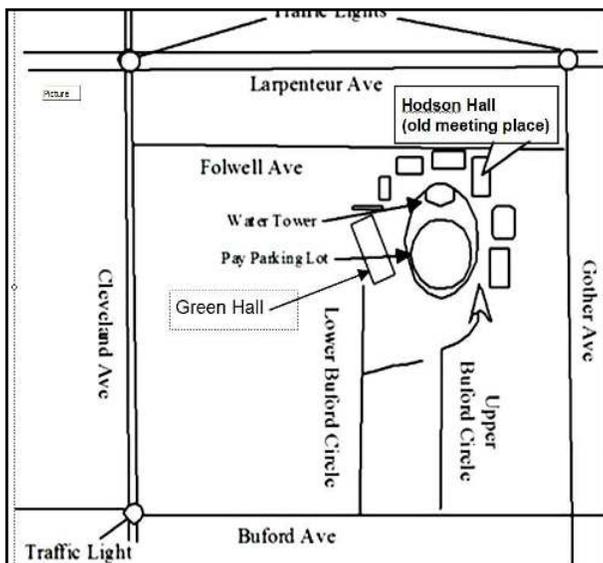
Knowing the risks, I (We) agree to assume the risks, and agree to release, hold harmless and indemnify the Minnesota Mycological Society, and any officer or member thereof, from any and all legal responsibility for injuries or accidents incurred by myself or my family during, or as a result of any mushroom identification, field trip, excursion, publication, meeting, dining or any other activity sponsored by the MMS.

Signature: _____

Date: _____

Signature: _____

Date: _____



The Minnesota Mycological Society meets the second Monday of the month in Room 110 Green Hall, on the St. Paul Campus of the University of Minnesota (unless otherwise noted). Meeting time is 7:15 p.m.

A Note from Arleen & Alan Bessette on the Safety of Boletes

As most folks are aware, mycological knowledge is ever expanding and changing - a dynamic, exciting world undergoing an explosion of new learning regarding boletes in general and, in this case, their edibility. Since the publication of our book, *Common Edible and Poisonous Mushrooms of New York* in 2006, the general safety of bolete edibility has come into question due to increased awareness of myco-toxic poisoning syndromes. This has rendered the three step "Bolete Rule" of safe consumption inaccurate, unwise, wrong.

Case in point: It is now known that some species of the genus *Leccinum* have been implicated in several reported cases of poisonings and at least one death. They do not have a red or orange pore surface, do not necessarily bruise blue and do not taste bitter. We (and others) now strongly advise people not to consume orange-capped *Leccinums* due to the difficulty of distinguishing one species from another. To safely consume a bolete (or any other mushroom) we advise that you learn to positively ID your specimens.

[Interview with Doris—cont'd from pg. 8]

Toadstool: What were some of the important events in your life?

Doris: Meeting and marrying my husband of 62 years, and having the four healthy kids we were blessed with—couldn't get much better than that.

Toadstool: How did you get interested in mushrooms?

Doris: I found *Amanita muscaria* and *Gyrometras* (as I found out later) on our many trips to the BWCA. My husband bought me a book by Margaret McKnight. I could never be really sure of my finds to try to eat them, even those she said were edible. One mushroom used to keep coming up in the yard where we had an old stump. I found out later it was a good edible (*Grifola frondosa* or hen of the woods), when it didn't show up any more.

Toadstool: How did you get involved with MMS?

Doris: They printed articles in the paper as to where their meetings were to be held. I attended a foray at Spring Brook Nature Center. I decided I should pay my dues, after I had attended a few meetings. I joined in 1985. Dick O'Conner was president then. Jeff Donahue and Lee Muggli made identifications of our finds as we brought them in, and they were passed around to look at. Each year I seemed to learn a few more. I learned how to key them out, at least getting many down to the species. I served on the MMS board of directors for a number of years and was also a local foray chairperson.

Toadstool: Tell us what you like about MMS.

Doris: The people are really friendly and are willing to help in any way, so that you can learn to identify mushrooms on your own. Anna Gerendey was really helpful. She tried to educate us so that we can identify some of our finds—easy for her, and she has tried to make it easy for us.

Toadstool: What is your favorite mushroom?

Doris: The sulfur shelf is nice, but I think I really like the gypsy and the blewit.

Toadstool: Do you have some especially memorable mushroom moments?

Doris: One was the year MMS hosted the NAMA foray at Isabella, Minnesota, (near the BWCA). It was in 1988. What a year for mushrooms! Of course, the blueberries were out then too. I found a nice patch of chanterelles, which went well with our banquet dinner of walleye and wild rice. Our overnights at Deep Portage were great as well. There were many trails within walking distance. We were asked to put on a really good display for park visitors, took them on forays, and told them how to pick and collect their finds. We gained a few new members and started a club chapter in the north country.

Toadstool: Anything else you would like to share with us?

Doris: I did find a few mushrooms that ended up in the University of Minnesota Herbarium. Erma Lechko and I shared one we found at Lindberg State Park.

Only a few members are with the society from the time when I joined. Many have passed away. Maybe I'm just getting too old. Neighbors still call me when they see mushrooms in the area, or leave them atop the paper tube if I'm not home. I have the entire neighborhood hunting mushrooms!

Toadstool: Thank you, Doris, for this wonderful profile. We are honored to have you in our society.

MMS Wild River Foray, July 19, 2014

Mushroom ID by:
 Ron Spinosa, Nick Jordan, Sarah
 Foltz Jordan, John Lamprecht,
 Claudia Lamprecht, Kathy Yerich,
 Marek Turowski

[Image credits: Kathy Yerich]



Get out the books!



Help from Ron



Megacollybia platyphylla

Agaricus placomyces
Amanita muscaria
Amanita bisporigia
Amanita vaginata
Boletus subtomentosus
Boletus pulverulentus
Clavulinacristata
Coprinusquadrafidus
Cortinarius unk. species
Gymnopus unk. species
Gyroporus cyanescens
Hygrocybe unk. species
Inocybe unk. species
Laccaria laccata
Laccaria amythestina
Lactarius atroviridis
Lactarius unk. species
Lactarius subsericatus
Lactarius unk. White species
Laetiporus sulphureus
Leccinum unk. species
Lentinellus ursinus
Lycoperdon gemmata
Megacollybia platyphylla
Mycena unk. species
Mycorrhaphia adjustum
Otidea onotica
Paxillus atrotomentosus
Phaeolus schweinitzii
Phelinus gilvus
Pluteus cervinus
Polyporus alveolaris
Polyporus varius
Polyporus betulina
Ramaria stricta
Russula densifolia
Russula laurocerasi
Russula flavida
Russula unk. species
Russula unk. species
Stereum ostrea
Strobilomyces floccopus
Suillus americanus
Tremellodendron pallidum
Tylopylus felleus
Xerampholina camponella
Xerula megalospora



Hard at work!



Impressive list!



Not Chanterelles—
Xerampholina camponella

Mycorrhizal Fungi

The Amazing Underground Secret to a Better Garden

By Douglas H. Chadwick

Throughout history, people's explanations of life involved all kinds of wonderful stories and complex philosophies. Facts just weren't really in the mix. That began to change with the rise of science. Scientific momentum picked up sharply during the 16th and 17th centuries. As scholars scrambled to collect and categorize exotic beasts and botanical wonders, they dreamed of piecing together a full portrait of nature.

Then, eyeglass lens-makers in the Netherlands assembled the first high-powered microscopes, and scientists looked closer at a few items that were right in front of them: soil, old bread and drops of muddy water. The world they had been trying to make sense of for so long suddenly seemed ten, a hundred, a thousand times more intricate, strange and beautiful — alive in more ways than anybody could have ever imagined.



A white fungal network called hyphae, not plant roots, is the principal structure for the uptake of many important nutrients in the plant kingdom. *Illustration by Michael Rothman*

The Microscopic World of Beneficial Microbes

We still define natural habitats primarily in terms of plants and animals, the two kingdoms of life we can see with unaided eyes. The greatest amount of biological activity and the largest diversity of species and genes, however, come from the other four kingdoms science now recognizes: bacteria, archaea (a less-studied division of life-forms formerly considered bacteria), protists (mostly single-celled algae and protozoans), and fungi. The vast majority of these members are microscopic in size. They cannot be seen with the naked eye, but we now know they permeate soils and suffuse waters. They drift en masse through air. They thrive not only on the surface of every plant and animal, but within them as well. From the upper reaches of the atmosphere to the bottom of the seas, down into the rock layers and outnumbering the stars in the known universe, microbes are literally the creatures that make Earth a living planet.

Microbes remain mostly in the “out of sight, out of mind” category of nature for a lot of folks. Others, chemical spray in hand, can hardly stop thinking about them, envisioning “germs,” mold spores and other unseen swarms poised to unleash disease and rot. Either way, a broader understanding of the life-forms that truly put the “bio” in “biosphere” has been slow to emerge. Interest is building, though, as the public learns more about the positive roles microorganisms play, including how some types can boost yields in gardens. These mycorrhizae — extraordinary fungi that interact with our garden crops — are what we'll be zooming in on.

Behind the Scenes With Beneficial Fungi

I'm a wildlife biologist. Decades ago, I visited a team working to restore streamsides churned to bare gravel by placer mining. They were planting willow and alder in hopes of stabilizing the banks and preventing further erosion. Other vegetation could then move in and once again shade the passing waters, cooling them for native trout and spawning salmon. I was already picturing songbirds returning to nest in the lush foliage while mink, otters, and bears patrolled the shores, except the normally hardy willow and alder wouldn't grow. They withered instead, and the banks stayed empty — until the team prepared the next batch to be planted by first soaking their roots in a broth containing certain fungi. This is common practice today. It wasn't then. Besides changing the way I've planted trees at home ever since, the visit made me realize that my view of the most important wildlife in ecosystems might be upside-down.

What is called a mushroom is merely the temporary structure some fungi grow to produce spores. The main body of a fungus typically consists of a network of fine-branching threads known as “hyphae.” While you'll sometimes see them massed together, spread like a web across a decomposing log, they're usually hidden underground and essentially invisible to us; the individual filaments are only a *single cell* wide. The network of fungal hyphae is called a “mycelium.” As it turns out, the largest known creature on Earth is neither a blue whale nor a redwood tree; it's the several-hundred-ton mycelium of one humongous fungus that's between 2,000 and 8,000 years old. Spread across 4 square miles of Oregon's Blue Mountains, the fungal network grows at an average depth of only a few feet. By contrast, the mycelia of most

Species are small, but they're as common as, well, dirt. If you pick up a pinch of soil almost anywhere, you'll have miles of hyphae in your hand.

Estimates for the number of fungi species run in the millions. Mycologists have identified close to 100,000 so far. Of those, nearly 6,000 interact with plants' roots. These are roughly divided into two types: those in which the fungus remains outside the root's cells (ectomycorrhizal fungi) and those that penetrate the root's cells (illustrated in the Slide-show: <http://www.motheearthnews.com/organic-gardening/mycorrhizal-fungi-zm0z14aszkin.aspx?SlideShow=2#axzz3EdUYbByt>)

The outcome in both cases is a continual exchange of goods. Ten to 20 percent of the sugars a plant produces through photosynthesis are absorbed by the mycorrhizae. In return, the fungus delivers many essential nutrients to the plant and increases drought resistance. Higher crop yields can be the result for gardeners. As the ends of the hyphae weave among soil particles via cracks and crannies too small for even the narrowest root hair, the mycelium becomes an auxiliary root system that's in contact with a subterranean volume of soil from several hundred to 2,500 times greater than what the plant could reach alone.

Plants routinely face a challenge absorbing enough of certain key elements, such as phosphorus, nitrogen, potassium and iron. Fungi don't face this obstacle; they produce specialized acids and enzymes that break the bonds that bind those nutrients to soil and organic compounds. Although we call this process "decay" and attach a morbid aura to the word, it's a lively enterprise. Gardeners recognize this decomposition from their compost piles. It's no surprise that a plant with hundreds, if not thousands, of miles of hyphae working on the plant's behalf to mine key nutrients and freight them back to the roots is able to grow faster, stay healthier, and ultimately yield more than it would without the fungi's partnership.

Plant Partners: How Mycelium Increases Plants' Nutrient Uptake

Polish scientist Franciszek Kamienski gets credit for discovering in the 1880s that the fungus and plant combination was in fact a symbiosis — a mutually beneficial partnership. A contemporary gave it the name "mycorrhiza," which is Latin for fungus-root. Don't get freaked out by the Latin. Just say it with me: *my-core-rise-uh*. The plural is mycorrhizae: *rise-A*.

At least 90 percent of all plant families are known to partner with mycorrhizal fungi. These associations can be between a single fungus species and a single plant species, but most plants associate with many species of fungi, and vice versa. Mycorrhizae are by no means considered the exception any longer. They rule. *Mycorrhizae, not plant roots, are the principal structures for most nutrient uptake in the plant kingdom.*

The first plants that colonized land some 400 to 500 million years ago were descendants of aquatic algae. According to fossil evidence, symbioses with fungi appeared shortly afterward. Some think they had already formed before the proto-plants even left the water. Either way, mycorrhizae would have greatly improved early plants' chances of adapting to the stresses imposed by the harsher and less predictable environments encountered on shore, especially since those plants hadn't really developed roots yet. In a sense, helping plants cope with the demands of life on land is what mycorrhizae have been doing ever since.

Although we think of fungi being most at home in deep, dank forests, they're surprisingly abundant in open shrublands and prairies, too. The outer walls of hyphae contain gluey compounds that cause fine particles of earth to clump together on and around the threads. This process is a major factor in building soil structure and making the ground less vulnerable to erosion. Mycelial networks also play a valuable role in sequestering buffer plant partners from the high acid content of peaty soils. In saline ground, the hyphae help safeguard their partners from high salt concentrations. Mycorrhizae can also protect plants from pests and diseases.

Mycorrhizal Fungi in the Garden

How can a gardener take advantage of this symbiotic relationship that plants and fungi have been developing for 400 million years? Microbiologist David Douds of the USDA's Agricultural Research Service has been studying that question for 35 years. His studies show that fungal inoculants can increase the yields of many vegetable and field crops, including leeks, peppers, potatoes, strawberries, sweet potatoes and tomatoes.

Inoculants can give transplants a strong start, but the main key to raising good crops lies in maintaining healthy communities of native mycorrhizal fungi in the ground itself. Douds cautions against heavy or frequent tilling and the use of chemical fertilizers (especially phosphorus) and soil-applied fungicides. These activities break apart, weaken or otherwise suppress beneficial microbes, including fungal mycelia. You can keep your soil in prime condition by minimizing disturbances apart from occasional light tilling, weeding and mulching. **[cont'd on pg. 14]**

How to Use Cover Crops and Other Techniques to Increase Beneficial Fungi Populations

An equally important step is to ensure that mycorrhizal fungi survive through winter and early spring. The kinds of mycorrhizal fungi that support many garden crops aren't capable of living and reproducing independently of their plant partners. In a carefully weeded and fully harvested garden, mycorrhizal fungi numbers can decline for lack of live roots to colonize. Douds advises avoiding empty beds by keeping plants, whether food crops or cover crops growing at all times. In fall, plant rye, oats or, Douds' favorite, hairy vetch. All of these plants have extensive root systems and readily harbor mycorrhizae. Rows of perennial onions and strawberries can also serve as reservoirs for overwintering fungi. Orchards don't require the same attention, but buffer strips of a grass-and-legume blend will help retain a mix of fungi.

Douds sows hairy vetch in September while his garden is still producing, targeting areas where the soil is accessible, such as under and around tomato plants. The following year — usually late May when the hairy vetch is in full flower — he chops the shoots and lets them lie on the soil's surface. Wait until the hairy vetch is in full flower; cut it too soon and it will re-sprout as a "weed," but cut it too late and it will produce seeds, which can be problematic. Douds then transplants his tomatoes, peppers and other vegetables into the hairy vetch mulch.

Since learning about mycorrhizae's reliance on live plants for winter survival, Mother's Editor-in-Chief, Cheryl Long, has grown a thin strip of perennial alfalfa along the edges of her garden paths. "It doesn't take up growing space, and during summer I cut it for protein-rich poultry feed," Long says.

Many gardeners know that over-fertilization can be harmful, but they may not be aware that phosphorus builds up in soil more readily than the other two elements in common fertilizer mixes (nitrogen and potassium). Under a regimen of frequent, well-intended application, phosphorus can reach levels that actually discourage the formation of mycorrhizae. Phosphorus is the middle number of the N-P-K percentages shown on fertilizer products. Choose low "P" numbers unless a soil test has shown your soil is low in phosphorus.

Learning a New Way

Now that scientists have taught us that invisible, magical mycorrhizae are in the soil, minimal tilling and constant cover crops should be considered a routine part of growing good crops. If you want to take extra steps in spring to help your crops establish these remarkable plant-fungi partnerships, Douds, in cooperation with the Rodale Institute, has developed a technique you can use to grow your own fungal inoculum to give your transplants a head start at the very beginning of their lives.

When gardening or farming with mycorrhizae in mind, there are a couple of things you don't need to worry about. The first, Douds points out, is that you don't need to inoculate your established garden soil with beneficial fungi. If the soil has had plant cover and hasn't been abused, it will already have the fungi present. The second non-worry is what would be best for beets, spinach and most members of the mustard family, which includes broccoli, Brussels sprouts, cauliflower, collard greens, kale and radishes. These are among the relatively few plants that get along fine without fungi for partners. To learn more about the structure and evolution of mycorrhizal fungi, plus its symbiotic relationship with plants, lichens and humans, see *Mycorrhizal Fungi and Plant Roots: A Symbiotic Relationship*: <http://www.motherearthnews.com/nature-and-environment/symbiotic-relationship-zm0z14aszkin.aspx#axzz3EdUYbByt>

How to Promote the Plant-Mycorrhizae Partnership

- Minimize soil tilling
- Always keep live plants in your beds, even in winter
- Rotate crops within your beds
- Avoid pesticides and chemical fertilizers
- Avoid applying too much phosphorus; a soil test every few years is a good idea

Wildlife biologist, author, and longtime contributor to National Geographic, Douglas H. Chadwick has spent much of his career among wild animals — very big wild animals. Yet ever since receiving his first microscope as a child, he has been equally fascinated by miniscule life-forms.

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Protecting the fungi

From *The Kingdom of Fungi*, by Jens H. Petersen

To ensure the availability of future fungal biodiversity we should:

1. Work against rapid climate change.
2. Protect the biodiversity and continuity of forests.
3. Manage grazed and unfertilized grassland.
4. Stop the uninhibited use of fertilizers and fungicides in agriculture and forestry.
5. Encourage research in fungal taxonomy and biology.

New MMS Committee

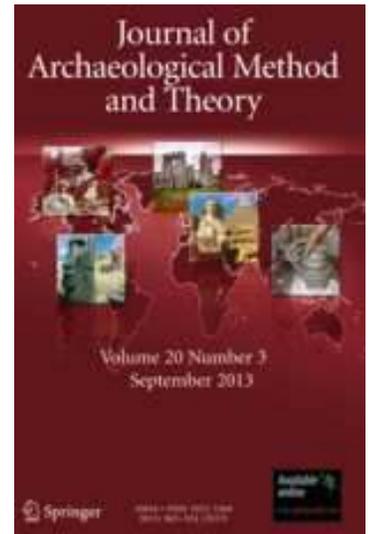
The MMS will be forming a Program Committee to plan speakers, workshops and other events for 2015. If any members would like to work on the committee, contact Janet Contursi:

jancontursi@msn.com

Alcohol and drugs: not just for modern man

New article uncovers the “anthropology of intoxication” in prehistoric European societies

Unlike modern Man, the prehistoric people of Europe did not use mind-altering substances simply for their hedonistic pleasure. The use of alcohol and plant drugs – such as opium poppies and hallucinogenic mushrooms – was highly regulated and went hand-in-hand with the belief system and sacred burial rituals of many preindustrial societies. Elisa Guerra-Doce of the Universidad de Valladolid in Spain contends that their use was an integral part of prehistoric beliefs, and that these substances were believed to aid in communication with the spiritual world. Guerra-Doce’s research appears in Springer’s *Journal of Archaeological Method and Theory*.



Despite the fact that the consumption of these substances is as ancient as human society itself, it is only fairly recently that researchers have started to look into the historical and cultural contexts in which mind-altering products were used in Europe. To add to the body of literature about the anthropology of intoxication in prehistoric European societies, Guerra-Doce systematically documented the cultural significance of consuming inebriating substances in these cultures.

In the research, four different types of archaeological documents were examined: the macrofossil remains of the leaves, fruits or seeds of psychoactive plants; residues suggestive of alcoholic beverages; psychoactive alkaloids found in archaeological artifacts and skeletal remains from prehistoric times; and artistic depictions of mood-altering plant species and drinking scenes. These remnants include bits of the opium poppy in the teeth of a male adult in a Neolithic site in Spain, charred Cannabis seeds in bowls found in Romania, traces of barley beer on several ceramic vessels recovered in Iberia, and abstract designs in the Italian Alps that depict the ritual use of hallucinogenic mushrooms.

Because Guerra-Doce mainly found traces of sensory-altering products in tombs and ceremonial places, she believes such substances are strongly linked to ritual usage. They were consumed in order to alter the usual state of consciousness, or even to achieve a trance state. The details of the rituals are still unclear, but the hypothesis is that the substances were either used in the course of mortuary rites, to provide sustenance for the deceased in their journey into the afterlife, or as a kind of tribute to the underworld deities.

She adds that the right to use such substances may have been highly regulated given that they were a means to connect with the spirit world, and therefore played a sacred role among prehistoric European societies.

“Far from being consumed for hedonistic purposes, drug plants and alcoholic drinks had a sacred role among prehistoric societies,” says Guerra-Doce. “It is not surprising that most of the evidence derives from both elite burials and restricted ceremonial sites, suggesting the possibility that the consumption of mind-altering products was socially controlled in prehistoric Europe.”

Reference:

Guerra-Doce, E. (2014). The Origins of Inebriation: Archaeological Evidence of the Consumption of Fermented Beverages and Drugs in Prehistoric Eurasia. *Journal of Archaeological Method and Theory*. DOI 10.1007/s10816-014-9205-z.

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Radical Mycology Comes to Minneapolis

The Radical Mycology project is a volunteer-based organization dedicated to educating the world on the benefits of the fungal kingdom for personal, societal, and ecological well-being.

This fall, Radical Mycology is going on a North American tour to promote the upcoming book *Radical Mycology*, the third [Radical Mycology Convergence](#), and to hold presentations and workshops on the skills and theories behind the Radical Mycology movement.

The Radical Mycology tour will share a unique approach to understanding the important role that fungi play in positive personal, societal and ecological transformations. Mushrooms and other fungi can help address many pressing global issues and as awareness of fungi grows, people around the world are seeking accessible knowledge on how to work with these incredible organisms. The 2014 Radical Mycology tour will present numerous mycological skills for people of all backgrounds in a practical and accessible way. Sharing a range of workshops (see below) and resources on the value of fungi, this tour will build a stronger and more diverse mycelial network of like-minded mushroom lovers, activists, and citizen scientists.

The tour will be in Minneapolis on Oct. 17-18. For more information, check out the [Radical Mycology website](#).

Renew your MMS membership!

Now is a great time to renew for 2015

3 reasons to renew:

- 1. You won't miss any 2015 MMS newsletters.**
- 2. You'll be able to attend all 2015 MMS forays and events.**
- 3. Renew now and beat the rush!**

See pg. 9 for Renewal Form

Grifola frondosa: Hen of the Woods

By Judy Johnson

Grifola frondosa is also known as "hen of the woods" or "maitake," and is a delicious fall mushroom. It is a large clustered mass of flattened caps attached to a central stem, and can reach as large as a basketball. It is a gray-brown color and blends in well with fallen leaves, hence its name, hen of the woods. Maitake is the Japanese name for this mushroom and it is now cultivated in Japan where it is highly prized as an edible mushroom.

G. frondosa grows at the base of deciduous trees, most notably oaks. When out this fall, we found them at the base, or within a few feet of red, white and bur oaks, as well as dead oaks. Apparently it grows at the base

of other deciduous trees but I have found them around oaks only. When you find one, be sure to note where it is located, since it will grow there again in the future. It always surprises me how difficult it is to find a specific tree the next year when I'm looking for hens again. We have noted the location of our mushroom finds with a GPS, which can be very helpful.

Fall is the time to look for hen of the woods. In Minnesota, it starts to grow about one month before the leaves change color, which is early September. The season seems to be about one month long, and mushrooms can be found after the first frost. I have no idea how long it takes these mushrooms to grow to their large size, but they do get bug- and dirt-infested easily, and in my experience some of the later mushrooms have fewer bug problems.

To find hen of the woods, just go out to an area that is predominantly oak trees. Then circle around the tree and search for the mushroom within 3 feet of the tree. Because of its coloring, it does blend in with the forest floor but, if you've



G. frondosa with secondary fungus
[Image credit: Judy Johnson]

looked for other mushrooms, you'll have the eyes for this mushroom. You'll need to look around 40 to 80 trees to find one hen. I find that burrs and weed seeds are more of an irritation than when looking for morels in the spring, so be sure to wear thicker jeans or pants. My thighs have been itchy and irritated when I have worn light-weight pants and gone through a patch of stinging nettles. The area where I found the most hens is flatter and a bit wetter, but friends have found them on hillsides as well. One good friend has found them while riding her horse!

Bring a jackknife when picking this mushroom to dislodge the base. There is a fair amount of dirt, stems and debris that grows into this mushroom, so I "field dress" with the knife before I put it in a sack. Cut off areas filled with dirt or debris, as these areas are not worth keeping. Unlike morels, I use larger plastic bags when I pick hen of the woods. I put them in separate bags to prevent bruising to the caps. If the mushroom is covered with a white secondary fungus, note the location but leave it and try again next year. The secondary fungus causes a bitter taste and, again, is not worth

the bother. If there is just a small amount of the secondary fungus, it can be wiped off with a damp cloth.

To clean this mushroom, wash it in the sink with the water running lightly. Separate the caps and pick out the dirt and debris with a knife or your finger nails. Be sure to have some distraction such as the TV on, since it takes as long to clean this mushroom as find it! Cut out any woody stems, secondary fungus or dirt-filled sections. The older sections of the mushroom have a more "wild" taste that may or may not appeal to you.

You can cook the hen of the woods like you would a morel. I sauté it with shallots and a generous amount of butter. I then cover with toasted bread crumbs and freeze it. I'll use this as a goose stuffing at Thanksgiving. To store this mushroom, it is suggested to either freeze it or dry it. I usually store my dried mushrooms in the freezer to prevent any small amount of secondary fungus from ruining my hard earned treasures.



G. frondosa [Image credit: Judy Johnson]

Psilocybin inhibits the processing of negative emotions in the brain

Emotions like fear, anger, sadness, and joy enable people to adjust to their environment and react flexibly to stress and strain, and are vital for cognitive processes, physiological reactions, and social behaviour.

The processing of emotions is closely linked to structures in the brain, i.e., to what is known as the limbic system. Within this system the amygdala plays a central role -- above all it processes negative emotions like anxiety and fear. If the activity of the amygdala becomes unbalanced, depression and anxiety disorders may develop.

Researchers at the Psychiatric University Hospital of Zurich have now shown that psilocybin, the bioactive component in the Mexican magic mushroom, influences the amygdala, thereby weakening the processing of negative stimuli. These findings could "point the way to novel approaches to treatment" comments the lead author Rainer Krähenmann on the results which have now been published in the medical journal *Biological Psychiatry*.

Psilocybin inhibits the processing of negative emotions in the amygdale

The processing of emotions can be impaired by various causes and elicit mental disorders. Elevated activity of the amygdala in response to stimuli leads to the neurons strengthening negative

signals and weakening the processing of positive ones. This mechanism plays an important role in the development of depression and anxiety disorders. Psilocybin intervenes specifically in this mechanism as shown by Dr. Rainer Krähenmann's research team of the Neuropsychopharmacology and Brain Imaging Unit led by Prof. Dr. Franz Vollenweider.

Psilocybin positively influences mood in healthy individuals. In the brain, this substance stimulates specific docking sites for the messenger serotonin. The scientists therefore assumed that psilocybin exerts its mood-brightening effect via a change in the serotonin system in the limbic brain regions. This could, in fact, be demonstrated using functional magnetic resonance imaging (fMRI). "Even a moderate dose of psilocybin weakens the processing of negative stimuli by modifying amygdala activity in the limbic system as well as in other associated brain regions," continues Krähenmann. The study clearly shows that the modulation of amygdala activity is directly linked to the experience of heightened mood.

Next study with depressive patients

According to Krähenmann, this observation is of major clinical importance. Depressive patients in particular react more to negative stimuli and their thoughts often revolve around negative contents. Hence, the neuropharmacologists now wish to elucidate in further studies whether psilocybin normalizes the exaggerated processing of negative stimuli as seen in neuroimaging studies of depressed patients -- and may consequently lead to improved mood in these patients. .

Rainer Krähenmann considers research into novel approaches to treatment very important, because current available drugs for the treatment of depression and anxiety disorders are not effective in all patients and are often associated with unwanted side effects.

Journal Reference:

Rainer Kraehenmann, Katrin H. Preller, Milan Scheidegger, Thomas Pokorny, Oliver G. Bosch, Erich Seifritz, Franz X. Vollenweider. Psilocybin-Induced Decrease in Amygdala Reactivity Correlates with Enhanced Positive Mood in Healthy Volunteers. *Biological Psychiatry*, 2014.



Psilocybe semilanceata

Researchers have now shown that psilocybin, the bioactive component in the Mexican magic mushroom, influences the amygdala, thereby weakening the processing of negative stimuli. [Image credit: Alan Rockefeller]

The Minnesota Mycological Society

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