THE TOADSTOOL REVIEW

MINNESOTA MYCOLOGICAL SOCIETY NEWSLETTER

July 2021

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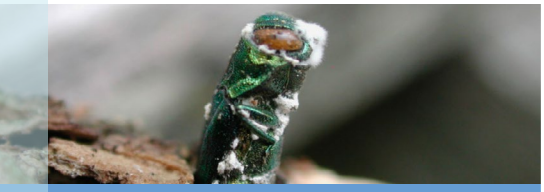

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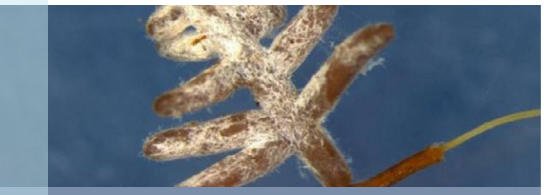

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By: Tim Clemens, MMS President

PRESIDENT'S NOTE

Rain would be nice. About 75 percent of Minnesota is officially experiencing a drought according to the U.S. Drought Monitor with the rest of the state "abnormally dry," the level below drought. Make sure to look for mushrooms in microclimates that hold on to moisture: decomposed or mossy logs, in deep leaf litter, in full shade, in areas close to the water table, or at a farmer's market to support our great local mushroom cultivators.

We have several forays under our belts now using the new process and they've been a resounding success. A year of social distancing experience has given us all the skills and awareness to gather safely, yet fluidly, in an outdoor setting. Zoom continues to be a fantastic new tool for the MMS, but there's nothing quite like spending time together in person. Look forward to more forays in July and think about whether you would like to volunteer at, or organize, a foray. We will be releasing the MMS Foray Planning Manual to teach you how to propose a foray. If you're interested in helping the MMS accomplish our important outreach mission by being added to the volunteer email list, let me know at president@minnesotamycologicalsociety.org.

We're halfway through the year and that means the Photo Contest is rapidly approaching. *Make sure to take pictures of your mushroom finds so you can enter them in the contest to win fabulous cash prizes, bragging rights, and the admiration of your peers.* Also prepare yourself for Mushrooms After Dark, where we'll explore the forest at night with UV lights to discover biofluorescence and challenge our concept of how the world truly appears. Good luck out there!

Tim's Mycology Term of the Season: *Chanterelle* **(Ancient Greek): borrowed from French by way of Latin for 'cantharus', a drinking vessel. Originally from the Ancient Greek 'kantharos' meaning a drinking cup with two handles. Chanterelle refers to many different mushrooms across the genera** *Cantharellus*, *Hygrophoropsis*, *Craterellus*, *Polyozellus*, **or** *Gomphus*, **not all of which are edible. Chanterelle also is the name of the highest string of any instrument in the violin family of instruments.**

Monday July 12th - Foray at William O'Brien State Park *- Registration Open*

Begins at 5:00 p.m. -- MMS members only – no guests. Pre-register & signup waivers required.

This will be our first foray of the 2021 summer season. This event replaces the MMS meeting that would normally be held on this day. All forays are free events for MMS members. Members receive foray locations and details through the MMS Newsletter and MMS mail. It is recommended to bring your own dinner/food and liquids.

Saturday July 17th - Foray at St. Croix State Park *- Registration Closed*

Begins at 10:30 a.m. -- MMS members only – no guests. Pre-register & signup waivers required.

Thursday July 22th - Foray at Lake Maria State Park *- Registration Closed*

Begins at 9:30 a.m. -- MMS members only – no guests. Pre-register & signup waivers required.

Monday August 9th - "Should I Have Eaten That?"

Zoom Presentation: 7:00 p.m. – meeting link will be emailed to members.

Dr. Michael Beug – and introducing his new book Mushrooms of Cascadia: An Illustrated Key

Michael Beug completed his Ph.D. in Chemistry at the University of Washington in 1971. After one year teaching at Harvey Mudd College, he spent 32 years at The Evergreen State College in Olympia, Washington where he taught chemistry, mycology and organic farming.

Michael started mushrooming in 1969 and began photographing fungi in 1973. His photographs now have appeared in well over 80 books and articles on mushrooms. In 1975, he joined the North American Mycological Association (NAMA) and the Pacific Northwest Key Council, a group dedicated to writing macroscopic keys for the identification of fungi. His specialties are the *Ascomycota*, the genus *Ramaria*, and all toxic and hallucinogenic mushrooms. He is researching oak-associated fungi of the Columbia River Gorge, especially *Cortinarius* species. He has discovered more than 50 new mushroom species from a dozen genera.

In NAMA, he serves on the Education Committee, is chair of the Toxicology Committee, past chair of the Editorial Committee, and past editor of the Journal McIlvainea. He won the 2006 NAMA Award for Contributions to Amateur Mycology. He regularly writes about mushrooms in *Fungi Magazine*, *McIlvainea*, *The Mycophile*, and *Mushroom: The Journal of Wild Mushrooming*. Michael has prepared over two dozen PowerPoint presentations about mushrooms (available through NAMA as a two DVD set).

Monday September 13th - Mary Whetstone and the MMS

Zoom Presentation: 7:00 p.m. – meeting link will be emailed to members.

Mary Whetstone and the History of the MMS with Heather Erickson

Learn about the beginnings of the Minnesota Mycological Society and our founder, Dr. Mary Whetstone. Dr. Whetstone was a pioneer in medicine and paved the way for professional women in Minnesota, but her passion was mycology. When she first began learning about mushrooms, she was a novice looking for alternative sources of nutrition for women and children. She would spend the remainder of her life contributing to the field of mycology. The MMS and other mycologists continue to follow in those footsteps made over a century ago. Although Dr. Whetstone's contributions to the Minnesota medical community and the body of mycological knowledge are vast, very little has ever been published about her.

Heather Erickson is the author of two MIPA Award-winning books, Facing Cancer as a Friend: How to Support Someone Who Has Cancer and Facing Cancer as a Parent: Helping Your Children Cope with Your Cancer. She Is also an SEO content writer for a web development company. Her favorite part of that job is the research she gets to do. Heather has been researching Dr. Whetstone and has received access to her letters to Dr. Charles. H. Peck, who named Amanita whetstoneae in her honor.

MN Mycological Society

ENTOMOPATHOGENIC FUNGI ASSOCIATED WITH EMERALD ASH BORER

By: Sofía Simeto

Entomopathogenic fungi have the ability to parasitize and kill insects, they occur naturally and are responsible for the control of many insects. The first reports of entomopathogenic fungi dates to the 19th century when Agostino Bassi, an Italian entomologist, observed that the white muscarine disease of silkworms was caused by a living entity that had a powdery appearance and was contagious. The fungus was named after him once his work was published in 1835 and he is attributed to having rescued the economically important Italian silk industry at that time. Entomopathogenic fungi comprise a diverse group of species with varied morphology, phylogeny, and ecology (Araújo & Hughes, 2016). They are distributed among five of the eight fungal phyla, are also present in the *Oomycota* (fungal-like organisms) and comprise more than 700 species from 100 genera (Araújo & Hughes, 2016; Boomsa et al., 2014).

Their host range spreads among 20 insect orders parasitizing all developmental stages. According to Araújo and Hughes (2016), the *Hypocreales*, one of the most important orders of entomopathogenic fungi, evolved through an interkingdom host jump when an ancestral fungus that nourished on plants switched its nutritional mode to exploiting insects, approximately 170 millions of years ago, during the same period in which sapsucking insects arose. This is suspected to have occurred several times and this adaptation might have provided a route to infect other insects (through insect to insect transmission) that were not phytophagous (feeding on plants), giving rise to three of the most important entomopathogenic families: *Clavicipetaceae, Cordyocipitacease* and *Ophiocordycipetaceae* (all within *Hypocreales*).

Entomopathogenic fungi can infect their hosts by penetrating insect cuticle without the need of being ingested. Once the fungal spore land on the insect, it can secrete hydrophobins (surface active proteins produced by filamentous fungi) to better attach to hydrophobic surfaces such as the insect´s exoskeleton (adhesion phase). After that, the germ tube penetrates the insect´s multilayered cuticle via a combination of physical force (by forming specialized structures called appresoria which act by Turgor pressure) and enzymatic degradation of cuticle compounds (infection phase).

Once the fungus has breached the cuticle barrier and reaches the insect´s cavity it must adapt to the new environment while continuing to fight against the insect´s immune system. Some species start developing as hyphal bodies (yeast-like cells produced by budding) which facilitates a rapid colonization. Some fungal species also produce toxins and immunosuppressors during this phase, to facilitate infection. All these sequential processes occur while the fungus acquires nutritional compounds from host cells and that will eventually end with the insect´s death and mummification (Boomsa et al, 2014; Butt et al, 2016; Pedrini et al, 2018) (colonization phase). To complete its life cycle and reproduce/disperse, the fungus needs to emerge to the surface again to produce either asexual or sexual spores which can be actively discharged or passively

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Above: EAB egg inoculated with water (control)

Right: EAB larvae mycosed by *Lecanicillium longisporum*

Above: Healthy ash log sprayed with entomopathogenic fungi and EAB implanted eggs.

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released. To achieve that, the fungus usually finds its way-out through the joints of the insect where cuticle is thinner. Once outside, it switches to hyphal growth again.

Entomopathogenic fungi are considered a safe alternative for controlling insects with low risk to non-target organisms and the environment and are thus seen as good candidates to be incorporated in integrated pest management approaches as biological control agents. This is reflected in the high number of registered commercial fungal-based products against insect and nematode pests (Lacey et al., 2015; Arthurs & Dara, 2019). Several studies have shown that some entomopathogenic fungi can develop as plant endophytes that is, they can grow inside plant tissue asymptomatically, feeding on plant exudates. This can be an advantageous characteristic as its survival would not depend only on finding an insect host and it also reflects a complex life cycle that can be completed on invertebrates, plants or in the soil (Mantzoukas et al, 2020).

The emerald ash borer (EAB) is a serious non-native small wood boring beetle capable of killing mature ash trees and potentially decimate native ash resources throughout North America. Since it was first discovered in Michigan in 2002, it has killed hundreds of millions of ash trees in urban and rural areas, landscapes and forests (McCullough, 2020). EAB is native from Asia and is thought to have entered the country inadvertently on wood-packing material (Poland and McCullough, 2006). In its native range, it only attacks weakened trees that are under stress, declining or dying, and are thus unable to defend themselves properly (Herms et al., 2014). North American native ash species have never faced this insect pest before its arrival and therefore have not developed defenses against it. This can result in nearly 100 percent tree mortality in forests within two-to-six years of arrival (Knight et al., 2013).

Although there are several studies on the biology of the insect, little is known about the fungal community associated with the beetle and the role these fungi play in ash mortality. Our research project “Fungi associated with the Emerald Ash Borer: finding effective biocontrol agents and elucidating the role of fungi during ash decline and mortality” lead by Dr. Robert Blanchette and Dr. Kathryn Bushley at the University of Minnesota, aims to describe the fungal diversity associated with EAB galleries and to better understand the role of this fungal community.

For this main objective we isolated fungi from EAB larval galleries sampled throughout the main geographic areas of Minnesota where ash is affected by EAB. We identified fungal species and were able to assigned them to four main functional groups: fungi that live on dead or decaying organic matter (saprophytes), fungi that produce a canker-type lesions , fungi that degrade wood (decay fungi) and entomopathogenic fungi. With focus on this last group we obtained isolates from several well-known entomopathogenic genera such as: *Purpureocillium, Beauveria, Clonostachys, Lecanicillium, Akanthomyces, Microcera, Cordyceps, Tolypocladium, Pochonia*. With that in mind, we established another research objective: to assess their potential as biological control agents of EAB by evaluating the virulence against different life stages of the pest under controlled laboratory conditions and field conditions.

To evaluate the impact on active larvae under the bark, we performed laboratory assays spraying small uninfested ash logs and by implanting EAB eggs on them later. After a certain incubation period we evaluated larval development and inoculum recovery comparing our fungal treatments with a water control. Similarly, we sprayed infested trees in the field, brought them to the laboratory, and evaluated larvae development and mortality. In future studies we will inoculate EAB adults reared in the laboratory by dipping them into fungal spore suspensions and we will spray infested tree trunks with fungal spore suspensions before adult emergence. By setting a mesh cage around the treated portion of the trunk, we will then capture emerging adults. In both cases, we will evaluate adult mortality. To evaluate the effect on EAB eggs, we inoculated our fungal strains on fresh eggs by placing a micro droplet of a fungal spore suspension on each of them. After incubation, we evaluated if larvae did hatch or if the eggs were killed. To test the most promising strains in the field, we will spray the trunk of infested trees and will later implant fresh eggs to assure a certain baseline of infestation. In the Fall, treated trees will be cut down, brought to the laboratory, and debarked to evaluate if eggs hatched and if larvae developed.

Currently we have had some very interesting preliminary results from the laboratory trials, and we are now at a stage where we are testing the most promising strains in the field. We believe that by better understanding the fungal community associated with EAB and by assessing its potential as possible biocontrol agents, we can greatly contribute to EAB management with these new IPM approaches.

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ECTOMYCORRHIZAL FUNGI A POSSIBLE BULWARK AGAINST CLIMATE CHANGE

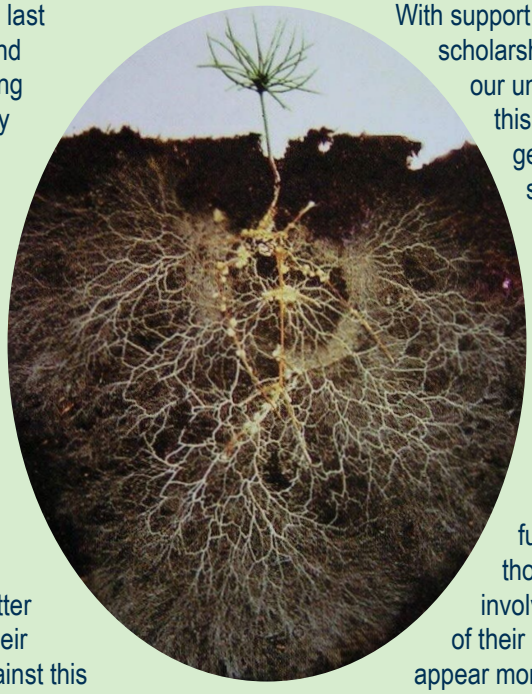
By: Talia Michaud

Over the last two centuries, industrial activity has caused accelerating environmental change on a global scale. Our future is uncertain, owing its direction to a thin layer of gas blanketing the planet and the biogeochemical processes that mediate it. Simply put, minor perturbations in carbon stored in major pools, like sediments in the ocean or soils on land, will have outsized consequences for all life on Earth.

The movement of carbon through soils in forests is controlled by how much carbon plants fix through photosynthesis, and the degradation of their dead tissues by decomposers, among other factors. Inextricably tangled in this process are mycorrhizal fungi. This specialized and diverse assemblage of fungi associates with plant roots, foraging for nutrients among soil pores too small for roots to reach in exchange for photosynthetically fixed sugars.

Different trees, however, partner with different types of mycorrhizal fungi with unique foraging strategies, namely arbuscular mycorrhizal (AM) fungi, and ectomycorrhizal (ECM) fungi. AM fungi are descended from a common ancestor and almost exclusively partner with plant roots. ECM fungi, on the other hand, are a polyphyletic group descended from upwards of 40 different lineages of saprophytic fungi. This distinction has important implications: while AM fungi generally cannot access nutrients from complex organic matter in soils, some ECM fungi can, using retrofitted mechanisms inherited from their decomposer ancestors.

Analysis of historical herbarium collections indicates that plant nutrition in northern temperate regions has been declining over the last century. If this trend continues, declining nutrient availability may limit the amount of carbon that plants can fix and potentially store in soils, exacerbating carbon dioxide accumulation in the atmosphere. Given their evolutionary inheritance, ECM fungi might be better able to insulate their plant partners against this progressive nutrient limitation and mitigate this potential positive feedback.



Through analysis of plant and fungal specimens in the Bell Herbarium collected over the last century and a half, we tracked nitrogen (N) nutrition among fungi and plants, as well as N exchange between ECM fungi and plants. As expected, plant tissues showed declining N nutrition over time, but AM plants showed more severe declines than ECM plants. This supports that ECM fungi are better equipped to support their plants' N nutrition than AM fungi. Analysis of N isotopes reveals that this phenomenon was likely enabled by a change in the trading dynamics between ECM plants and fungi, in which ECM fungi transferred relatively more N to plants over the course of the last century than they kept for themselves. This finding contradicts predictions derived from global change experiments that alter individual drivers alone, underlining the importance of historical analyses. This dataset, however, is focused solely on broadleaf deciduous trees and host-generalist ECM fungi.

With support from the MMS scholarship, I hope to deepen our understanding of this phenomenon by generating species-specific nutrient and isotope data for host-specific fungi and their tree partners. I am particularly interested in species of *Suillus* partnering with Pinus and Larix. Host-specific ECM fungi like Suillus are thought to be more involved in the N nutrition of their hosts, which also appear more sensitive to environmental change, potentially rendering the symbiotic response more volatile. This work will inform predictions of mycorrhizal feedbacks to global change, as well as the fundamental biology of this fascinating symbiosis. Ultimately, enabled by the efforts of past and current collectors, this work highlights the value of herbarium collections and a historical perspective.

UNRAVELING THE NATURAL HISTORY OF THE GENUS *CLAVULINA* ACROSS TEMPERATE FORESTS IN NORTH AMERICA

By: Eduardo Perez-Pazos

Fungal species are categorized under functional guilds such as biotrophic or saprotrophic based on their nutritional strategies. One biotrophic interaction that involves fungal and plant species is the ectomycorrhiza. Ectomycorrhizal fungi (ECMF) get the major fraction of their carbon (C) via the biotrophic interaction with the living cells of plant roots while transferring soil nutrients in exchange, conforming a mutualistic interaction crucial for forest health. On the other hand, saprotrophic fungi (SAPF) get their C through decomposition of plant, animal, and microorganisms' residues, extracting the nutrients trapped in the soil organic matter (SOM). Evidence of SOM degradative activity in ECMF has accumulated in literature, as well as the presence of SAPF associated with plant roots in a symbiotic-like manner, showing that the division of these two guilds (ECMF/SAPF) is not straightforward.

Clavulina coralloides **(collected at La Malinche National Park Itasca Biological Station and Laboratories, Tlax, Mexico) – September 2015)**

One tool for the distinction between ECMF and SAPF species, is the stable isotope approach, which became relevant over the last two decades. The basis of this method is to verify if a nutrient flux between either SOM or potential ectomycorrhizal plant host and a fungal species exists. Isotopic values of C and nitrogen (N) has been the most employed in fungal ecology showing that, ECMF are enriched in ∂15N and diminished in ∂13C in comparison with SAPF, due to a phenomenon known as isotopic fractionation. Studies based on isotopic evidence combined with phylogeny, enzymatic assays, and/or synthesis experiments have identified several taxa within ECMF or SAPF guilds. Nevertheless, genera like *Phaeoclavulina* (a sister clade of *Ramaria*) and *Odontia* (a sister clade of *Thelephora*) led to inconclusive results given their mid-values between ECMF and SAPF fungi. Intermediate ∂15N and ∂13C values have been reported for *Clavulina* (coral fungi) which suggests that it could have some degree of saprotrophic activity untested yet.

Clavulina reae **(collected at the Itasca Biological Station and Laboratories (MN, USA) – August 2019)**

Coral fungi belonging to the genus *Clavulina* are widely distributed. Nowadays there are ca. 90 species described for this genus, with *C. coralloides* (crested white coral), *C. rugosa* (wrinkled coral), *C. cinerea* (gray coral), and *C. amethystina* (amethyst coral) representing the most common ones. However, there are only 29 records of Clavulina specimens from the Bell Museum at the University of Minnesota, and the public database of iNaturalist shows less than 50

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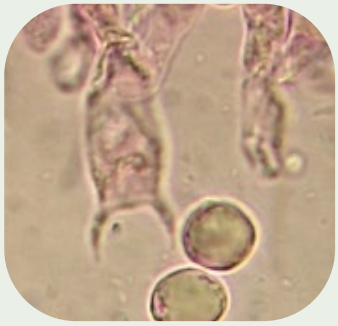
GENUS CLAVULINA ACROSS NORTH AMERICA...CONTINUED FROM PAGE 6



Clavulina species show a bi-sterigmate basidium with curved sterigmata. Image taken from mushroomexpert.com

records of this genus for the state of Minnesota (MN). So far, we know that specimens of *C. rugosa, C. coralloides*, and *C. reae* are distributed in Minnesota. These species display a simple or branched fruit body with white to gray, and even purple tones. Some of the species than can be misidentified as *Clavulina* belong to genera such as *Ramaria*, *Clavaria*, *Tremellodendron*, and *Thelephora* among others. Nevertheless, microscopically, Clavulina species show a bi-sterigmate basidium with curved sterigmata, and smooth, small-sized basidiospores, which help to differentiate those from other similar mushrooms.

I expect to obtain ∂15N and ∂13C stable isotope data from *Clavulina* mushrooms from both, temperate and tropical regions. For this purpose, I will collect *Clavulina* across Minnesota during summer and fall, 2021. Additional to fresh mushroom collections, I will request samples from herbarium specimens. My target universities/museums are the 1) University of Minnesota Bell Museum, 2) Field Museum of Natural History, 3) University of Florida, and 4) Humboldt State University Herbaria. Overall, this work will allow me to uncover the ecological role of Clavulina species in different forests and particularly, in Minnesota.

PHOTOS FROM MMS MEMBERS....SUBMITTED BY DELANEY BABICH

Send in your photos to the newsletter! If you are able, send along any ID you were able to come up with to tpieper7951@gmail.com. Bottom left: *Ascocoryne sp.* Left: *Cladonia cristatella*. Bottom right: Beetle with mycelium. RIght: *Stereum sp.*

HIGHLIGHTS FROM THE WILLOW RIVER STATE PARK FORAY

MMS President Tim Clemens (above) led a foray at Willow River State Park in Hudson, Wisconsin. Around 45 members attended with 21 species identified, including: *Exidia recisa; Gymnopus subsulphureus; Gymnopus dryophilus; Laetiporus sulphureus; Megacollybia rodmanii; Morchella americana; Mycena acicula; Mycena inclinata; Peziza violacea; Phellinus gilvus; Pluteus cervinus; Cerioporus squamosus; Neofavolus alveolaris; Psathyrella delineate; Stereum ostrea complex; Trametes versicolor; Tremella mesenterica; Trichaptum biforme; Xeromphalina tenuipes;* and *Xylaria polymorpha.*

BOOK REVIEW: *FUNGIPEDIA: A BRIEF COMPENDIUM OF MUSHROOM LORE*

By: David Born

The following is a review of Fungipedia: a brief compendium of mushroom lore, by Lawrence Millman and illustrated by Amy Jean Porter. 2019, Princeton University Press, Princeton and Oxford.

Let me tell you about a friendship grounded in murder, murder in the Arctic to be precise, and a friendship that opened my eyes to the world of mushrooms and fungi, and led to my joining the MMS.

I should begin with a "novice alert."

To be upfront about my ignorance, prior to 2020, my mycological knowledge consisted of the following:

1. (Most) mushrooms are good to eat.
2. Some mushrooms aren't good to eat. (Some will even kill you.)
3. Grocery stores can be trusted to tell the difference between 1 and 2 above.
4. Mushrooms grow in damp places, usually, can be found on old logs, living trees, and in grass and leaves.
5. Lichen are related to mushrooms, somehow.
6. So are a lot of other things, like. . . well, I don't know what else, but there must be other things.
7. Some mushrooms can mess your mind; sometimes in good ways, other times, not so much.
8. Mushroom hunters seem interesting, but a bit offish – rather like hobbits, I presume.

Now for the murder. In the late 1960s I spent time in an Inuit community of 120 people on the Belcher Islands, otherwise known as Kangiqusualuk ilua, off the west coast of Quebec in Hudson Bay. In the 1920s and again in the 1940s, murders had been committed on the Islands, crimes which came to the attention of the Canadian authorities. The incident in the 1940s involved a meteor, God, Jesus, Satan, and the death of nine people. A man who had killed his sister became a friend of mine. It's a long story, but trust me, it happened.

Many years later, in 2020, I stumbled across a book focused on the 1940 murders, along with observations on the murder of our planet, but that's yet another story. The book, *At the End of the World*, was written by Lawrence Millman. A writer myself, one still influenced and intrigued by the Inuit living on Islands, I wrote Millman to discuss my experiences there.

We struck up an immediate friendship, and I soon discovered he was the author of more than a dozen books, spanning travel and exploration, folklore, poetry, and fiction. He was, as well, a mycologist, and he slowly introduced me to a world that was a foreign to me as the Belcher Islands had been when I landed there so many years ago.

Which brings me to one of Millman's latest books, *Fungipedia*. There are writers who have the ability to astonish readers with each new page, such is their erudition, their wit, and their ability to turn a phrase. Millman is one such writer, providing in *Fungipedia*, a book that draws novices like me into mycology, but which also has tidbits, tiny morsels of trivia if you will, that will satisfy the more discerning palate of the experts among us.

Readers should be warned: this is no field guide to mushrooms. You won't learn how to become an amateur mycologist, nor will you find exotic recipes for the morel, shitakes, cremini or enoki mushrooms putting in appearances at the local farmers' market. This book is more of a trip (no pun intended) through a fantastical garden led by a tour guide who can approach fungi (mushrooms and otherwise) from any one of a dozen different angles – and does.

Speaking as the novice I am, one way to stir my curiosity is to "surprise" me with unusual facts about trees, critters, flowers – you name

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An illustrated mini-encyclopedia of fungal lore, from John Cage and Terrence McKenna to mushroom sex and fairy rings

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

Combining ecological, ethnographic, historical, and contemporary knowledge, author and mycologist Lawrence Millman discusses how mushrooms are much more closely related to humans than to plants, how they engage in sex, how insects farm them, and how certain species happily dine on leftover radiation, cockroach antennae, and dung. He explores the lives of individuals like African American scientist George Washington Carver, who specialized in crop diseases caused by fungi; Beatrix Potter, creator of *Peter Rabbit*, who was prevented from becoming a professional mycologist because she was a woman; and Gordon Wasson, a J. P. Morgan vice-president who almost single-handedly introduced the world to magic mushrooms. Millman considers why fungi are among the most significant organisms on our planet and how they are currently being affected by destructive human behavior, including climate change.

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

BOOK REVIEW...CONTINUED FROM PAGE 9

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it. I know of no other resource that offers as many surprising facts about fungi as *Fungipedia*.

The book is packed to the gills (pun intended) with enough facts to stimulate one's curiosity while also satiating the most voracious trivia nut in your life. Millman discusses the fungus named after Spongebob Squarepants *(Spongiforma squarepantsii)*. He explains how the oyster mushroom we love to eat, itself eats nematodes and various bacteria and, in the wild, is both home to and the diet of fungus beetles. He names eleven of the types of "hair" found on mushrooms and explains their function. Millman introduces us to Civil War Captain Charles "Old Ironguts" McIlvaine, who classified mushrooms as edible as long as he didn't suffer "violent evacuation." There's even an entry explaining the relationship between Santa Claus and mushrooms.

But facts are just the spores in Millman's book. Once nestled in the nooks and crannies of your brain, Millman's facts grow into stories and more often than not will leave you laughing. Filled with dozens upon dozens of short, but fascinating entries, the book is nonetheless pocket-size, suitable for jaunts in the woods, long waits in the dental office, or reading in the seclusion of our new, Covid-haunted reality.

Better yet, for the hardcore mycologists out there, it's the perfect book for friends and acquaintances who see you and your passion as weird as hobbits.

Highly recommended - - David Bom

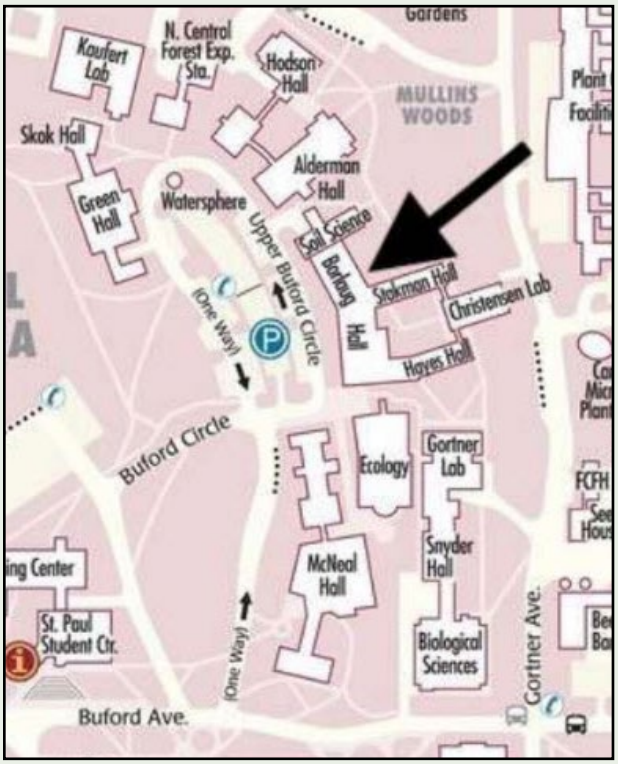
SNAPSHOTS FROM AROUND THE CLUB

COVID can't stop the MMS! **Gene Kremer (right), our Golden Chanterelle Award winner for 2020, finally is able to receive his award. Gene was selected for this honor as a reflection of his many years of exceptional service to the MMS and mycology in general to the upper midwest. Left: MMS Past President/Membership Coordinator John Lamprecht presented the award.**

This piece of art work was submitted by MMS member Nancy Carlson.

TEST YOUR ID SKILLS WITH A SPECIMEN FROM A MMS MEMBER!

MMS member Jonathan Boe submitted this mushroom and asked "What is this very fuzzy tooth mushroom? It was growing out of wood." Send in your answers to tpieper7951@gmail.com and we will identify the specimen in the next issue.



The Toadstool Review is the quarterly newsletter of the MN Mycological Society (affiliated with NAMA, the NorthAmerican Mycological Association).

The newsletter keeps members informed about club meetings, forays and otherevents, and includes articles and mycological information. It is published in January, April, July and October, and submissions are welcome. Deadlines are the 15th of December, March, June and September. Please email your submission to the editor:

tpieper7951@gmail.com

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