A Publication of the
Boston Mycological Club
Since 1897

Volume 74, No. 1.
April 2019

The Bulletin

AMANITA PHALLOIDES IN THE NORTHEAST • SLIME MOLDS • ERICOID MYCORRHIZAL PARTNER • LISTENING FOR MUSHROOMS • CLASTODERMA DEBARYANUM

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

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CONTENT WANTED
Generously submit your contributions to:
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The *State of the World's Fungi*(Kew, 2018) (*https://stateoftheworldsfungi.org/*) reports that a full 9.5% of new species described in 2017 were from North America. While you ready yourselves to continue finding plenty we hope you will keep writing in and take care to recognize that which is harder to notice.

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

And you have continued to keep us impressed and, candidly, a little perplexed with the unique contributions in this issue. We have endeavored to fit this varied content in this *Bulletin* to the best of our abilities and hope you will enjoy the range of pictures, poetry, art pieces, and articles. Keep up your enthusiastic pursuit of fungi in all of their myriad forms. Every issue will be housed permanently in the Harvard Herbaria archives.

We encourage submission from any and all mycophiles and we make a concerted effort to publish from first time contributers.

The cover image depicts two resinicolous species *Sarea resinae* and *Sarea difformis* photographed by Joe Warfel. These specimen were captured at the Super Cup Fungus Foray and you can read more on page 4.

Credits
Printed locally by South Shore Printing of Scituate, MA.

The Bulletin
APRIL 2019

Touchdown!

By Lawrence Millman

On February 3, the Thoreau Farm in Concord sponsored the 2nd Annual Super Cup Fungus Foray in order to provide mycophiles with a healthy alternative to watching a bunch of grown men smash repeatedly into each other in an event known as the Super Bowl. During most fungal forays, only demented individuals engage in this sort of ridiculous activity.

The Super Cup Fungus Foray again took place at Estabrook Woods in Concord. Harvard mycologists James Mitchell and Luis Quijada came along in order to aid and abet my identification skills. James is perhaps the world's leading expert in the resin-inhabiting genus *Sarea*, and he quickly found two different *Sarea* species, *S. resinae* and *S. difformis*. None of the species of this cup fungus was more than a millimeter in diameter, but to those who observed them, they were far more "super" than a football stadium.

Front Cover Image *Sarea resinae(yellow)* and *Sarea difformis(black)*

Larry Identifies Collections

Here I should mention that a certain individual whose role with the Boston Mycological Club is similar to Queen Elizabeth's in England recently sent a letter to Club members in which she remarked: "February and March are lean times to feed our habit." Obviously, the individual in question didn't attend this year's Super Cub Fungus Foray, where we documented 41 different species. Among the most interesting of those species were both the sexual and asexual forms of the ascomycete *Holwaya mucida*, the naturally cracked crust *Peniophora meridionalis*, and the polypore *Trametes suaveolens*, which smells strongly of anise.

Speaking of our so-called habit, the Christmas Mushroom Count at Wachusett Wildlife Sanctuary fed it so well that those of us who took part in it felt like gluttons afterwards. At that Foray, we documented 86 different species, which would seem to indicate that not all fungi head south for the winter.

Here's the list for the Super Cup Fungus Foray:

Angelina rufescens
Apiosporina morbosa (Shit on a Stick)
Bisporella citrina (Lemon Drops)
Botryobasidium sp.
Camarops petersii (Dog's Nose Fungus)
Cerrena unicolor (Mossy Maze Polypore)
Chlorosplenium chlora
Crinula caliciiformis (asexual form of *Holwaya mucida*)
Daedaleopsis confragosa (Thin Maze Polypore)
Daldinia concentrica (Cramp Ball)
Diatrype stigma
Diatrypella sp.
Exidia recisa (Brown Witches Butter)
Holwaya mucida
Hydnochaete olivaceum (Olive Toothed Polypore)
Hymenochaete rubiginosa
Hypomyces pallida (on *Tyromyces chioneus*)
Hypoxylon fragiforme
Irpex lacteus (Milk White Toothed Polypore)
Kretschmaria deusta (Carbon Cushion)
Nectria sp.
Lachnelulla resinacea
Panellus stipticus (Night Light)
Peniophora meridionalis
Phaeocalium polyporaeum (Pygmy Parasite)
Rosellinia sp. (Pyrenomycete)
Sarea resinae
Sarea difformis
Schizophyllum commune (Split Gill)
Stereum complicatum (Crowded Parchment)
Stereum ostrea (False Turkey Tail)
Trametes cinnabarina (Cinnabar-Red Polypore)
Trametes concyifer (Tender Nesting Polypore)
Trametes hirsutum (Hairy Turkey Tail)
Trametes pubescens (Pubescent Turkey Tail)
Trametes suaveolens (Anise-Smelling Polypore)
Trametes (=Coroliopsis) trogii
Trametes versicolor (Turkey Tail)
Tremella lutescens (Witches Butter)
Trichaptum biformis (Purple Toothed Polypore)
Tyromyces chioneus (Cheese Polypore)

Letters To the Editor

Dear Editors,

Having edited the Bulletin in the '70's and 90's, I should know... What I should know is that the current *Bulletins* are eye-candy and mind-candy combined. I must resort to superlatives because both in content and in appearance, they outdistance anything done before at the BMC or, for that matter, by any other club. I took the last issue with me on a recent plane trip read it avidly from cover to cover. By the time I landed, I felt enlightened, pleased, and, here and there, amused. To combine such robust content with this an amazing degree of readability is a good trick indeed. Please accept my nostalgia-driven congratulations and my thanks for such mycopleasures.

Elio Schaechter

Elio served as BMC's Bulletin editor from 1974 through 1995. We are grateful to accept your praises and sustain the legacy you left us. Indeed we would be thrilled for your contributions.
The Editors

Dear Editor,

Virtually every mushroom club has a library with books that members can check out. Virtually every mushroom club, I should say, except the BMC.

Its books remain forever stuck in the bookcase. A member can, of course, look at a book during a meeting, assuming he or she would rather not listen to the speaker. Otherwise, the books in the library are only gathering dust. Why not give them to the Salvation Army?

Anonymous

Dear Editor,

Thank you. Another good one!

Now it is expected, so be careful, lest you set the bar too high. Makes it hard for you and others will be reluctant to take over, when the time comes. Cheers! Andrus Voitk.

Dear Editor,

As a brand new member with very, very limited experience in the mysteries of mycology, I am badly in need of help and guidance. With impeccable timing, I joined just as the season was ending. I just received my first copy of the bulletin and was intrigued by snippets of information that led to dead ends for me. I love the idea of growing oyster mushrooms in the basement in shredded newspaper but not a clue as to how to go about doing same.

How should a rank beginner spend the off season learning???

Yours Truly,

Robert

Hedera helix(left) compared to Joe Warfels closeup on a Coryceps(right).

Dear Editor,
I recently noticed a "growth" on a white pine tree that was covered with ivy [see photos] and I was struck by the approximate resemblance to Joe Warfel's fungal growth from a dead ant on pp. 6 and 7 of the most recent Bulletin. I had contacted blindly the Harvard biology folks who clued me in to what the "growth" was [see below]. A curious coincidence.

Klaus

I am pretty sure this these are the petioles of juvenile leaves of ivy *Hedera helix* from which the leaflets have fallen off. the petioles hang on for a bit longer, but soon they will fall as well. Our fungi specialist did not think this was a fungus.
Hope that's of interest.

Christian

Thanks for sharing Klaus. Joe's extraordinary macro-photographic abilities have created a whole slew of look-alikes. I wonder how many corporate mushroom healing elixirs, notorious for global market obfuscation are actually these too. :) Thanks for sharing.

Amanita phalloides in the Northeast

By Bill Bakaitis

On February first, 2019, The Atlantic published an article entitled: *Death Cap mushrooms are spreading across America.*[1] The article, written by Craig Childs, relies heavily upon the expertise and concerns of the eminent west coast Mycologist, Paul Kroeger, who has documented and is alarmed by the rapid and widespread occurrence of *Amanita phalloides* along the west coast, from California northward through Washington, Oregon, Vancouver and British Columbia. The article, and apparent concern, has been widely circulated and discussed, and several people have contacted me about it. I am hoping here to respond to some of their concerns.

Described as Death Cap, *Amanita phalloides*, Is it?
Bailey, L. H. (Liberty Hyde), 1858-1954; Miller, Wilhelm, 1869-. *Cyclopedia of American horticulture, comprising suggestions for cultivation of horticultural plants, descriptions of the species of fruits, vegetables, flowers, and ornamental plants sold in the United States and Canada, together with geographical and biographical sketches*. New York [etc.] The Macmillan company. Digitizing Sponsor: NCSU Libraries via Flickr Commons

In each case the writers expressed alarm, I suspect in part because of the explosion of mushrooms which occurred here in the Hudson Valley last summer. Unlike the situation on the west coast as described by Kroeger and others, I think that for mycologists in the Catskills/Mid-Hudson area this fear is largely unwarranted.

1 https://www.theatlantic.com/science/archive/2019/02/deadly-mushroom-arrives-canada/581602/

Here is why I come to this conclusion:

First as to the toxicity of the amatoxins: Deadly amatoxins appear in some, but not all, species of *Amanita* having a cup-shaped bulb at the base (e.g. *A. bisporigera* and *A. phalloides*). They also are present in a few other species of mushrooms in unrelated genera ~ *Galerina marginata* / *G. autumnalis* being the most likely to be encountered. The toxins are also presented in a few small, rarely collected *Lepiota* such as subincarnata and in the equally inconspicuous *Conocybe filaris/Pholiotina rugose*.

Published reports of those who have eaten the 'Destroying Angel', *A. bisporigera*, or the 'Death Cap', *A. phalloides* describe the mushrooms as being 'delicious' although most patients I have interviewed described the taste as more mediocre. Because amatoxins are not destroyed by heat, cooking will not render the mushroom harmless

The toxic sequence of amatoxins is well known. The first signs of poisoning usually appear from eight to twenty-four hours after the meal, with watery/bloody diarrhea. Even if left untreated, these initial symptoms usually subside for a day or so, leading to the well named 'period of latency'. On the third day, symptoms return, an indication of liver damage and incipient failure. If left untreated at this window of time, death may come a week or so after ingestion. The death rate in untreated cases appears to be in the neighborhood of 60%. Modern medicine however, changes everything. A comprehensive taxonomy of treatment modalities at different stages following amatoxin ingestion can be found at: *https://www.toxinz.com/Demo/6/RlVOMUExLzAwNA%3D%3D*

What this means for the unfortunate mushroom eater is that there is a relatively long period between ingestion and death, with several treatment options available as the case progresses.

The North American Mycological Association has maintained an active data base of toxic events reported to their Toxicology Committee, headed by Michael Beug. *https://www.namyco.org/2014_nama_toxicology_committee.php* Across the US and Canada some 160 Toxicology specialists work to identify the mushrooms involved in suspected poisonings. The tabulated results of the thousands of cases investigated show that the public (and often professional) estimates of the lethality of *Amanita* poisoning appear to be greatly exaggerated. Contrasted to the public perception of 'certain death' attributed to *Amanita* poisonings, the combined deaths of both treated and untreated cases appears to be close to 10%, with, on average, one death per year being reported over the past forty years. In studies where only treated cases were analyzed, the death rate was calculated to be even less. A study in Spain, for example, claimed a 95% survival rate and an Italian toxicology team reported that their

"experience indicates that the protocol used in our toxicology unit is effective for amatoxin poisoning, and that all [105} patients treated within thirty-six hours after mushroom ingestion were cured without sequelae." *https://www.tandfonline.com/doi/abs/10.1080/15563650701365834?journalCode=ictx20*

In my thirty plus years of active Poison Control work, I have never worked a case where death in a human ensued from eating an *Amanita* or *Galerina*. This includes children as well as adults over the age of seventy-five. Here in the northeast, there have been a few such deaths, of course, but they have been rare.

Of the several treatment options used over the years, the most dependable seem to involve the early and continued monitoring of vital signs, and aggressively maintaining the stability of electrolytes/blood pressure/coagulation/liver functions etc. Bear in mind the golden thirty-six hour window cited above. The earlier treatment begins, the quicker and more complete the recovery. I have worked cases where dogs have died, but in my experience, what they actually ate was almost always a mystery. For a technical description of amatoxin toxicity and treatment involving liver failure, see *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3395149/*

Secondly, as to the identity and spread of *Amanita phalloides* in our area. Most field guides will illustrate a dozen or two *Amanita spp.*, usually the most common in the area they seek to represent. Rod Tulloss, arguably the most knowledge *Amanita* expert in North America, cites 1,072 published names of *Amanita* species, 624 of which are accepted as distinct species. Of these perhaps 170 or so have been documented in North America. In my fifty years of serious collecting, I have documented with photographs, records, and usually vouchers, some seventy to eighty species of *Amanita* fruiting from NY to Maine. Many are rarely collected, several were state records. Some were clearly expressions of adaptations of a changing climate. One in fact, *Amanita pelioma*, collected at Harvard Black Rock Forest, Cornwall NY, in 1988, was the only collection ever made north of Virginia, a record I believe which still stands.

During this time of serious dedicated collecting, I have documented *A. phalloide*s only twice. In the 1980's Peter Katsaros and I collected it in Westchester County NY, at the Irvington Reservoir, next to Sleepy Hollow road, in the exact spot originally discovered by Sam Ristich some twenty years prior. A long careful search of the area did not reveal any other fruitings. They were not to be found on any of the other Norway Spruce, (*Picea abies*), planted there during the mid-1930's as part of the CCC (Civilian Conservation Corps) anti-depression program, nor on

any of the other mycorrhizal trees in the area. A return trip to the area @ 2015 failed to find it at all.

A second time, in late October 2015, at the request of Rod Tulloss, I was able to confirm a site in Dutchess County originally discovered by Steve Rock two years prior. These specimens also were collected under Norway Spruce brought there in the mid-1930's. And again *A. phalloides* was nowhere to be found except under a specific Norway Spruce. There are records of a few poisonings reliably attributed to A. phalloides in other Westchester County locations, but always, if memory serves me correctly, under Norway Spruce plantations, which were in public parks, likely constructed in the mid-1930's..

From New Jersey and the Mid-Atlantic states there are records of *A. phalloides* becoming mycorrhizal with other vascular species. Rod Tulloss lists several of these in his website *http://www.amanitaceae.org/* New Jersey, in particular is well documented. In addition, Dennis Aita from NYMS tells me he and the NYMS have been able to document it under White Pine and Oaks but only in a few specific sites on the north shore of Long Island and the Bronx. Likewise Dianna Smith has found it at a Reservoir in Cornwall NY, but only twice, in 2006 and 2007. A collecting partner of Gary Lincoff recalls that Gary had found it (in the NY

area) only once, in the Bronx. In these, and other private correspondences, Pine, Oak, Hornbeam, and Norway Spruce were mentioned as the likely host trees.

In my personal experience I could find no evidence that it had spread beyond the specific tree onto which it had formed mycorrhizal attachment prior to transplantation into North America. It could not be found even on adjoining, sister norway spruce brought over at the same time. Steve Rock confirms that this is also his experience with the Dutchess County site we both have investigated.

The spread of *A. phalloides* from the original to new mycorrhizal hosts especially in California has been well documented but, in the experiences cited above, A. *phalloides* is spreading grudgingly – if at all– in the Mid-Hudson region north of Westchester County (roughly RT 84). Serious collectors I know also confirm they have never or rarely found it despite years of searching.

Sketchy speculations and possible hypotheses: OK, then. Here is the conundrum: If *A. phalloides* was introduced to both the east and west coasts during the same mid 1930's window of time, what might account for the current differential rate of colonization and expansion between the east and west coast populations? There are undoubtedly many interconnected factors, with three broad categories of possibilities: Differences in the habitats, in the inoculant specimens, or in the activity of the collectors.

The Habitat: Innumerable interrelated variables comprise what we might call 'habitat.' Climate, weather, rainfall, substrate, soil-borne micro fauna and flora, host plant options, etc. The difficulty mycorrhizal species have in attaching to new hosts stands out as an interacting variable. Whereas saprobic species can easily move from one substrate/habitat to another – presumably because of the similarity of the sugar based carbon substrate – mycorrhizal attachment is difficult to achieve, both in the laboratory and in the field. As west coast mushroom collectors are quick to assert, there is something in their habitats which facilitate more aggressive growth and mycorrhizal attachment. Many competing hypotheses might explain this phenomenon, but applying Occam's razor, one might suggest a relatively simple one: Perhaps a coincidence, caused by the winter-time fruiting season of the fungus allows its freshly discharged spores an increased chance to meet with newly sprouted seeds, seeds free of the hegemony of established mycorrhiza. In the mild, rainy, west coast winter newly fallen acorns with their unsheathed root sprout should have a longer time to establish symbiotic relationships with fresh hyphae before frost or drought closes that virgin window. [Once hegemony has

been established by a competing mycelium, mycorrhizal attachment is reported to become more difficult.] On the east coast, by contrast, there is often a deep freeze shortly after phalloides fruits, often pushing frost and ice several inches into the ground, effectively ending the growing season for good.

The Innoculating Specimens: A second line of inquiry may be extracted from an article appearing in the newsletter of the Bay Area Mycological Society. From the article, we learn that *A. phalloides* was introduced into California not attached to the roots of Norway Spruce, (*Picea abies*), but on an ornamental cork oak,(*Quercus suber*), again from European stock around 1938. If these two members of the same species have subtly different preferences/needs/abilities for optimal symbiotic partnerships, this would likely enable the west coast specimens to more rapidly colonize the oaks of the area. Interestingly, if correct, this hypothesis would seem to implicate genetic factors between oak and spruce symbiotic strains of *A. phalloides*. And if so, might also underline differences between the biological and genetic concepts of 'species.' As in the first hypothesis, these possible 'causes' are conjecture on my part; both are offered primarily to stimulate discussion and also to set the stage for the third possibility which follows. For more, see: *http://bayareamushrooms.org/mushroommonth/amanita_phalloides.html*

The Collectors: A third hypothesis as to why phalloides is so rarely reported in the Northeast, including the mid-Hudson area, might be because mushroom collectors here have not looked for it hard enough. *A. phalloides* is not edible, fruits late, and is not on any back-to-the- earth, paleo or trendy medicinal list. In this hypothesis, *A. phalloides* might in fact be more common than we think. It is around, but not sought or collected. If so, this is a factor easily rectified.

Several years ago Gary Lincoff was interested in enlisting local mycological associations in an attempt to document the spread of *A. phalloides* in the northeast. Associations and/or members with an interest in traditional taxonomy have been able to document *A. phalloides* (and a good number of other interesting taxa); those unfamiliar or uninterested might not be able to 'see' it even if encountered.

Lincoff's interest still seems to be a worthwhile project, one which could involve Mycological Associations with meaningful field work, work which was once the *raison d'être* of amateur mycology. In addition, during those delightful days of autumn when fungi are often hard to find, even sheer taxonomic beginners could delight in the joys of being outdoors, tromping through the woods, searching for the rare and unusual, having meaningful collaboration with more seasoned and experi-

enced local experts and interpreters of the habitat.

Finding *A. phalloides*: *A. phalloides*, the "Death Cap" (or "Cup") is often confused by the lay person with *A. bisporigera*, the 'Destroying Angel". Both of these *Amanitas* contain the same lethal amatoxins and should never be eaten. Whereas the common *A. bisporigera* is usually tall, gleaming white and fruits most likely in the heat of summer, in our area, the rarely collected *A. phalloides* tends to be more squat, at times being described as 'stringy', fruits late in the season, and is of a 'brassy yellow-green' color.

Forms of *Amanita citrina*, because of the yellowish tinge of the cap, the large bulb at the base of the stipe, and the tendency to fruit late in the season, have at times been mistakenly identified as "*A. phalloides*." Should you be faced with this dilemma in the field a sniff test might help in making a discrimination: *A. citrina* has a 'potato-like' odor, whereas *A. phalloides*, especially when mature, has the sickeningly sweet, chlorine-like odor of the common *A. bisporigera*.

After bringing your collection home, you will, of course, want to consult credible literature to make your final determination. A good user friendly on-line site is that of Michael Kuo's *Mushroom Expert*.[2] For more technical information you can easily navigate through the sidebar directory of Rod Tulloss' *Amanitaceae*.[3]

A small addendum of sorts: Upon returning from the persistently dry Maine last fall, and between fishing trips to the shore, I did go out several times to see what was still fruiting in the Mid-Hudson area after the rains of summer 2018. In particular I visited the site where in the past Steve Rock and I had individually collected *A. phalloides*. There were a few species of *Pholiota* on the trees, an odd *Russula* or two here and there in the duff, a good number of *Tricholoma*, various Corts, and forms of *A. citrina*, along the path. On a water soaked log at the edge of the lake, over a peck of the green capped- orange gilled Fall Oyster, *Panellus serotinus*, were to be found. There was even a large but disintegrating *Grifola frondosa* at the base of a large white oak, but look as I might, I could find no evidence of *A. phalloides*.

Of the eight to ten separate attempts by at least two teams of experienced mycologists, phalloides had been found there on only four occasions of which I am aware – six specimens in all. I now check for it there annually. Eighty years after introduction into this location, and after repeated attempts to find it among this and other stands of norway spruce on this large, diverse, and well documented plantation which was estab-

2 *https://www.mushroomexpert.com/amanita_phalloides.html*

3 *http://www.amanitaceae.org/*

lished in the mid 1930's – and with the original maps to guide us – *A. phalloides* here appears to be confined to only one living-room sized plot of land surrounding one particular tree, and even on this tree fruiting only sporadically. Neither Steve nor I could find any evidence of it fruiting under any other norway spruce, white pine, birch, oak, poplar, willow or shrub in the area.

Conclusion: Let me return to the observation with which I began this piece In contrast to

Grifola frondosa
Joshua Winer, Artist and BMC member, 2018, *http://www.joshuawiner.com*

Amanita citrina,(above) Variants Of Which May Be Confused With *Amanita phalloides*. (right)
Both fruit late in season. In citrina, bulb is soft, 'marshmallow-like', unlike the firmer cup of *A. phalloides* and *A. bisporigera*. The cap of citrina may be 'greenish' particularly in filtered light of a green canopy, but usually covered with flocculent remnants of universal veil, unlike the fibrous veil of phalloides which usually remains attached to the bulb producing the distinctive 'Death Cup'. The odor of citrina is usually described as 'potato or radish-like.'

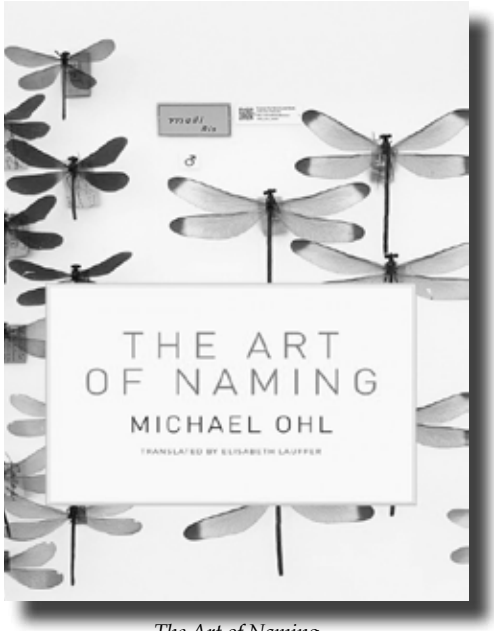
The "Death Cap," under norway spruce: Rarely collected, small, stringy and deadly.

the well documented spread of *A. phalloides* on the West Coast, and to a lesser extent the Mid-Atlantic States, I see no rapid expansion to new territories or mycorrhizal partners here in the Mid-Hudson region of New York State. Until this happens, if it ever does, the casual mycophagist has the most to fear, not from "The Death Cap" but from the equally dangerous, widespread and common "Destroying Angel" *Amanita bisporigera*. But this is not a newly emerging threat. The Destroying Angels have been here as long as we have. They are deadly, but easy to identify and avoid, and surprisingly not as deadly as commonly thought if prompt medical treatment is obtained.

The Art of Naming

Book Review By Lawrence Millman

Michael Ohl
Translated by Elisabeth Laufer
2018, The MIT Press
294 pages, $29.95



The Art of Naming
By Michael Ohl

In German biologist Michael Ohl's new book *The Art of Naming*, there isn't a single mention of mycology, but no matter. The book will delight and instruct readers who possess any interest in taxonomy, fungal or otherwise. According to Ohl, scientific names "exist to be played with," and he provides a history of that playing. It turns out mycologists aren't the only off-the-wall taxonomists.

Here are a few examples of the book's widely varied cast of characters and/or subjects: the obsessive species namers who have what the author calls a "Gotta Count 'Em All" mentality; the entomologist who declared, "I shall name this beetle after my beloved wife;" the cottontail rabbit (i.e., bunny) named after Playboy founder Hugh Hefner; the outrageously egocentric palaeontologist Edward Drinker Cope, who bequeathed his skeleton to science so it would be the type specimen for the human species; the family of Hawaiian spiders named Orsonwelles; the dozens of species inspired by the fantasy world of Lord of the Rings; and English ecologist Sir Peter Scott, who wrote a paper for *Nature* on the Loch Ness Monster, to which he gave the name *Nessiteras rhomboterax*... an acronym for "monster hoax by Sir Peter Scott." Here I might add that if *The Art of Naming* goes into a second printing, the recently described fungus *Spongiforma squarepantsii* deserves a mention in its pages..

An excellent book on all accounts — run, don't walk, to your nearest bookstore (not Jeff Bezos's publisher-killing company) and purchase it!

Clastoderma debaryanum

Who's in a Name

By John Dawson

Clastoderma debaryanum Blytt is a common slime mold in the order Echinosteliales. Like other species in that order, it is minute and often overlooked. But however inconspicuous it may be, its name commemorates one of the most influential mycologists and plant pathologists of the nineteenth century: (Heinrich) Anton de Bary.

Born in Frankfurt-am-Mein, Germany on 26 January 1831, de Bary was one of ten children of the physician Theodor de Bary and his wife Emilie Meyer de Bary. Encouraged by his parents, young Anton developed an interest in natural history at an early age and was introduced to fungi and algae by another local physician, Georg Fresenius.

Following his graduation from the *Gymnasium* in Frankfurt de Bary pursued studies in medicine at a series of universities (as was then the custom): first at Heidelberg, then at Marburg, and finally Berlin, from which he received his medical degree in 1853 — for a dissertation on sexual generation in plants!

Indeed, during his years of medical studies de Bary had also been a student of several leading botanists, including Alexander Braun, Christian Gottfried Ehrenberg and Johannes Müller; and the same year he completed his doctorate in medicine he published a book, *Untersuchungen über die Brandpilze und die durch sie verursachten Krankheiten der Pflanzen*, in which he correctly identified rust and smut fungi as the causes of several important diseases of cereal grains, in contrast to the view, then still prevailing in some quarters, that fungi arose through spontaneous generation as a consequence of putrefaction.

De Bary's career as a practicing physician was very short-lived. In 1855, after serving briefly as a *Privatdozent* (unsalaried lecturer) in botany at the University of Tübingen, he was named professor of botany at the university in Freiburg im Briesgau, where he established the world's first botanical laboratory and began to attract a coterie of students. At Freiburg he studied the development of myxomycetes and observed the process of sexual reproduction in the potato-blight oomycete *Peronospora infestans* (then considered a fungus), which he later reclassified as *Phytophthora infestans*. He also elucidated the mechanism of alternation of hosts in *Puccinia grammis*, the pathogenic rust of wheat and rye.

In 1861 de Bary married Antoinie Einert, with whom he had four children. In 1867 he moved to the university at Halle, established another laboratory there, and became co-editor of the periodical *Botanische Zeitung*, to which he also contributed many articles. During de Bary's

residence at Halle the Franco-Prussian War (1870–71) broke out, after which, in the wake of Germany's victory and attendant unification, he was appointed rector at the University of Strasbourg (rechartered as a German university following Germany's accession of Alsace-Loraine). He remained there as professor of botany until his death on 19 January 1888.

At Strasbourg de Bary founded a botanical institute that attracted students from Europe and North America, continued his studies of the potato blight, and published two important books: *Die Erscheinung der Symbiose*, in which he introduced the term "symbiosis" , and *Vorlesungen über Bacterien*, in which he surveyed all that was then known about bacteria.

In all he published more than 100 articles on a wide range of botanical topics, and the "signal contributions to [the] classification and systematization of botanical knowledge" that his books made turned the study of fungi into a scientific discipline.[1]

According to the obituary of de Bary by Marshall Ward that appeared in the British journal *Nature*,[2] de Bary was not a brilliant lecturer: "he appeared shy and nervous when on the dais". But his "impressive truthfulness . . ., the earnestness of his teaching, and the absence of any striving for effect", together with "his humorous and never malicious disposition . . . and his sharp, but always just, criticism of anything pretentious" left an indelible impression on his students.

Anton de Bary

User Magnus Manske on en.wikipedia, Public Domain, *https://upload.wikimedia.org/wikipedia/commons/0/00/Anton_de_Bary.jpg* via *Wikimedia Commons*

1 Quoted from the entry on de Bary by Gloria Robinson in the *Dictionary of Scientific Biography* (vol. 4, pp. 611–614), from which the biographical information presented here was extracted.

2 Vol. 37, no. 3 (January 26, 1888), pp. 297–299.

Slime Molds

A Tribute To the Bizarre

By Liam Nokes

This year's mushroom season was an excellent one full of regular and plentiful rainfall and excellent days to venture outside and collect. Such a season, in the author's experience, often brings home numerous morphological wonders and unfamiliar oddities in the basket. Many of these strange organisms that frequently plagues lawns, leaf litter, and decaying wood alike fall under the category of slime molds. Slime molds, though not fungi, have a long history within mycology. They are truly fascinating organisms, in life cycle, taxonomic history, and pertinence to more broad areas of study. From being small scale analogues to multicellular development to designing resource efficient, fail-safe transportation networks and exemplifying incredible morphologies, slime molds are universally prevalent, and perhaps worth a closer inspection at the end of a long foray.

Contrary to what many think, slime molds are not multicellular organisms. They are aggregation organisms, so they start out as single celled amoebae. They eat, grow, and divide until they run out of food. At this point the cells start to aggregate and form what is known as a plasmodium, or a slug like creature made

of sometimes more than tens of thousands of individual amoebae that can move around and find the ideal spot to reproduce. At this point in the life cycle, however, some major differences start to appear among the organisms classified as slime molds. In the case of Myxomycetes, the larger slime molds that one might see on their lawn after some rain, the aggregated cells fuse. They undergo a phase of sexual reproduction where the cells exchange genetic material to form genetically distinct offspring. It is for this reason that Myxomycetes are labelled as true slime molds, for they undergo true fusion in the plasmodium. There are a number of other amoebae, however, that demonstrate such aggregative tendencies without fusing at all.[1] These are known as cellular slime molds and vary greatly in life cycle, habitat, and behavior. Some of the slime molds without true plasmodia even form underwater slime nets of the amoebae strung together. Cellular or not, however, the next goal for the slime mold is to reproduce; to fruit and produce spores. Once this is accomplished the spores find their way to a new location to begin the cycle again.

1 There is some evidence that genetic recombination occurs in cellular slime molds, but the instances are rare and isolated.

Trichia decipiens : From Karen Sanamyan

Slime molds spores are quite often distributed by birds.

Migration routes of some North American birds
Cooke, Mordecai Cubitt, Bird Migration Patterns. published 1875. Appleton. released October 2009. Page 71,
Pearson, Thomas Gilbert. *The Bird Study Book*. Doubleday, Page & Company 1917 Illustrated by Will Simmons. Page 71 via Project Gutenberg.

Both the cellular and acellular slime molds are a bit of an evolutionary mystery, but based on their tendencies bits of their natural history can be pieced together. For one, the slime molds are not all from the same origin. Because of the vast diversity of forms and behavior (from Myxomycetes to the 'slime nets'), convergent evolution is likely at play. It is likely that the process of aggregation provided similar benefits to the slime molds that being multicellular would. These benefits would include greater size in the aggregation and fruiting stage, greater geographic distribution and longevity due to the ability for the dispersal of the durable spores, and eventually sexual reproduction. However, because many slime molds depend on the motile capabilities of insects and other small animals for spore dispersal, it is also likely that they came to be once such vectors existed. The argument for the more recent emergence of slime molds is further supported by their vast geographic distributions; the result of small animals. Without the animal dispersal vector, there may have been no motivation to aggregate to form sporocarps up at the animals' level.

The exact causes of the geographic distribution of slime molds has been a puzzle extremely difficult to solve in the recent past due to the sheer magnitude of the area where a single species grows. Many slime molds have been found over distances of thousands of miles, which is extremely puzzling. If the slime molds were to disperse their spores using only insects, by the time they made

it over the thousands of miles that they do, divergent evolution would have taken its course and the species on either end of the distribution would be different. Recent research on this very topic has brought to light the fact that slime mold spores are quite often distributed by birds that prey on the insects that carry their spores. Hannah Suthers of Princeton University found that some slime mold spores could last up to ten days in a migratory bird's stomach. The migration from North America to South America only takes 72 hours, explaining their incredible distribution.[2] The prolific dispersal of slime molds brings to light their effects on the global ecosystem. Because they are so common, they are responsible for a large portion of the decomposition of many soil bacteria, other slime molds, and fungi, that decompose things themselves, recycling energy into the ecosystem. It is safe to say that without slime molds, the global ecosystem would be very different.

Because of their aggregative nature, slime molds have been used as an analogue for the human embryo in studies about developmental biology. Of course, cellular slime molds have been the primary experimental tool, for they are far more easily studied than Myxomycetes. For this reason, the majority of information about mechanisms for control, movement, shape, and differentiation between stalk and spore cells of slime molds pertains to the cellular slime molds.

There are a number of factors that govern the movement and growth of cellular slime molds, the most powerful of which is cyclic Adenosine Monophosphate (cAMP). This is the governing chemical cause of aggregation, slug formation, and orientation, and it eventually runs the processes of differentiation and morphogenesis. Typically when the slime mold amoebae run out of food and a few begin to secrete large amounts of AMP, resulting in the aggregation of the slime mold. The amoebae secreting the most AMP orient to the front tip of the slug and move faster than the rest of the amoebae, thus creating a gradient, so there is less AMP as one moves down the slug and the amoebae form a line and stay together. The speed of the slug increases proportional-

2 *Polysphondylium filamentosum* is actually present in North and South America as well as parts of Europe, following no migratory bird paths and is another mystery

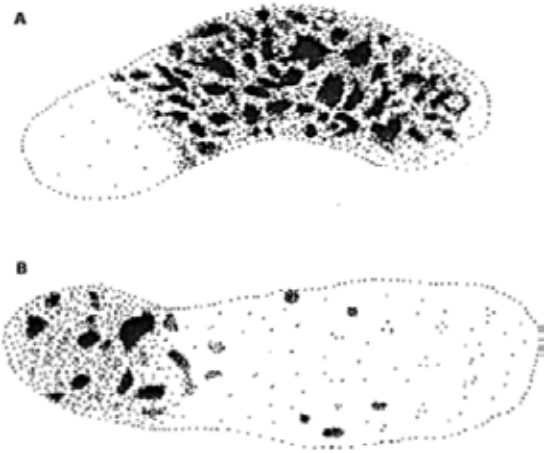
ly with the amount of individual cells in it, as more oarsmen in a boat would increase the speed of the boat (Bonner, 1959). On top of the cyclic AMP and quantity of cells, there are a number of other things that affect the movement of the slime mold slug. They are extremely sensitive to gradients of light, heat,[3] and oxygen, for these things increase the closer to the soil surface the slug is. Along the same lines, the cellular slime molds orient sharply away from Ammonia, spore-containing tips. These whorls, as well as the morphological development of the cellular slime molds, is governed overwhelmingly by reaction diffusion phenomenon, likely involving cAMP. Studies on the whorls have suggested that differences in size and distance apart of the whorls depends on the amount of cytoplasm volume as opposed to the number of cells, which suggests that the mechanism is largely physical.

These reaction and diffusion phenomena are actually quite simple on a small scale, and are the primary mechanism of cellular differentiation. The differentiation of cells into spore and stalk occurs in roughly the same sequence in each species, but it does differ in timing within the life cycle. For instance, some species show distinct variation beginning in the slug stage where others do not display such differences until they begin to grow upwards (such as whorl producing species). For the sake of simplicity, the well studied model organism *D. discoideum* presents a simple illustration of differentiation while the slug is still motile. After about one hour to five hours of migration, the slug, the cyclic AMP concentrations shift from relatively uniform to a sharp division between anterior and posterior ends of the slug. This results in a sharp division line between the large posterior end that end up becoming spores (prespore) and the smaller anterior end up as stalk cells (prestalk[4]). The exact cause of the division is still a point of contention, with a couple of rivaling ideas. One potential explanation is that the position of the cells within the slug determines their role, but there is also evidence that each cell's role is predetermined. The

3 There are some bizarre cases regarding the reactions of different morphologies to light and especially heat, and further research is required into these effects to fully understand their purpose and extent in cellular slime molds.

4 Acytostelium species are an exception, for they secrete a cellulose stalk

Beginning of differentiation in *D. discoideum* : John Tyler Bonner
(A) Slug with prespore region stained
(B) Slug with prestalk region stained



likely conciliation between these two ideas is that both are involved in the differentiation which increases in concentration the deeper in the soil the slug gets. These process. A wonderful experiment from the 1940s[5] cut a slug of D sensitivities serve the primary purpose of getting the slug above the ground to the perfect spot so the spores can be dispersed effectively.

The movement of the slug is only half of the struggle, however, for next the slime mold must actually disperse its spores. There are two things involved in this process: the slime mold must orient vertically for optimal dispersal of spores, and it must actually have the cells differentiate to become spores or stalk cells. The vertical orientation comes naturally with attraction to oxygen, and is universal among the cellular species. There are also some idiosyncrasies in different species, for some cellular slime molds grow whorls, or branches that spring from the stalk and have discoideum into distinct parts from the posterior and anterior zones. When these were allowed to fruit immediately after being cut, the ratios of stalk to spore cells were very far from normal (Stalk:Spore≈1:3), but when given a few hours before fruiting, the some prestalk cells converted to prespore cells and visa versa depending on the slice of the slug. These results indicate that the true differentiation process is a result of predetermination of a cell based on its early position within the slug: a combination of the two opposing explanations. These properties of the cellular slime molds, aside from

5 See Raper, K. B.'s paper "Pseudoplasmodium formation and organization in Dictyostelium discoideum" (1940) in J. Elisha Mitchell scient. Soc. 56, p241-28

Myxobacteria: University of Wroclaw

simply being fascinating, may also present solutions to some of the same questions in developmental biology that are yet to be uncovered.

As many who have made an attempt to understand slime mold taxonomy may know, the slime molds have had tough history with classification. The discovery of slime molds took place at some point during the 19th century, when their fungus-like appearance and sporocarp formation along with a lack of genetic taxonomic techniques placed them in the Kingdom Fungi. As their phylogenetic history and true life cycles have come to light and effectively stumped the taxonomists, the slime molds have found themselves in the wastebasket of classification: Kingdom Protista (this is not an attack on the Protists, just acknowledgement of the fact that it is where everything with contested belonging in the other Eukaryotic Kingdoms gets tossed). They later shifted all about, with De Bary classified slime molds under the class Mycetozoa in the protists, placing some "doubtful mycetozoa" in a more novel Gymnomyxa Phylum. The slime molds then experienced a turbulent period where they shifted among subclasses, obscure subdivisions, and between Kingdoms, until Whittaker placed them as three phyla in the Fungi (Myxomycota, Acrasiomycota, and Labyrinthulomycota). Olive quickly placed them back into the Protist Kingdom a year

later in 1970 under the umbrella Mycetozoa. The exact classification is still in flux today, as is the case with many organisms as the age of genetics conquers all, but they all still remain in rather consistent divisions among the Protists in the subphylum Mycetozoa.

Slime molds are not the only aggregate organisms that provoke interest mycological communities, however. Some Ascomycetes such as *Neurospora crassa* form fungal chimeras underneath the ground by fusing mycelia. The process is remarkable, and the fungi then undergo a massive fluid and genetic exchange that is not yet fully understood, but allows for the possibility of sexual combination among more than two specimens. The Myxobacteria also demonstrate the ability to aggregate to form biofilms (hence their Myxo- prefix) as well as a number of social patterns involving cooperation and predation, and thus are an interesting illustration of the true sociobiological capabilities of Prokaryotes. The motif of such a lifestyle over three separate Kingdoms of life highlights its potential importance in understanding the evolution of multicellular organisms. The aggregation life strategy also provides a near perfect analogue for the controlled study of regulatory processes in developmental biology of the embryo, as well as presenting a myriad of other research directions.

Today's research in slime mold sociobiology and development reveal yet more idiosyncrasies and applications of slime molds. Many researchers have moved on from their developmental biology entirely to explore other interactions among themselves and with the environment, with al-

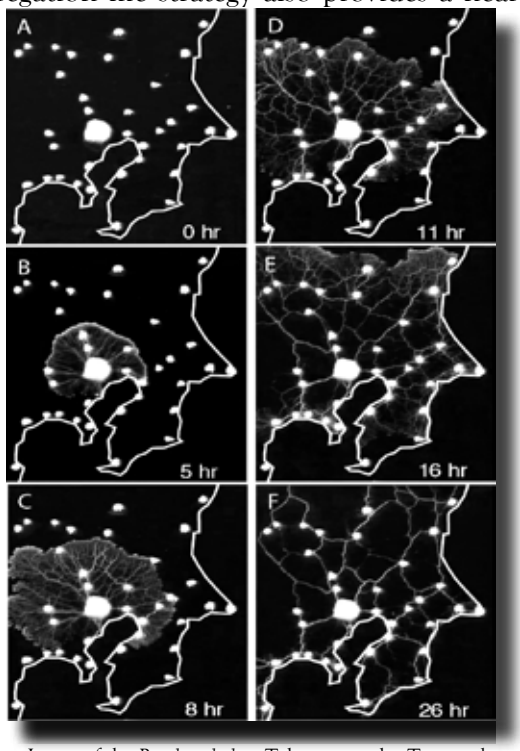


Image of the *P. polycephalum* Tokyo networks: Tero et al.

ready promising results.

Recently Myxomycete slime molds have acquired substantial media attention. Their ability to orient themselves spatially to best fit and navigate obstacles and the environment has been a fruitful area of preliminary research. The most well known of these recent breakthroughs involves *Physarum* species and their ability to find the shortest path through a maze.[6] When Toshiyuki Nakagaki and others from the Hokkaido University placed *Physarum polycephalum* at one edge of a maze with a number of paths varying in length but all ending with the same food reward. Not only did the slime mold expand through the maze, the aggregation was able to decide on the shortest path once they had made it through, allowing for the food at the end to be distributed most effectively through the body. The researchers have taken this research much further, and have even applied the networking techniques of *Physarum polycephalum* to model the Tokyo rail system. Using intense light that the slime mold dislikes at varying locations to represent the mountainous topography around Tokyo and clumps of food source at the major cities and stops, the researchers set the slime mold free on the model. The results were incredible: within 26 hours, the slime mold specimen had expanded and developed a network of thin strands connecting the food particles that mimicked closely the railway network around Tokyo, which took network engineers much more time to plan. Beyond their network designing capabilities, *Physarum polycephalum* has also been demonstrated to anticipate periodic events. After the plasmodium of *P. polycephalum* was shocked three times in a periodic fashion, the next few times it was due to receive a pulse, it slowed down its speed, indicating an ability to anticipate and brace for the periodic undesirable condition. Just as a reminder to insure the full shock at these capabilities: the organisms possessing these impressive powers are just congregations of brainless unicellular amoebae. These discoveries, while simply astounding, also present a number of new questions and applications that are yet to be uncovered.

As is clear from their seemingly neurological abilities to retain information and make efficient distribution networks, the slime

6 The video *Are You Smarter Than A Slime Mold* is a wonderful concise illustration of this ability and is available online

molds put forward a clear path towards better understanding network algorithms as well as neurosystem development. That is not all, though, for as molecular techniques improve, the plot in slime mold biology thickens. More new fronts of research develop as scientists begin to look at their evolutionary history and the mathematics that govern all of their developmental processes. The internet and other forms of communication are difficult to engineer at large scales, and the application of slime molds could generate new insights into these problems. Old ideas also find themselves challenged, such as the idea that reaction diffusion phenomena directly cause morphogenesis among the cellular slime molds. Scientists competing to grow the smallest fruiting cellular slime mold have succeeded with one containing three stalk cells and four spore cells, for which the previously accepted diffusion phenomena impossible on such a small scale. Of all of the places that slime molds research is headed, perhaps the one with the most widespread implications would be that in developmental biology. Differential genetic expression (explain) is a problem that has puzzled biologists for centuries, and slime molds will provide the first stepping stones to understand this important process. Hopefully, their fascinating characteristics and applications pose enough merit for a better appreciation of slime molds in the mycological community.

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Ericoid Mycorrhizal Partner

By Johnny Mianscum
2019, Ouje-Bougoumou, Quebec

I think that I shall never see
a poem lovely as Labrador tea
a heath shrub in the Ericaceae
which, say the Cree, will never die
its leaves remain green at 40 below
with or without several feet of snow
as green as in a temperate clime
where there's hardly any bit of rime
So praise this hardy taiga plant
and read it rather than my silly chant

Labrador Tea
Nakai, Takenoshin; Koizumi, Geneichi. *Dai Nihon jumokushi*. Tokyo: Seibidoì Shoten. Contributing Library: Harvard Botany Libraries Digitizing Sponsor: BHL-SIL-FEDLINK via Flickr Commons

Mushroom Apocalypse: A Book of Fungal Fiction

Whimsical, satiric, and sometimes even outrageous, Mushroom Apocalypse is Lawrence Millman's 16th book and the first ever book of mycological short stories. In its pages, you'll encounter (among other characters) a pair of foodies who contemplate eating a mushroom cloud, the Dalai Lama as a magic mushroom aficionado, and a Russian czar named Ivan who's a terrible mushroom identifier.

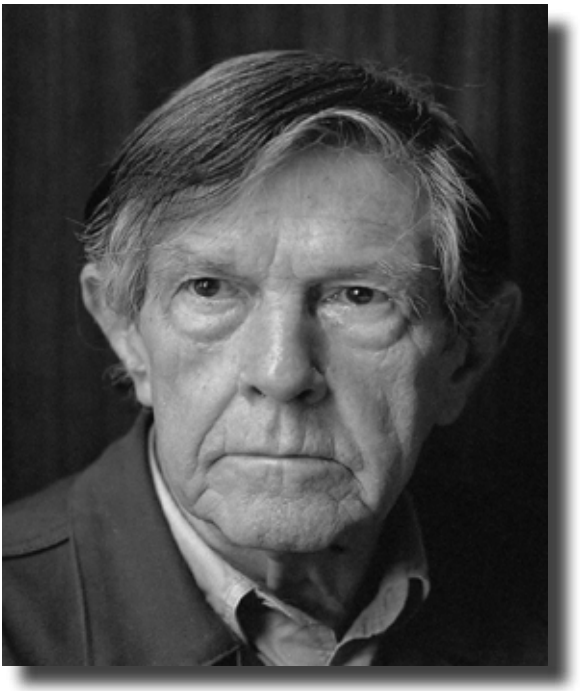
The book can be obtained at the Duff Sale or by sending $16 check/cash (postpaid!) to Lawrence Millman, P.O. Box 381582, Cambridge, MA 02238. Be sure to ask for an inscription!

Cover Image Mushroom Apocalypse
by Lawrence Millman

Our Website

http://www.bostonmycologicalclub.org/

This is an incredible resource created with the generous patience and extraordinarily talents of Scott Shaffer. Among past lectures and other resources you can use your account to readily view digital back issues of *The Bulletin*.



John Cage
By Rob Bogaerts (Anefo) [GFDL *Fotocollectie Anefo*. Nationaal Archief, Den Haag, This file is made available under the Creative Commons CC0 1.0 Universal Public Domain Dedication, via *Wikimedia Commons*

Listening for Mushrooms

By Peter Hoenig

My preferred walk is the path I've done for 30 years. There are familiar trees, stones, hills, plants and mushrooms. They have become friends and I look for them when turning the corners. Often, new sitings emerge and the walk gets richer. Finding an insightful someone who has traveled a similar route is a particular treat.

In September 2018, The New York Times asked 18 prominent musicians to choose 5 minutes of music they love. I listened to the 90 minutes as I flew to visit my son in Chicago. The last piece, chosen by the American opera director, Yuval Sharon, was John Cage's 4' 33". The first performance of 4' 33" was in 1952 in Woodstock, New York, by the American pianist, David Tudor. Tudor walked onto the stage with a stopwatch, sat down, and never played a note. The movements were 30", 2' 23", and 1' 40". He announced the beginnings of movements by closing the keyboard lid, the endings by opening it. A different pedal was depressed for each movement. John Cage described the performance as, "You could hear the wind stirring outside during the first movement.

During the second, raindrops began puttering on the roof, and during the third the people themselves made all kinds of interesting sounds as they talked or walked out." I sat on the plane listening to the hum of the jet engine, the movement of passengers, faint conversation, my breath, and wondered what drew this prominent 20th century composer and philosopher to mycology.

John Cage covered a large territory in his life. He explored, broke through traditional norms, taught, composed, and wrote. There are thousands of articles, tapes, and books by him and about him. In his early 20's Cage studied with the eminent composer Arnold Schoenberg, and was inspired to "devote (his) entire existence to writing music." For the next 60 years Cage didn't stop creating and he changed the world, but he soon broke with Schoenberg. Schoenberg wanted him to focus on harmony and counter-point but Cage felt constrained and rebelled. He became immersed in the post-WW2 world of art, particularly inspired by Robert Rauschenberg's all-white paintings. The paintings' demand on the viewer intrigued Cage, and prompted him to explore the idea of challenging an audience to "listen". Traditional music, he felt, was a oneway path from the musician to the audience. He saw the lack of intention to listen as the difference between sound and silence. There was no silence for Cage. If you didn't hear, it was because you were not listening- "Music is continuous. It is only we who turn away."

Cage worked hard to listen "intently." In 1950 he went into the anechoic chamber on Oxford Street at Harvard University. It was a room that was built by the Office of Naval Research and insulated with acoustically absorptive material that suppressed echoes and outside noise. Inside the silent room he heard two sounds, one high and one low. The chamber engineer explained to Cage that the high note was his nervous system and the low note was blood in circulation. Cage summarized his Harvard experience in a lecture titled, "Lecture on Something": "No silence exists that is not pregnant with sound." Listening, he taught, is different from hearing and requires intention.

Cage wants us to listen closely, challenging us to hear the sounds of spores, varying in size and shape, hitting the ground. And then in his whimsical and wild way, pushes us to consider the possibility that "the gills of certain mushrooms are employed by appropriately small-winged insects for the production of pizzicato and the tubes of the Boleti by minute burrowing ones as wind instruments...."

In the spring, following a warm spell, I looked for morels on a field, bordered by a hardwood forest. They should have been there, but there were none. Instead, my wife found them in our backyard. Perhaps there

were other variables I hadn't factored in, such as humidity, the severity of the winter, the wind, soil composition, the cycle of the moon. Mushroom hunting isn't like planting beans, where there is a high confidence level that nine out of ten seeds will emerge in twelve days. Fungi have a randomness and mutability that is challenging. This is the "indeterminacy" that Cage played with in his music and saw epitomized in mushroom hunting. He composed music in which, despite careful listening and study, the next note comes as a surprise.

John Cage was a peripatetic mycologist. He started off eating mushrooms during the depression because he was hungry, and ended up being a founder of the New York Mycology Society. He was an avid fungal chef. He taught mushroom identification at The New Schooi in NYC, was a collector of mushrooms, mushroom books and paraphernalia- all now housed at the University of California, Santa Cruz. He enjoyed learning and playing with fungal taxonomy, and wrote a book titled *The Mushroom Book* (1972), with illustrations by Lois Long and species descriptions by Alexander Smith. Cage's contributions were lithographs on transparent Japanese paper, punctuated by poems of fungal taxonomy, often unreadable.

Cage explained, "the lithographs of mine (were) done with handwriting, so that ideas are to be found in the same way that you find wild mushrooms in the forest , by just looking." Only 75 copies of the book were printed. Copies are tough to find. Cage was also a prize winner on the popular Italian quizz show, Lascia o Raddoppio. For double or nothing he was asked the question: "Tell us the names of the twenty-four

Mushroom Book Cover Art
By John Cage, Lois Long, Alexander Smith

kinds of white-spore mushrooms listed in George Francis Atkinson's classic, "*Studies of American Fungi: Mushrooms Edible, Poisonous, Etc.?*". He answered correctly, in alphabetical order, and won eight thousand dollars and an honorary membership in the local Italian mycology society.

Hunting for mushrooms sustained Cage. He often went alone but seemed to prefer going in a small group. He went with students, friends and colleagues including Jasper Johns, Robert Rauschenberg, and Merce Cunningham. He took the hunt seriously and when writing about his walks quoted Henry David Thoreau: "What right do I have to be in the woods, if I am thinking of something out of the woods." It was his retreat and his temple. He was a 1900 Century transcendentalist and I suspect aspired to be in nature as Ralph Waldo Emerson describes in his essay, *Nature*: "I become a transparent eye-ball; I am nothing; I see all."

I am a novice mushroom hunter, having been at it for only a couple of years. I have enjoyed learning about mushroom dyeing of cloth, paleomycology, mycological taxonomy, etc.. I know a bunch of the New England edibles, and my kitchen has gallon jars holding dried black trumpets, oysters and hen of the woods. But all of the above would float away if I did not walk in the woods. I walk in Adams Woods, behind Walden Pond. Henry Thoreau walked these woods. I walk through the woods usually with my head at a 45 degree angle, unless I expect to see chicken of the woods. A tree crowded with turkey tails no longer requires me to look up to confirm the tree's death. In the bark of a conifer I spot a cup-fungi eating sap. Spotting the black trumpet against the dark leaf cover was a big find for me. And I am swept away by the beauty of the rusty- filled polypore as it's cap slips from yellow to burgundy red to brown. I like to hunt with my wife. A friend, Josh Winer, is a frequent companion. He is an artist, muralist, and for 50 years has trained his eyes to see. He will locate the meadow mushroom while I am still scanning. And it is pure pleasure - the listening, the indeterminacy, the getting better.

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BMC - Eagle Hill Scholarships Available

Eagle Hill Classes have been posted early this year and some are reproduced below. If any look appealing to you and you are willing to take good notes bring information back to the BMC we encourage you to apply for the BMC The Eagle Hill's Scholarship.

May 19 to May 25	**Lichens and Lichens Ecology** Troy McMullin
May 26 to June 4	**Old-growth Forest Lichens and Allied Fungi** Steven Selva and Troy McMullin
May 26 to June 4	**Introduction to Bryophytes and Lichens** Fred Olday
June 16 to June 22	**Independent Study: Topics in Fungal Biology** Donald Pfister
July 28 to Aug 3	**Mushroom Identification for New Mycophiles** Greg Marley and Michaeline Mulvey
August 11 to August 17	**Crustose Lichens and Accessory Fungi** Toby Spribille
August 11 to August 17	**Lichens, Biofilms, and Stone** Judy Jacob and Michaela Schmull
August 18 to August 24	**Mushroom Microscopy** David Porter and Michaeline Mulvey
Sept 27 to Sept 29	**Fall Maine Mushrooms** Greg Marley and Michaeline Mulvey
October 25 to October 27	**Crustose and Foliose Lichens** Fred Olday

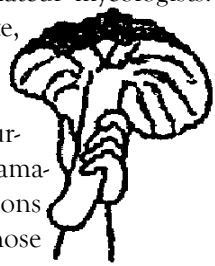
Since 1897

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

The Next BMC Bulletin Wants Your Work

Please submit any and all contributions before **August 1.**

CALL FOR SUBMISSIONS



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

Generously submit all contributions to BulletinBMC@gmail.com

Help Friends of the BMC

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

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

Sudbury Valley Trustees: www.svtweb.org The Trustees of Reservations: www.thetrustees.org.

Membership for 2019

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

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

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

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

Wait, Wait, Don't Tell Me! (For Wild Mushroom Cooking Aficionados)

By Andrea Seek

Here's what you do: Complete the sentence with the common name of an edible wild mushroom, then answer with the Latin genus and species name!

One point for the common name, two points if you can answer with the Latin name.

Example: If you showed up half an hour late to your job interview, you know you ?

Answer: Blewit. So you should say, "*Lepista nuda*."

Set your timers!

Go!

1. If you're too scared, you're a ?
2. His Purple Highness ?
3. Rock, paper, ?
4. High school girls wearing school football uniforms, no-tackle game, might said to be playing ?
5. When the Last Days come, the Angel Moroni will raise the dead by blowing his ?
6. Cruciferous vegetables: cabbage, broccoli, and ?
7. If your cupboard is full of jellies, your friends might think you have a ?
8. Boo'd up with your ?
9. Wood nymph riding tack, also know as ?
10. Walks on three legs ?

(Answers on back cover)

UPCOMING EVENTS

Sunday May 5 5pm	**BMC Annual Culinary Potluck** *Dreams And Nightmares Of Urban Restoration Ecology* talk by Steven N. Handel At the Cambridge VFW
Sunday May 19 7:30pm	**Dyeing with Mushrooms & Lichens** Harvard Herbaria Seminar Room **Leslie Masson**
May-June Mondays	**Spring Course Lectures For New Members** Harvard Herbaria Seminar Room May 20, June 3, June 10, June 17
August 1-4 Thur-Sun	**NEMF 34th Samuel Ristich Foray** Lock Haven University, Lock Haven, PA
August 8-11 Thur-Sun	**NAMA Foray** Paul Smiths, New York
August 14-18 Wed-Sun	**Telluride Mushroom Festival** Telluride, CO
Aug 29-Sept 2 Thur-Mon Labor Day	**COMA Clark Rogerson Foray** Hemlocks Center, Hebron, CT
Aug 29-Sept 2 Thur-Mon	**2019 New Moon Mycology Summit** New York
Saturday Sept 21	**Gary Lincoff 19th Mushroom Foray** North Park, PA *http://wpamushroomclub.org/lincoff-foray/*
Sept 26-29 Thur-Sun	**Wildacres Regional Foray** North Carolina

Join our efforts in sharing all regional mycology related events with BulletinBMC@gmail.com

Mystery Fungus

Dear Mycophiles, The mystery fungus that led to the exploration of the Arctic in the 19th century is *tripe de roche*, the name of which refers to several lichen species in the *Umbilicaria* genus. Sir John Franklin survived an overland expedition in Western Canada by eating *tripe de roche*, a fact that allowed him to disappear 20 years later. Explorers looking for him ended up documenting a sizable portion of Arctic Canada.

Answers To Riddles Page 38

1. Chicken; *Laetiporus sulphureus*
2. Prince; *Agaricus augustus*
3. Scissors/Caesars; *Amanita caesarii*
4. Powderpuff Football/Puffball; *Calvatia gigantea*
5. Trumpet/Trompette de la mort; *Craterellus cornucopioides*
6. Cauliflower; *Sparassis crispa*
7. Jelly Tooth; *Pseudohydnum gelatinosum*
8. Honeys; *Armillaria mellea*
9. Dryad Saddle; *Polyporus squamosus*
10. Old Man; *Strobilomyces strobilaceus*