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HAIR ICE: A BIOPHYSICAL PHENOMENON ASSOCIATED WITH FUNGI

by Jan Thornhill

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My friend Ulli called one chilly morning in November and said she'd found a stick in the woods for me.

"A stick?" I said.

"You *want* it," she said cryptically.

She was right. Though what she brought over ten minutes later looked like an ordinary piece of a dead alder branch, part of it was not ordinary in the least. One end had sprouted a glorious tuft of silky white hair—except it wasn't hair. It was hair ice.

Though you'd be forgiven for thinking that hair ice is simply an extraordinary form of frost—it's not. Frost forms when moisture in the air freezes on objects. Hair ice, on the other hand, starts from the inside and moves outwards. The process works something like this: moisture in a hardwood stick or twig is forced radially through its medullary rays until it's exuded through openings a single cell in width. When this moisture hits humid, sub-zero air, very fine filaments of ice begin to grow—filaments that can attain lengths of more than five centimeters and look exactly like very fine hair. It's an uncommon phenomenon, and not only because weather conditions must be absolutely perfect. It seems that the process is also dependent on the presence of various living fungi.

So what do fungi have to do with it? The idea that "a fungus participates in a decisive way" in the formation of hair ice, (or *Haareis* in German), was first suggested in 1918 by Alfred Wegener, (who also developed the theory of Continental Drift), but was unproven. Recently though, Gerhart Wagner and Christian Mätzler from the University of Bern have tested the fungi association by experimenting with twigs that had previously grown hair ice. They treated these sticks with three agents known to suppress the growth of fungi—heat, alcohol, and fungicide—while keeping a portion of each aside as a control. Afterwards, they froze all the samples under identical conditions, then compared the results. Sure enough, only the untreated pieces re-grew luxuriant manes of ice. Wagner and Mätzler theorize that the living mycelia of various fungi within the wood continue to metabolize at near freezing temperatures, producing heat and gases that force moisture outwards. When this moisture escapes and comes into contact with humid below-freezing air (about -4°C), the result is hair ice. *(Continued on p. 5)*

Photo by Jan Thornhill

FORAYS & OTHER EVENTS

This section of ***The Mycophile*** is reserved for publicizing the annual forays of NAMA affiliated clubs and other events you may be interested in learning about. If you would like us to list your club's next big event, contact us with details you would like displayed here and send to the editor dianna.smith@comcast.net.

See also http:/namyco.org/events/index.html.

April 25-27: USA Science and Engineering Festival at the Walter E. Washington Convention Center, Washington, D.C. The Mycological Asssociation of Washington (MAW) and NAMA will be hosting a booth on fungi.

M**ay 9-11**: The Oregon Mycological Society (OMS) will be hosting its **Spring Mycology Camp** at Suttle Lake, Oregon. For more information see www.wildmushrooms.org.

July 27-August 2: Eagle Hill Institute course, ***Mushroom Identification for New Mycophiles: Foraging for Edible and Medicinal Mushrooms*** with instructors Greg Marley and Michaeline Mulvey. See course decription at http://www.eaglehill.us/programs/nhs/seminar-flyer-pdfs/2014MarleyMulvey.pdf.

August 7-10: 2014 **NEMF Samuel Ristich Foray** at Bowdoin College, Maine. Dr. Seanna Annis, mycologist and plant pathologist at the University of Maine at Orono, will be the host mycologist. Presenters will include Renée Lebeuf, Raymond Archambeault, Greg Marley and Michaeline Mulvey. See www.nemf.org/foraynext.htm.

August 10-16 : Eagle Hill Institute course, ***Boletes, the Genus Lactarius, and Other Fungi of New England*** with Alan Bessette and Arlene Bessette. Course description can be seen at http://www.eaglehill.us/programs/nhs/seminar-flyer-pdfs/2014Bessette.pdf.

August 24-30: Eagle Hill Institute course, ***Amanitaceae taxonomy: Fundamentals and Microscopy to Barcodes*** with Rod Tulloss and Chistina Rodriguez-Caycedo. Course description can be viewed at http://www.eaglehill.us/programs/nhs/seminar-flyer-pdfs/2014TullossCaycedo.pdf.

September 4-7: COMA's annual **Clark Rogerson Foray** will be held at Berkshire Hills Emmanuel Camp in Copake, NY and is easily accessible from NYC, the Hudson Valley, Connecticut and Western Massachusetts. See www.comafungi.org/special-events for information on registration.

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(**Hair Ice** - *continued from p. 1*)

Hair ice is only known to form on decorticated parts of deciduous wood and has been reported on species of *Fagus*, *Alnus*, *Quercus*, *Corylus*, and *Acer*. A number of winter-active basidomycetes and ascomycetes have been identified on samples, including species of *Tremella*, *Exidia*, *Hypoxylon*, *Peniophora*, and *Diatrypella*.

Though I have not yet identified any fungi on the alder stick my friend gave me, after reading about Wagner and Mätzler's success at coaxing hair ice to grow in the laboratory, I decided to try a simple experiment of my own.

I soaked the stick I'd been given in water (its original mane having quickly melted away). I then placed it on a wet paper towel on a plate and put it out in our unheated boot room at 6 pm, then waited for the temperature to drop. Though the original ice formation had only been at one end of the stick, by 10 pm icy white fuzz ran its full length. By morning it was covered in hair ice, so dense in places that it had pushed the remaining bark free of the wood.

I have since repeated this experiment after first allowing the stick to dry for two weeks in the heated house. I soaked it in water for a few hours and put it out in the cold again. Lo and behold—a fresh crop of hair ice.

Curious about how "rare" this phenomenon is, I have collected a number of *Alnus* samples hosting a variety of flask fungi, *Exidia*, and *Hypoxylon* from a frozen wetland, thawed and soaked them, and set them out in the cold sealed in plastic. Though most have done nothing other than to freeze solid, two separate pieces, both hosting unidentified Pyrenomycetes, managed to sprout centimeter-long hair ice—not a spectacular showing, but enough to convince me that, under the right conditions, hair ice is not as uncommon as has been suggested in the literature.

Reference:

Gerhart Wagner, Christian Mätzler, 2008, Haareis auf morschem Laubholz als biophysikalisches Phänomen/ Hair Ice on Rotten Wood of Broadleaf Trees—A Biophsical Phenomenon. Forschungsbericht Nr. 2008-05-MW. Universität Bern. http://www.iap.unibe.ch/publications/download/3152/de/

Photo by Jan Thornhill

The Fantastic World of Fungi

NAMA has a booth at an upcoming STEM Festival at the Walter E. Washington Convention Center in Washington D.C., April 26-27, 2014. Our theme is The Fantastic World of Fungi, where kids of all ages can learn about the beauty, smell, color and shapes of fungi. Talk to a mycologist and learn how the underground symbiotic network between trees and fungi provides an active pathway for exchange of nutrients, water and sugars. Find out how mushrooms are used for food, recycling nutrients, building materials, in art, for dyes and papermaking.

Visit NAMA's booth at the 2014 USA Science & Engineering Festival: **Hall DE, Booth Number 6037.**

Teachers will be introduced to The Fungus Files: An Educator's Guide to K-6, an incredibly accessible model of interdisciplinary ecological education. The Fungus Files is packed with dynamic and diverse activities easily adaptable to students of all ages, learning styles and ability levels.

Many thanks to the Mycological Association of Washington (DC) and Connie Durnan for helping coordinate our participation in this event.

2013 ANNUAL PHOTOGRAPHY CONTEST
Pictorial Category

First Place: Daniel Winkler's *Ramaria araiospora var. araiopora*
Second Place: Jonathan Frank's *Polyozellus multiplex*
Third Place: Walt Sturgeon's *Fomitopsis spraguei*
Honorable Mention: Daniel Sheet's *Laetiporus sulphureus*
Daniel Winkler's *Craterellus cornucopioides*
Todd Elliott's *Cookeina tricholoma*

Daniel Winkler: *Ramaria araiospora var. araiospora*

Jonathan Frank: *Polyozellus multiplex*

Walt Sturgeon: *Fomitopsis spraguei*

Daniel Sheet: *Laetiporus sulphureus*

Daniel Winkler: *Craterellus cornucopioides*

Todd Elliott: *Cookeina tricholoma*

Moldy Oranges for Education: A Question from the Mammoth Site/Health Issue

E-MAIL QUESTION:
Dear Dr. Michael Beug, David Rust, Sandy Sheine and Linnea Gillman,

My name is Don Esker; I'm the Program Coordinator/Paleontologist for the Waco Mammoth Site of Texas. I've got a serious mycological question, but I'll provide some background first: We're an in-situ bonebed and museum telling the story of the sudden deaths – and fossil preservation of two separate herds of Columbian mammoths during the last Ice Age. In addition to tours and on-site educational programs, our Education Director, Dava, puts together lesson plans that teachers can download for free. Her most recent lesson plans centers is on taphonomy: the study of what happens to an organism between its death and its exhumation. Dava's lesson plan has kids studying what happens as oranges decay in different environments. They chart the decay of each orange, and at the end they tease apart the factors that determine whether an organism survives to fossilization. That's where mycology comes in.

Some of the oranges get mighty moldy. That much was expected. The prevalence of decay organisms in an environment goes a long way in deciding what's preserved and what isn't. What wasn't expected was the odor. The moldy oranges produce a smell very much like acetone. In fact, I'd swear it WAS acetone. Why?? There's no acetone in oranges. Some research revealed that oranges contain a great deal of the aromatic ester ethyl butyrate. It's supposed to smell orange-y, naturally. It's chemically really similar to ethyl acetate. Acetone. We thus have a few questions:
Are there any species of mold that can digest ethyl butyrate into ethyl acetate?
What enzyme would allow that?
Do any of these species pose a health threat to students?
Is there a fire hazard?
I know that this is kind of an off-beat question, but we could really use your help. I look forward to hearing from you!
Warmest Regards,
Don
P.S. Here's Dava's lesson plan:
http://www.waco-texas.com/userfiles/cms-waco-mammoth/file/WMS_taphonomy_lab.pdf

E-MAIL RESPONSE FROM DR. BEUG:
You probably are smelling ethyl acetate - a common ingredient of finger nail polish remover. That is not acetone, however the two are not infrequently confused. Acetone can also be used a fingernail polish remover.

The sugars in the orange ferment to ethanol with yeasts, a cellular Ascomycete fungus (versus a filamentous Ascomycete). Some of the ethanol is oxidized to acetic acid with film-forming acetic acid bacteria. Some residual ethanol will react with some of the remaining ethanol to form ethyl acetate (a common contaminant of oxidized wine).

There will not be enough ethyl acetate to be a significant fire hazard.

The health hazard I would be concerned about is inhalation of mold spores from the *Penicillium* species (another Ascomycete, this one a filamentous species) that form the green mold on the orange. A green Trichodermamold (another filamentous Ascomycete) is also possible.
In addition to potential damage to the lungs from the spores, any children with a Penicillin allergy could be at risk. Some species of Trichoderma can grow in the lungs and cause human mucoses.

E-MAIL RESPONSE FROM DON ESKER:
Dr. Beug;

Thanks for your help! That was driving us crazy! We've got the kids wearing PPE including gloves, goggles, and particulate masks, so I think we're covered!
Don Esker

Brandon Matheny talks about *Inocybe unicolor* and other North American Inocybes

An interview by Joel Horman, editor, LI Sporeprint

Brandon Matheny is an assistant professor in ecology and evolutionary biology at the University of Tennessee in Knoxville, where he pursues research in fungal systematics and evolutionary biology. He is internationally known for his expertise in the family Inocybaceae, a large cosmopolitan group with probably as many as 700 species worldwide.

At the Wildacres Foray in North Carolina in Autumn 2012 during a lecture, Brandon mentioned that *Inocybe caesariata*, a species Joel had no doubts about, was more properly called *Inocybe unicolor* Peck and that *I. caesariata* was a hazy European concept. In subsequent discussions, it was decided that a good way to disseminate this information to the amateur community would be an interview in a widely read amateur publication. A transcription of this interview is presented below:

Joel: *I think that, like most amateurs, I was happy to find a distinct enough species of* Inocybe *to identify on sight without resorting to keys and microscope, and which was agreed upon by all the popular guidebooks, not to look further. As a professional with a special interest in the genus, your take was of course different. Can you describe for us the scenario by which you were led to doubt the validity of* Inocybe caesariata *in North America, and where it led?*

Brandon: First of all, it's a European name, first introduced by Fries as *Agaricus caesariatus* in 1838. Karst then transferred it to *Inocybe* 1879. Kaufman included *I. caesariata* in his NA Flora treatment of Inocybe in 1924. Hesler applied the name *I. caesariata* in 1936, Lincoff in 1981, and Phillips follows them in 1991. Then it shows up again in another publication by Roberts and Evans in 2011 called "The Book of Fungi." But what all these authors are clearly referring to is Peck's *Inocybe unicolor*, a conclusion I came to after studying Peck's type and several fresh collections from the southeast U.S. When Stangl came out with his treatment of *Inocybe* in Bavaria in 1989 he included *I. caesariata* in his key in a very cryptic manner and without a description. Stangl may have been using the concept of *I. caesariata* as used by Heim. This latter species was described in 1984 by Bon as *Inocybe heimii*. Funga Nordica indicates that *I. heimii* is a coastal dune associate under Pines and represents *I. caesariata sensu* R. Heim.

So the problem is, and this is fairly typical, we don't know what exactly *Agaricus caesariatus* was. Evidently, neither do the Europeans. There is no type, and Fries' original description lacks sufficient detail for reliable identification. Therefore, it is somewhat reckless to apply the name to North American taxa. Instead, we do have a North American name for what Hesler, Lincoff, and the others have suggested is *I. caesariata*, and that is *I. unicolor*. The interesting thing is it's a very common fungus. I think all of my graduate students can now recognize it, or at least they should. It's one of the most common Inocybes in my area, Knoxville, in forests and in urban areas under planted Oak and Basswood. It has also been found in the Smokies in natural habitats and other areas in the southeast (Missouri, Virginia) in Oak-Hickory forests. My guess is that *I. unicolor* prefers calcareous soil, and the area where I live in Knoxville has a karst type of topography.

Atkinson and Murrrill knew the fungus but described it under different names. Atkinson described it as I. *marmoripes* (from west of Cayuga Lake, near Glenwood, a suburb of Ithaca) in 1918, and Murrill before that in 1911 as *Inocybe lorillardiana*, so named because he found it on the grounds of the Lorillard mansion in the Bronx, New York fruiting in front of museum buildings in grasses under Hickory (*Carya*). Both of these taxa are the same as *I. unicolor* based on my studies of Atkinson's type and authentic collections labeled as

I. lorillardiana by Murrill. Kauffman reported all three names (*marmoripes, lorillardiana, unicolor*) in the NA Flora not understanding, of course, they were all the same. Smith in 1939 reports *I. unicolor* as *I. lorillardiana* in Michigan. So it's pretty widespread, occurring in the southeast as well as the northeast. At this point the species appears endemic to eastern North America, and it's unusual for the group in which it belongs, subgenus Mallocybe or what I call the Mallocybe clade, in that it has long cheilocystidia, which is atypical for the Mallocybe group.

Inocybe unicolor Photo by Brandon Matheny

Inocybe lorillardiana

How far north it gets I don't know. It fruits between June and Sept. and into Oct. in Tennessee. *Inocybe unicolor* also occurs in my front yard under native *Quercus*, and for those of you know Rytas Vilgalys at Duke University it fruits in his backyard in Durham, North Carolina. I have seen similar dried specimens collected by David Lewis in east Texas that require confirmation.

Inocybe subochracea Photo by Joel Horman

The good thing is the species is easy to identify in the field, which is kind of unusual for an *Inocybe*. In outward appearance it's phenotypically similar to *I. subochrachea*, another species endemic to eastern North America, but they are quite different microscopically: *I. subochracea* has abundant bright yellow hymenial cystidia as "metuloids" when a squash mount of a piece of gill tissue is examined in KOH under the microscope. Inocybe unicolor lacks metuloids and has no pleurocystidia, sterile terminal cells that occur on the faces of the gills.

Joel: *What first elicited your interest in the genus* Inocybe? *Was the intrinsic difficulty of identification a challenge?*

Brandon: Oh, yeah! It probably was what drew me to them because up to that point I was just collecting mushrooms for food, and I had probably sampled between 90 and 100 species starting in 1996 when I was living in Seattle. For several years I went out often, looking for edible mushrooms to prepare for the table. I was looking for a challenge, so I decided to identify Inocybes, which were quite diverse in an area where I had been doing an inventory, getting to know the local flora in an area outside of Seattle, a low elevation forested wetland including Douglas fir, Western hemlock, Red alder, and Black cottonwood. This held at least 10 species of *Inocybe*, and I wanted to know what they were.

Eventually, I was introduced, by members of the Puget Sound Mycological Society (PSMS) to Joe Ammirati, professor of mycology at the University of Washington. So I worked with Joe for a little bit - he was kind of testing me out, I think, to see how dedicated I might be. He after a time said, "OK, I can help further you along taxonomically, training-wise, but you have to show up early Saturday mornings." So I would come to his lab early Saturday mornings, and he started me off sorting through *Tricholoma* species. I would study the Tricholomas microscopically to get a feel for the diversity within the genus. All those PSMS forays with Brian Luther, Dick Sieger, and their microscopes really paid off!

Eventually, I began to work more often on Inocybes. Joe then let me have access to the herbarium to get material identified by Stuntz to compare with my own, and also enabled me to have access to the taxonomic literature, which was extremely helpful. I kept at that for a while, perhaps for a period of several months, and by that time Joe was more familiar with me. At some point later thinking about my future, I asked him if I applied to the UW for grad work would he take me in. And he goes, "If you work on *Inocybe*"; so I said "OK." That was my ticket in. However, given that my scientific background was pretty shallow, I had to go back and ramp it up: I had to spend a couple of years taking math and chemistry at a local community college and some upper division biology courses at the University of Washington before I entered graduate school.

Then I finally got in by Fall of 1998 and worked on systematics of what I call the family Inocybaceae, since they are not closely related to *Cortinarius* (Cortinariaceae); I did that for the next five years. So I would say their diversity really elicited my interest plus the challenge of their identification.

I recognize clades or monophyletic groups (species or descendants that share a unique common ancestor), and in some cases these clades do not correspond to taxonomic sections and subsections of Singer, for instance. So there's a lack of evolutionary understanding and natural relationships if we continuously refer to non-monophyletic sections and subsections. For example, the *I. lanuginosa* group is monophyletic and contains a suite of species such as *I. lanuginosa*, *I. leptophylla*, and *I. teraturgus*. What we are now learning is that there is a contingent of Australian and southern South American species (most undescribed) that are closely related to *I. lanuginosa* and its allies.

If you look at section *Inocybe* by Singer, he's got a lot of species in it. However, this group is not monophyletic and should be restrained to the handful of species that share a common ancestor inferred by a molecular phylogeny. This includes *I. relicina*, found only in Finland, Sweden and Norway; the very cool and exciting *I. tahquamenonensis*, a dark purplish black scaly thing, which is endemic to eastern NA, and *I. tubarioides*, which is very weird, typically fruiting on rotten wood and also endemic to Eastern NA. The North American species are not common, and every time I see *I. tubarioides*, it often throws me off. It looks like a cross between a *Psilocybe* and a *Telamonia*, if you ask me. And then we found another species down here in North Carolina that I'm pretty convinced is undescribed - a sort of reddish scaly species, and it is most closely related to *I. tubarioides* and *I. tahquamenonensis*. It's been brought to me different years from Mt. Mitchell State Park in western North Carolina during the Wildacres NAMA regional foray. I'd like to get this one described but am hoping for a better photo!

Joel: *Are there other* Inocybe *species that grow on wood? Isn't that unusual?*

Brandon: Yes, it is unusual as most Inocybes fruit on the ground. However, *I. leptophylla* sometimes occurs on wood, and *I. lanuginosa* is often found on rotten wood, but also on the ground. There are a few others, species near *I. subcarpta* or *I. boltonii* that I've found on rotten wood, but their taxonomy is not settled. Egon Horak has described a few others that occur on rotten Southern beech wood from the southern hemisphere.

Joel: *It's a long time between publication of new general field guides, perhaps 10 years or more. Until the next one is published, should there be a mechanism for the distribution of name changes or substitutions for the benefit of ardent amateurs?*

Brandon: Ideally, there are existing resources for current taxonomy and nomenclature: MycoBank and Index Fungorum -and that's probably where I would start, but I don't know if they would accept my suggestions with respect to *I. unicolor* without them being published. But I could suggest that they treat *I. marmoripes*, *I. lorillardiana*, and *I. caesariata* sensu american authors as taxonomic synonyms of *I. unicolor*. Doesn't hurt to ask.

Joel: *There are some* Inocybe *species which seem to be accepted trans-Atlantically, e.g.,* I.geophylla, I. lacera, I.hystrix, *etc. Should we doubt the applicability of these names to North American species, inasmuch as they are based on European descriptions?*

Brandon: Yes, if we have evidence to suggest otherwise. We don't really know what percentage of species in NA is actually widely distributed across the holarctic. Karen Hughes and Ron Petersen have a project assessing this for a broad array of taxa. If I had to guess, I would say in *Inocybe* 50% or along those lines, but it might also depend upon what region of NA you are considering because the similarity between, e.g., the California flora and the European flora is probably going to be low. I think the number of shared species between some parts of Europe and eastern North America might be higher in our spruce-fir zone.

Joel: *So you do leave open the possibility that some are genetically identical?*

Brandon: Yes, we have data that support that for several species. *Inocybe hystrix*, for example, is genetically the same in Tennessee and North Carolina as in Sweden. And we found another species from Europe in the spruce-fir zone in the southern Appalachians called *I. pseudoasterospora*, and that is also the same genetically as a European collection. Brad Kropp and I confirmed two European species also occur in NA: *I. spuria* and *I. obsoleta*. I believe Ellen Larsson and Cathy Cripps have demonstrated this as well for some species in the Mallocybe group that occur in alpine settings. I've collected *I. sindonia* under Norway spruce in Seattle, but this species is obviously introduced. It's also not uncommon under planted pines in New Zealand and Australia.

Inocybe hystrix Photo by Joel Horman

Joel: *What mechanism would allow them to remain the same after millions of years and the separation of continents?*

Brandon: Good question. Gene flow between disparate populations of *I. hystrix*, *I. pseudoasterospora*, *I. spuria,* and the others is somehow being maintained whether by migration of similar plant partners (think of Birch, Willow, Pine, Spruce) in response to glacial cycles or simply long-distance dispersal. This is a complex topic especially with respect to phylogeographic patterns (or shallow geographic relationships between populations or very closely related species) of organisms in the holarctic. Others, like Jozef Geml at Leiden in the Netherlands, have thought more deeply about this. It's one reason why I decided to focus on studying historical biogeographic patterns (more ancient geographical area relationships among species) of Inocybaceae in the southern hemisphere where the geological history is less ambiguous.

Joel: *What about Inocybe geophylla? Isn't this a widespread and easy-to-recognize* Inocybe*?*

Inocybe geophylla Photo by Joel Horman

Brandon: *Inocybe geophylla* will turn out to be a complex of different species, morphologically similar, for example some forms with an umbonate pileus and others convex, others more robust in size, different ecology, etc. After we generate the multi-gene phylogenies, then we can map out the morphological and ecological or geographical differences and see how well they correspond to different clades. *Inocybe insinuata*, described by Kauffman from California, I would consider an autonomous species in the *I. geophylla* group; it may be more widespread along the west coast and is a chunkier version than *I. geophylla* in the strict sense, which no one has confirmed from North America yet. *Inocybe lilacina*, often treated as a variety of *I. geophylla*, is clearly different, and furthermore in NA several species of *I. lilacina* can be separated morphologically, molecularly, and geographically. The northern California version of *I. lilacina*-which I would regard as a new species -lacks the intense lilac-violet colors of, for example, the form found in the southeast US, which will prove to be a different species as well from the type, which is broadly distributed between Washington and New York. Crazy as this sounds all of them are different than European lilacina. In Europe at least two different clades of *I. "lilacina"* have been recovered. The type collection, however, was described by Peck as *I. geophylla* forma *lilacina* near Albany, New York. I have DNA sequences from material I collected in Peck's stomping grounds and very close to the type locality. There may also be a unique lineage of *I. lilacina* sampled from the Rocky Mts. So we're seeing quite a bit of distinction in populations of *I. lilacina* across NA. The issue is: do we recognize them as different species? And I would argue that, yes, we should, because in several cases there are clear morphological differences corroborated by the gene phylogenies and geographical distributions.

Joel: *Based on molecular analysis you constructed a chronology of the seven subgenera of* Inocybe*, and elucidated the evolutionary biogeography as well. Can you touch upon the historical background of the east/west split in North America?*

Brandon: Alexander Smith was very intrigued by this split, I think. The Great Plains forms a natural barrier between eastern NA and western NA, and he also noted major differences in the fungal flora (or mycota) out west versus those in the east, and to me, having collected in both these areas, they are obviously very different. However, no one has really done a rigorous biogeographical analysis yet a focus on divisions within the North American mycota. Scott Redhead published a really interesting article on this some years ago, but using a morphological species concept. In this paper he suggested several different biogeographical patterns among Canadian macrofungi. Part of the problem is, if we're going to assess just how different these floras are, we need to have reliable concepts of what the species are, and right now that is one of the major impediments to mushroom taxonomy in NA. And as more and more work is within what is otherwise a single morphologically recognized species; or, we're simply not able to see what the differences actually are without the aid of gene trees.

Joel: *What is the most surprising evidence that molecular analysis revealed in the genus* Inocybe?

Brandon: It actually reinforced some ideas by Thomas Kuyper, who was quite insightful back in the 1980s based on morphology and before the molecular wave hit us. Kuyper predicted that all the Inocybes that had metuloids would be monophyletic, and he was right. He also predicted that species he recognized as belonging to subgenus Mallocybe would be a monophyletic group and that prediction was also borne out by molecular evidence. Kuyper had a very broad morphological concept in species recognition that is not supported in many cases. However, his big picture approach to several of the main groups in *Inocybe* was spot on.

What no one anticipated, however, was the discovery that the Crepidotaceae is the sister group to the Inocybaceae and not to *Cortinarius* or *Hebeloma*. This was definitely one of the most surprising results of the molecular phylogenetic work. When I mentioned this to Egon Horak, one of the world's foremost taxonomic authorities of mushrooms, he was quite shocked and would not believe me! Some recent works have merged the two families as one with Crepidotaceae getting the nod because it's an older name. My preference is to keep them apart. I've written about this topic in an article published in McIlvainea several years ago. The Crepidotaceae does contain some stipitate groups like *Simocybe* and *Neopaxillus*. These and the Inocybaceae have similar spore pigments and spores without a germ pore. The major difference would be their mode of nutrition, the Crepidotaceae being free-living decomposers and the Inocybaceae being mycorrhizal. Some biochemical differences (muscarine) also separate the two families.

Joel: *Are they mycorrhizal generalists?*

Brandon: Probably yes in many cases. Some species of *Inocybe* are quite specific to hardwoods, and other species are reported in the literature to associate with Pinaceae and some angiosperms. In Australia there are some species that appear to be strictly associated with *Nothofagus*, others strictly associated with eucalypts, some with *Acacia*, and others with *Allocasuarina*. But it's been shown that some ectomycorrhizal fungi may form networks with multiple unrelated plant partners. Among the eucalypts, Inocybes might associate with various genera (*Eucalyptus, Corymbia, Melaleuca*), but I have no data that support *Inocybe* networks between these plant genera. If we go back to *I. unicolor* as an example, it is restricted to hardwood associations, as best we know, in particular *Quercus, Tilia*, and evidently *Carya*. So it appears it could associate with any of those three genera and possibly *Fagus* as well. From an Inocybe point-of-view that would be rather high host specificity. Some other species that Cathy Cripps knows better than I do may exhibit a high degree of specificity with *Salix, Dryas*, or *Betula* in alpine settings.

Inocybe unicolor Photo by Brandon Matheny

Joel: *Can we point to a single species as the most rare in NA?*

Brandon: That's difficult to say, that is, talking about rarity in mushrooms. Clearly, some species are not as frequently encountered as others. I did a thorough study of *I. tubarioides* mentioned above, studying collections sampled throughout eastern North America, and we (Pierre-Arthur Moreau and I) came up with about 25 collections that we could study since it was described almost 100 years ago in 1918. Now does that make it rare? Well, rarely encountered and rarely put in an herbarium! I would say so- and it's not a fungus that I encounter every year.

Joel: *On Long Island we have found it perhaps twice in twenty years.*

Brandon: There is also an issue of restriction of distribution but local abundance. Several species in this category come to mind based on my last 5 years of collecting macrofungi in the southern Appalachians: *Gloeocantherellus purpurascens*, to me an iconic mushrooms of the Smokies, and another poorly known species (a little white thing that looks more like a *Tricholoma*) called *Hygrophorus subaustralis*. These appear to be geographically restricted to portions of the southeast but quite common locally.

Joel: *What percentage of* Inocybe *species can be identified by field characters?*

Brandon: Well, *I. unicolor*, *I. subochracea*, which we discussed- again, depending upon where you are, the local *lilacina* of your neighborhood, the local *geophyllas*, and usually *I. lacera* can be determined by a combination of ecology and field characteristics. The same goes for *I. lanuginosa* although you have to double check that it is not *I. leptophylla*. *Inocybe hystrix* is easy to recognize. So there are several; I wrote a key to commonly occurring species in the PNW, and many of those can be distinguished in the field. One such species is *I. picrosma*. Out east there is also the NA version of the European *I. fraudans* (which is not the same as the European species based on molecules), which is easy to recognize in the field. It's pretty cool, gets big (for *Inocybe*), and smells like Matsutake, a smell I love. Another eastern species, *I. luteofolia*, is field recognizable; here the stipe base turns dark, is pruinose, and the gills are yellow as suggested by the epithet. The *I. calamistrata* group can be recognized rather easily, however, there are several species in the group that differ subtly by odor- like fish, bruised Geranium leaves, or ripe pears. So, I think, if you know what you're looking for, species in this complex might become a little easier to recognize in the field.

One of the most existing things about *Inocybe* is that species-level diversity is much greater than anticipated. If you consider my front yard alone, I have recorded eight species of *Inocybe* fruiting with Willow oak or *Quercus phellos*, a southeastern species of oak. One of the Inocybes resembles *I. albodisca*, a species described by Peck from the NE. Molecularly, however, it is the same as a collection sampled under *Quercus* in Costa Rica and brought to my attention by Roy Halling. The two form a single unified lineage. This species appears to have at least a geographic distribution in high elevations in the Neotropics like Costa Rica but co-occurring with *Quercus* at lower elevations at more northerly latitudes. How far north this species goes is something we haven't determined yet. We also need to resolve which of two *albodisca*-like lineages in the northeast is Peck's *I. albodisca*, one of which is the same as the European *I. grammata*. There's always so much to do.

So, there are about 15 – 20 species one could readily identify in the field, perhaps more. It would be fun to do a paper on that for those interested in mushroom identification. Like, here are 20 mostly common Inocybes that you can recognize in the field in eastern NA.

Joel: *Are you continuing to concentrate on* Inocybe *research or will you be branching out to other areas?*

Brandon: I have a research project in Australia to do taxonomy of Australian species of Inocybaceae. That project has started to come to a close now after almost four years. When we (Neale Bougher and I) first started the project in 2010, at that time we could recognize 17 species, with 5 having been described as new in 2005 and 2006. Now, after 4 field trips to Australia, primarily Western Australia, Tasmania, and areas of Queensland, Victoria, and New South Wales, we can now recognize about 130 species with the aid of molecular tools. This number will only increase once others start to collect in additional regions of Australia and examine other holdings in herbaria such as in Melbourne.

I have done some recent taxonomic work on North American Inocybaceae and hope to continue to do so. One of these was on the Rimoseae s.str., a taxonomic presentation of species primarily from Utah. We described five new species and discussed three others. This work was made easier by progress made by Ellen Larsson on European taxa in the group.

Inocybe lacera Photo by Joel Horman

On another project I had an undergraduate, Emily Giles, examine the taxonomy of a species from the Pacific NW with a diagnostic reaction to PDAB. Lorelei Norvell and I both knew the species but were uncertain what to call it. It has this weird turquoise reaction to PDAB, a macrochemical. When we keyed it out in Stuntz' unpublished manuscripts, it came out to a manuscript name of his called *I. chondroderma*. Stuntz, however, never formally published the name. So the next thing was to get Stuntz's collections he labeled as *I. chondroderma* for comparison with our own. Now keep in mind Stuntz' collections were made mostly in the 1940s – 50s, but they are very well preserved at the University of Washington herbarium with sufficient DNA for sequencing. DNA sequences from Stuntz' collections matched up with our own. This was a very satisfying result but took quite a bit of detective work to solve. This also shows how important historical collections are. They are not just sitting around taking up space and gathering dust, but they are still reservoirs of important genetic material that help us sort out species concepts as they were used by taxonomic mycologists who are now long gone.

Joel: *Most serious amateurs rely on one (or several) keys to help identify* Inocybe*, such as that of Fatto or yours for the PNW, but there has been no definitive monograph in North America. Have you perhaps considered such a publication?*

Brandon: I'd like to do something like that. It's perhaps not far fetched to invest some time in a synthesis such as a taxonomic key to species of Inocybaceae reported from North America. I have a draft version for the *I. calamistrata* group (section *Cervicolores)*. Kauffman's NA flora key can still be used, but a fair number of names are now out-of-date.

Joel: *So it sounds like we will be hearing more about* Inocybe *from you.*

Brandon: Oh yeah. I have a huge backlog of stuff to do, and I would like to continue on that.

Note: Brandon and his student Christine Braaten just came out with a new paper on Inocybe. See http://www.nrcresearchpress.com/doi/abs/10.1139/cjb-2013-0195#.Uw4WJIVYq-0.

Inocybe unicolor Photo by Joel Horman

Inocybe albodisca Photo by Joel Horman

Editor: In the next *Mycophile*, we will print Brandon's complete description of *Inocybe unicolor.*

NAMA Members,

If you come across an article in your club's newsletter that you think deserves wider distribution, kindly forward the newsletter or article to me to evaluate its suitability for The Mycophile. Thank you.
Dianna (dianna.smith@comcast.net)

EDITORIAL:
A VERY BRIEF INTRODUCTION TO MYCOLOGY

Lawrence Millman

Contrary to popular belief, mycology is not really about identifying fungal species on Facebook or via the blurry images (a fungus? a poodle?) sent from someone's smart phone, so-called. Nor is it about throwing names at specimens that rest forlornly on a collection table. Indeed, mycology gives a thumbs down most of the time to collection tables because they're so fraught with contaminants. If it could talk, mycology might also say that Latin binomials are nice (unless you whack people over the head with them), but they're only a fraction of the story.

I know you're scratching your head in bafflement, so let me try to explain. Mycology is about the roles fungi play in their respective, but not always respectable ecosystems, whether in an old growth forest or on a new growth toenail. It's about how a particular fungal entity might relate to its chosen substrate — is it a parasite, saprobe, or mycorrhizal? Is such a entity rare and, if so, why? And — very important! — it's about what could have happened in evolutionary time to make (for example) *Cyphellopsis anomala*, a basidiomycete, look like a discomycete.

So don't fret if you can't identify that Lactarius you've found during one of your club's forays. Let the ego-brandishing thirty-somethings argue over what it might be all they want. Instead, ask yourself why the blazes is it lactating — i.e., exuding milk. Does it benefit in any way from such strange behavior? And why is that milk so eager to change from green to cinnamon-brown in color? Once you begin asking questions like these, you can also begin calling yourself a mycologist...

Do you need to identify this mushroom?

If You Are an Accountant, NAMA Needs Your Help

In an effort to bring our financial records up to date, the NAMA trustees voted to authorize an accountant to review them. We are hoping a NAMA member, who is also an accountant, will volunteer to take on the task. Our NAMA Treasurer, Herb Pohl of New Jersey, is in need of a qualified independant source, preferably who also lives in the tri-state area to check out our accounts. Please contact him at herbpohl@embarqmail.com.

A QUIRK OF FATE

by Taylor Lockwood

After taking my camera and passion for bioluminescent mushrooms around the world, I was pleased to find some “glowers” in my little town of Mount Dora, Florida. I had only seen them once before so an uncommon bloom of these “Jill o’ Lanterns” (*Omphalotus subilludens)* got me right into gear. These are the cousins to the “Jack o’ Lanterns” (*Omphalotus illudens*) known up and down the east coast and into parts west.

According to Jim Kimbrough’s book on Florida mushrooms, it wasn’t known to be bioluminescent.
I had found some two years ago and I did document the dim greenish glow and, I believe, they were the first such photos of *O. subilludens*.

This time I was ready with a plan. I have been waiting and looking for them for months and as soon as I found some, I drove to Orlando (the big city) and rented a camera top-rated for its low-light capabilities. The result was that I got some good photos from a very difficult-to-photograph Spirits of the Forest mushroom.

And then two days later:
As fate would have it, I found another kind — two different species within the four days of my rental period. These might be the only two that glow and grow here.

The second group I found was so dim I only noticed them in my peripheral vision — long after my eyes had adjusted to total darkness. Looking at them directly, it was hard to tell if they glowed at all. However, the bigger-better-faster camera saw it well enough to capture a passable image.

This second set was *Panellus pusillus*, a tropical mushroom found occasionally in Florida.

For Taylor Lockwood’s *Spirits of the Forest* video, click here: http://www.mushroom.pro/b_spc/spc_pages/spirits/spirits_video.php

Top photo: *Omphalotus subilludens*
Bottom two photos are of *Panellus pusillus*
Photographer is author Taylor Lockwood.

Is that a *Gyromitra*? Which One? Can I eat it?

By Michael W. Beug, PhD

While writing *Ascomycete Fungi of North America* with coauthors Alan and Arleen Bessette, we spent considerable time trying to sort out species concepts. For the Gyromitra-like fungi, we wondered whether there was any difference between *Gyromitra gigas*, *Gyromitra montana* and *Gyromitra korfii*. The three had been placed in synonymy, but was that the correct decision? Should *Discina perlata* be called *Discina ancilis* or is it really a *Gyromitra*? After all, it looks extremely similar to *Gyromitra melaleucoides*. Alternatively, should *Gyromitra melaleucoides* really be in *Discina*? What about *Pseudorhizina californica* and *Pseudorhizina sphaerospora*? They look like a *Gyromitra* with a *Helvella* stalk. Where do they belong? Finally, what should be said about edibility of these species?

Two sites on the web can help you learn what name is the currently accepted name. One site is Index fungorum (www.indexfungorum.org). Type in a species name and it will show you that species and all named varieties of that species with the preferred name (according to Index fungorum) in green. On December 30, 2013, I typed in *Gyromitra montana* and got *Discina montana* as the preferred name. Clicking on *Discina montana* led me to the Species fungorum page (www.speciesfungorum.org) where I learned that the full name is *Discina montana* (Harmaja) Ginns and that this name was published in *Fungi Canadenses*, Ottawa: no. 68 (1975). The synonym, *Gyromitra montana* Harmaja was published in Karstenia 13: 56 (1973).

Entering *Gyromitra montana* into MycoBank, the fungal website (www.mycobank.org/BiolomicsInfo.aspx), yields the information that *Gyromitra montana* Harmaja, *Discina montana* (Harmaja) Ginns with no clear guidance as to the preferred name. However it gives the full title of the 1973 Harmaja paper. I clicked on the title and a new page appeared showing some details of the 1973 Harmaja paper including a list of all of the species covered. The list included *Gyromitra korfii* (Raitv.) Harmaja, and since I was also interested in that species, I clicked on that name and another new page appeared. From that page, I learn that *Gyromitra korfii* (Raitv.) Harmaja ≡ *Discina korfii* Raitv. (published in 1970).

Since these studies are all in the 1970s (pre use of DNA), it is clear that Raitviir favors *Discina*, Harmaja disagrees and moves it to *Gyromitra*. Ginns placed *Gyromitra korfii* back in *Discina*. All of these names are legitimate, which should be used? Index fungorum and MycoBank, while proving exceptionally useful, had not provided a fully satisfying answer.

So what about *Gyromitra gigas*, a European species? Index fungorum and MycoBank agree – the current name is *Gyromitra gigas* (Krombh.) Cooke (1878) and synonyms are *Discina gigas* (Krombh.) Eckblad (1968), *Helvella gigas* Krombh. (1834), *Maublancomyces gigas* (Krombh.) Herter (1950), and *Neogyromitra gigas* (Krombh.) S. Imai (1938). There is no mention on either site of synonymy with either *Gyromitra montana* or *Gyromitra korfii*.

Gyromitra ancilis   Photo by Michael Beug

Gyromitra korfii Photo by Emily Johnson

We also needed to decide what to call the mushroom that we knew from field guides as *Discina perlata*. A check of Index fungorum indicated that the currently accepted name is *Discina ancilis*. However, there are three named forms. According to Index fungorum, *Discina perlata f. macrospora* should be *Gyromitra macrospora*; *Discina perlata f. geogenius* should be *Discina geogenius*; and both *Discina perlata f. perlata* and *Discina perlata var. perlata* should be *Discina ancilis.* Species fungorum gives the full citation as *Discina ancilis* (Pers.) Sacc., Syll. Fung. (Abellini) 8: 103 (1889). Ten synonyms are listed and the oldest is *Peziza ancilis* Pers. (1822). *Peziza perlata* (Fr.) (1822) is a very slightly younger synonym, but loses out to the oldest name, *Peziza ancilis* Pers. Doing a search for *Discina perlata* on MycoBank yielded the same list of forms and varieties as Index fungorum. However, MycoBank does not list *Discina ancilis* as a synonym, listing only the synonyms *Peziza perlata* Fr. (1822) and *Gyromitra perlata* (Fr.) Harmaja (1969).

We did not worry more about *Discina geogenius* (Rahm) Donadini (1984) since it was a European species, but did note that in 1976 it had been renamed *Gyromitra geogenius* (Rahm) Harmaja. *Gyromitra macrospora* (Bubák) Harmaja, Karstenia 13: 56 (1973) is another European species.

Finally, our questions were resolved, at least for now, by Methven, et al. (2013). Their DNA work shows *Discina* nested in with *Gyromitra* and they propose five subgenera for the genus *Gyromitra*. The subgenera are *Gyromitra*, *Discina*, *Caroliniana*, *Pseudorhizina*, and *Melaleucoides*. In North America, the subgenus *Gyromitra* contains *Gyromitra esculenta* (Pers.) Fr., *Gyromitra infula* (Schaeff.) Quél. and *Gyromitra ambigua* (P. Karst.) Harmaja; *Discina* contains *Gyromitra ancilis* (Pers.) Kreisel, *Gyromitra olympiana* (Kanouse) Harmaja, *Gyromitra leucoxantha* (Bres.) Harmaja, *Gyromitra montana* Harmaja and *Gyromitra korfii* (Raitv.) Harmaja; *Caroliniana* contains *Gyromitra caroliniana* (Bosc) Fr. and *Gyromitra brunnea* Underw.; *Pseudorhizina* contains *Gyromitra sphaerospora* (Peck) Sacc. and *Gyromitra californica* (W. Phillips) Sacc. ; and *Melaleucoides* contains the distant basal genus *Gyromitra melaleucoides* (Seaver) Pfister.

Now we could settle on an answer. Based on the work of Methven et al. (2013), all species formerly in *Discina* should be in *Gyromitra* and the accepted name for what we had learned as *Discina perlata* should be *Gyromitra ancilis*. The genus *Pseudorhizina* also disappears and its two North American species move to *Gyromitra*. We are left with a very interesting situation. The genus *Gyromitra* resides in the family *Discinaceae*. No species are left in *Discina*. Does the family name need to change? Stay tuned.

Which ones can I eat?

Just as there are advocates for eating *Amanita muscaria*, a poisonous mushroom with hot water extractable toxins, there are advocates for eating *Gyromitra esculenta*, a poisonous mushroom with toxins that decompose upon heating. To be clear from the start, I do not advocate detoxifying and eating either *Amanita muscaria* or *Gyromitra esculenta*. Debbie Viess has recently made an extensive case for dangers associated with detoxifying *Amanita muscaria* (Viess, 2013). I want to make a brief appeal not to try to detoxify and consume *Gyromitra esculenta*.

While there are no reports of deaths from consumption of *Gyromitra esculenta* in North America, there have been numerous deaths from this species in Europe. In North America, hospitalizations, even cases of liver damage from *Gyromitra esculenta* consumption are not unusual. *Gyromitra infula* and *Gyromitra ambigua*, the other two North American members of *Gyromitra* subgenus *Gyromitra* have caused poisonings in Europe, though there are no reports in the NAMA database involving either of these species. The toxin in *Gyromitra esculenta* is gyromitrin (N-methyl-N-formylhydrazine acetaldehyde) which quickly loses the acetaldehyde group in the stomach or on heating and then more slowly loses the formyl group finally forming monomethylhydrazine. Monomethylhydrazine is a well-studied carcinogenic toxin that has also been used as liquid rocket fuel. To my knowledge, the toxins in *Gyromitra infula* and *Gyromitra ambigua* have never been studied, but they are thought to be hydrazines, probably gyromitrin.

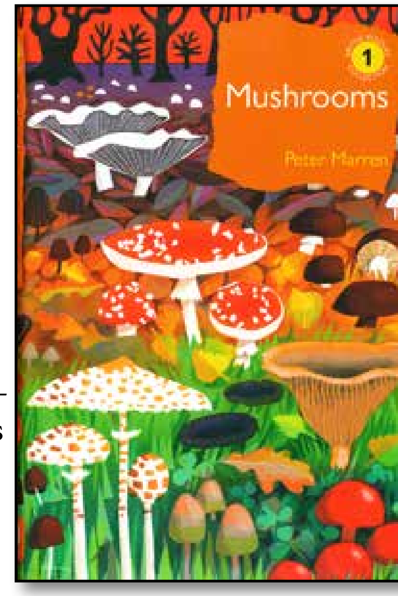
While the NAMA database has numerous reports each year of *Gyromitra esculenta* poisoning, there have only been six reports in thirty years for poisoning by *Gyromitra montana*. My recent examination of the six cases revealed not a single case where *Gyromitra montana* was positively identified. In at least one instance, I was able to determine that the culprit was actually *Gyromitra esculenta* by meeting a woman a year later who had seen the victim in the woods collecting what he had called "snow mushrooms." She had recognized the mushrooms as *Gyromitra esculenta* and had warned the man not to eat them. He ignored her and wound up in the hospital with severe liver damage. Even though the case was in my hometown, it was handled by a doctor who, citing patient privacy laws, would give me no information. Based on the common name "snow mushrooms", I had guessed that the man had consumed *Gyromitra montana*. Other cases may also have involved misidentification or may have involved either consumption of raw or only lightly cooked *Gyromitra montana* or cases of individual sensitivity.

After all, morels cause numerous poisoning cases every single year. Virtually everyone who eats morels raw or undercooked gets sick as a result. A few people are intolerant of even well cooked morels if consumed with alcohol; others are sensitive to well-cooked morels whether or not they consume alcohol. My conclusion is that *Gyromitra montana* can be considered edible if thoroughly cooked, though a few collections have been shown to contain traces of hydrazines. I would recommend cooking these mushrooms outside or with good ventilation so that the volatile hydrazines, if present, are not inhaled. *Gyromitra korfii* is probably also reasonably safe. There are no poisoning reports in the NAMA data base for *Gyromitra korfii*, though that is no guarantee that there have not been poisonings that were not reported to NAMA. I estimate that we only hear about roughly 10% of all poisoning cases.

Since the various "pig's ear" mushrooms (*Gyromitra ancilis*, *Gyromitra leucoxantha*, and *Gyromitra olympiana*) are in the same subgenus as *Gyromitra montana* and *Gyromitra korfii*, my guess is that they are also edible. Thirty years ago, I used to eat them and serve them to students, but found the flavor and texture to be mediocre, so I quit cooking "pig's ears". There are no poisoning reports in the NAMA database. *Gyromitra melaleucoides* is very different genetically but very similar macroscopically to *Gyromitra ancilis*. Since we have no poisoning reports for *Gyromitra melaleucoides* either, it is probably edible (and mediocre) as well. The other close look-alike is what we know of as *Disciotis venosa* (Pers.) Arnould, a close relative of *Morchella*, the true morels. *Disciotis venosa* itself has not yet been found in North America. We have at least two look-alikes that remain unnamed

(Continued on page 20)

Mushrooms: The Natural and Human World of British Fungi



Peter Marren
ISBN 978-0-9564902-3-0 (hardcover), 272 pages, 2012
British Wildlife Publishing (www.britishwildlife.com)
£24.95 list, £22.00 from publisher (approximately $41/$36)

To most North Americans, it probably seems odd that a "Wildlife" publishing company would produce a book about fungi. But, as I learned a few years back, it isn't so odd at all when you consider that the British meaning of "wildlife" is far broader than ours. It encompasses nature in general, not just the larger animals. Peter Marren is an amateur mycologist who, for many years, has written articles about mushrooms for the magazine, *British Wildlife*. Thus, he was a logical choice to author this first volume in a new series of books on various aspects of natural history and conservation (the second volume concerns meadows).

The book's purpose and approach are best described using Marren's words from the Foreword:

> I have tried to combine both the cultural and scientific approaches in a narrative that takes us from what fungi are, and what they do, to the ways in which we use or take delight in them. This is not a field guide … Nor is it a textbook on the science of mycology. I have aimed instead at writing a personal account of the wonderful world of fungi in which I have been sometimes a bystander, sometimes a participant, since my boyhood …

The 13 chapter titles provide a sense of the coverage: A fungal autobiography (in which Marren presents his mycological credentials), Meet the mushrooms (the basics of what fungi are and what they do), What's in a name? (an extensive look at both common and scientific names), Mushrooms on parade (a brief summary of the different types of mushrooms), What mushroom is that? (identification issues), Natural habitats, In our midst: our fungal neighbours (closer-to-home habitats for mushrooms), Earthtongues, waxcaps, and hedgehogs: what fungi tell us about the natural environment, Scarcity and plenty: why some mushrooms are common and others are rare, Forays amongst the funguses, The good, the bad, and the crazy (edibility, toxicity, and magic mushrooms), Picking for the pot, and Saving mushrooms. The text concludes with a fairly extensive list of references and suggested readings and a general index.

Marren's writing is clear, approachable, and makes for an enjoyable read. The text is profusely illustrated with beautiful photographs (mostly of mushrooms, but also of people) and other attractive images such as book covers and even a charming menu for a banquet that followed a 19th century foray amongst the funguses sponsored by the Woolhope Naturalists' Field Club of Herefordshire (apparently the folks who first used "foray" to describe a hunt for mushrooms).

My only complaint is that the book suffers from far too many over-generalizations and misstatements of fact, including nearly everything that is said about mushrooms and mushrooming in North America. Some examples: *Hebeloma radicosum* is said to have a long taproot that penetrates underground nests of mice or other animals, but that isn't how mushrooms grow. The fungus's mycelium is living within the nest and the mushroom grows upward from the mycelium to the soil surface not down into the nest. Marren considers David Arora's common name for *Lepiota naucina* (*Leucoagaricus leucothites*)—"woman-on-a-motorbike"—one of the best, allegedly reflecting a mushroom with "long, shaggy 'hair' falling from a crash-helmet-like boss (umbo)," and he laments that the species is "non-British." But the mushroom in fact has no long hair—the cap actually is rather smooth or faintly scaly—and a quick check of some British field guides shows that it is considered widespread and common there, where its common name is "white dapperling." The genus name, "*Lacrymaria*," means "having tears," not "Mary's tears," thus negating a possible biblical reference. The "leuco" in the genus name, "*Leucocoprinus,*" refers to the species having white spores, not to the mushrooms being white inkcaps. In many places certain mushroom fungi are said to be unrelated to others. But ALL mushrooms and, in fact, all organisms are related—it's just a matter of greater or lesser degree. *Sarcodon imbricatus* and *S. squamosus* are two different (though often confused) species, not former and current names for the same species. In making a case against regulation of mushroom-picking, Marren far overstates the existence of field experimental evidence suggesting picking does not lead to long-term decline in mushroom fruiting.

Although, for me, the occurrence of such things detracts botheringly from what otherwise is a fine presentation, it is unlikely that most readers would be affected to nearly the same degree. Thus, I think mushroom hunters in North America would enjoy this book and appreciate getting a sense for the similarities and differences between amateur mycology in our two different parts of the world and so I recommend it—just don't believe everything you read in it.

Steve Trudell

(**Is that a Gyromitra?** - *continued from page 18)*
at this point. Presumably North American species of *Disciotis* would cause no more trouble than eating morels, which can be very pleasurable for most people and very unpleasant (or worse) for some people. There is no information in the NAMA database about the edibility of the two species in the subgenus *Pseudorhizina*, *Gyromitra californica* and *Gyromitra sphaerospora*. I also do not know if they are consumed very often. I would hesitate to try them.

There is also no information in the NAMA database about poisonings from the two species in the subgenus *Caroliniana*, *Gyromitra caroliniana* and *Gyromitra brunnea*. However, I do know that many people eat *Gyromitra caroliniana*, known as the "red false morel." *Gyromitra caroliniana* can be huge, up to seven pounds, and is reportedly delicious. Like all epigeous (aboveground) Ascomycetes, it must be thoroughly cooked. I conclude that *Gyromitra caroliniana* and *Gyromitra brunnea* (the two species are easily confused) are probably no more dangerous to consume than *Morchella* species.

References

Methven, A.S., Zelski, S.E., and Miller, A.N. 2013. A Molecular phylogenetic assessment of the genus *Gyromitra* in North America. Mycologia 105: 1306-1314.
Viess, D. 2013. Further Reflections on *Amanita muscaria* as an Edible Species. Mushroom: The Journal of Wild Mushrooming 29(4)-30(1): 42-49, 65-68 (Fall 2011-Winter 2012).

The first photo to the right is of *Gyromitra esculenta* by Michael Beug.

The second photo to the far right is *Gyromitra brunnea* by Emily Johnson.

Paul Stamets to be Keynote Speaker at 2014 NAMA Foray

PSMS is pleased to announce that Steve Trudell will be the foray mycologist and Paul Stamets will be the keynote speaker at the 2014 Patrice Benson Memorial NAMA Foray, which takes place October 9-12 at Camp Arnold in Eatonville, Washington.

Foray Pricing

Costs for a 3-day foray package that includes lodging, registration, and 8 meals will range from $260 to $300 depending on the level of lodging chosen. Full hookup RV spots are available onsite at Camp Arnold, along with registration and the 8-meal plan, for $250/person. For those staying offsite, registration and the meal plan would be $230/person.

Registration will be handled online only on psms.org in the very near future. We will send out the link to the registration site once it's ready.

If you have any questions, please contact us at nama2014@psms.org
Pacita Roberts and Teddy Basladynski
Puget Sound Mycological Society members and organizers of the 2014 NAMA Foray

Keynote Speaker Paul Stamets

For over 30 years, Paul Stamets has been a dedicated mycologist in the Pacific Northwest and is internationally recognized for his contributions in mycology and the environment. He has been called a visionary for his beliefs that a deeper knowledge of fungi can help solve many of the world's pollution problems, which is the topic of his popular 2008 TED Talk that has been seen by millions. Paul coined the term "mycoremediation" to describe the application of fungi to clean up environmental pollution and other problems.

Paul founded Fungi Perfecti, a company specializing in cultivation and sale of edible, and medicinal fungi, and has filed 22 patents for mushroom-related technologies. He has discovered new species of mushrooms and pioneered techniques for edible and medicinal mushroom cultivation. His two books, *Growing Gourmet and Medicinal Mushrooms* and *The Mushroom Cultivator* have been recognized as definitive texts of mushroom cultivation.

His additional works include *Psilocybe Mushrooms and Their Allies*, *Psilocybin Mushrooms of the World*, *MycoMedicinals®: an Informational Treatise on Mushrooms* and many articles and scholarly papers. Paul's latest book is *Mycelium Running: How Mushrooms Can Help Save the World*.

Paul received the 1998 “Bioneers Award” from The Collective Heritage Institute, and the 1999 “Founder of a New Northwest Award” from the Pacific Rim Association of Resource Conservation and Development Councils. In 2008, Paul received the National Geographic Adventure Magazine’s Green-Novator and the Argosy Foundation’s E-chievement Awards. He was also named one of Utne Reader’s “50 Visionaries Who Are Changing Your World” in their November–December 2008 issue. In 2010, Paul received the President’s Award from the Northwest Chapter of the Society for Ecological Restoration. In 2013, he was the recipient of the NAMA Award for Contributions to Amateur Mycology. *(See article in the January-February 2014 edition of The Mycophile).*

Foray Mycologist Steve Trudell

Steve Trudell is affiliate professor in the College of Forest Resources and lecturer in the Biology Department at the University of Washington, and is also the scientific advisor for PSMS. He earned his Ph.D. from the UW’s College of Forest Resources, where his dissertation research explored the use of stable isotope signatures to study the roles of ectomycorrhizal and saprotrophic fungi in nitrogen and carbon cycling in old-growth forests of the Olympic Peninsula. Steve has served as vice president of NAMA and was president of the Pacific Northwest Key Council. He often writes for mycological publications, serves as a foray mycologist, and is invited as a lecturer for mycological societies and other nature groups.

Steve has photographed and identified mushrooms for over 30 years, and has used that experience to co-author *Mushrooms of the Pacific Northwest*, and his newest book, *Tricholomas of North America: A Mushroom Field Guide*. He studies the roles of fungi in forest nutrient cycling, and his interests include the reasons behind and controls on fungal biodiversity. Ultimately he would like to know why there are so many different mushrooms, what they are all doing, and how they fit in the ecosystem.

SPECIAL NAMA ANNOUNCEMENTS

The North American Mycological Association **(NAMA) is seeking an editor for *McIlvainea: Journal of American Amateur Mycology*.** Contact Michael W. Beug, acting Editor 2008-2013 for details.

!NAMA Mycological Communication Contest!
Deadline January 15 of each year

NAMA is seeking ways to encourage and assist students in their development as mycologists by providing writing and public speaking opportunities. To that end, **NAMA has initiated an annual mycological communication contest for students K-12 through Post Doc.**

Effective communication with the lay public about scientific discoveries and observations will help engender public interest in and support for both basic science and for the environment where we conduct our research. To encourage communication by students doing mycological research, NAMA is soliciting student research papers for publication in *McIlvainea: Journal of American Amateur Mycology*. All students who submit a paper will receive a one-year membership in NAMA. A $250 prize will be awarded to the author of the best paper in each of four categories: 1) best paper by a K-12 student; 2) best undergraduate paper; 3) best graduate/post doctoral paper and 4) judges option award (any category). In addition, the winners will be invited to attend the NAMA Annual Meeting/Foray and present their work at a student mycological colloquium. Winners who choose to attend the NAMA foray will each receive a $500 stipend to help cover registration, travel, meals and lodging.

In the event that no entries are received in a given category, the judges may make an additional judges option award. Entries must be submitted to Michael W. Beug, Editor, *McIlvainea* beugm@evergreen.edu.

This is your final issue of The Mycophile
IF YOU HAVEN'T PAID YOUR DUES YET for 2014.

Please download the membership form from our website and send it to **Ann Bornstein at 61 Devon Court, Watsonville, CA, 95076-1160** with your check. Or easily renew online using PayPal at www.namyco.org/join/index.html.

By sending our full-color publications electronically, we have been able to lower our membership fees, and pass the savings to you. But, because the cost of printing and mailing out black and white hard copies is higher than the membership fee collected, we urge you to sign up for the lower cost full-color digital version. You save money and so do we!

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North American Mycological Association
c/o Ann Bornstein
61 Devon Court
Watsonville, CA 95076

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Newsletter of the North American Mycological Association
THE MYCOPHILE

Photo by David Fischer, author of *Edible Wild Mushrooms of North America* and co-author of *Mushrooms of Northeastern North America.*
http://americanmushrooms.com

SARCOSCYPHA sp.
The Scarlet Cup mushroom in this photo was taken in upstate New York. Several different species are common in many north-temperate regions worldwide. They fruit on damp hardwood sticks in shaded wet or mossy ground in late winter and early spring. These ascomycetes are saprotrophic members of the Pezizaceae.