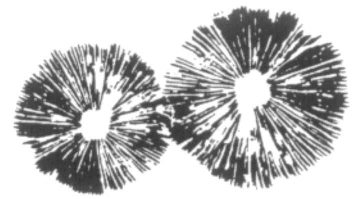
SPORE PRINTS



BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
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WOULD A ROSY GOMPHIDIUS BY ANY OTHER NAME SMELL AS SWEET?

Rebellion against dual-naming system gains momentum but still faces a few hurdles

by Susan Milius
Science News April 18, 2014

To a visitor walking down, down, down the white cinder block stairwell and through metal doors into the basement, Building 010A takes on the hushed, mile-long-beige-corridor feel of some secret government installation in a blockbuster movie.

Biologist Shannon Dominick wears a striped sweater as she strolls through this Fort Knox of fungus, merrily discussing certain specimens in the vaults that are commonly called “dog vomit fungi.”

This basement on the campus of the Agricultural Research Service in Beltsville, Md., holds the second largest fungus collection in the world, with at least one million specimens stored in high banks of institutional-beige metal cabinets. The organisms can glow in the dark, turn living ants into leaf-biting zombies, fetch thousands of dollars per pound at gourmet food shops or snarl international commodities markets.

It may look like the ultimate triumph of human order over natural chaos. But looks can be deceiving.

Shape-shifting fungi

Long before DNA analysis, the sharp-eyed brothers Charles and Louis René Tulasne realized that the same fungal species can take different forms. In 1861 the brothers published drawings of a powdery mildew fungus that sometimes forms clusters of dark, spiked orbs or microforests of spore-bearing hairs, now known to be sexual and asexual forms. At the time, the Tulasnes labeled both forms *Erysiphe guttata*.

Many fungi are shape-shifters seemingly designed to defy human efforts at categorization. The same species, sometimes the same individual, can reproduce two ways: sexually, by mixing genes with a partner of the same species, or asexually, by cloning to produce genetically identical offspring.

The problem is that reproductive modes can take entirely different anatomical forms. A species that looks like a miniature corn dog when it is reproducing sexually might look like fuzzy white twigs when it is in cloning mode. A gray smudge on a sunflower seed head might just be the asexually reproducing counterpart of a tiny satellite dish-shaped thing.

When many of these pairs were discovered, sometimes decades apart, sometimes growing right next to each other, it was difficult or impossible to demonstrate that they were the same thing. So one species would get two names. Careful observation later suggested that officially different species are actually one, but the pairs of names remained. In fact, it soon became standard mycological practice to name many species twice – once for the sexual form, once for the asexual one.

“Zoologists,” says mycologist David Hawksworth of Universidad Complutense de Madrid, “throw up their hands in horror.” For animals, one name covers the caterpillar and the butterfly it becomes. Botanists don’t just go naming a big tuft of fern fronds one thing and its separate, little green gametophyte another.

Yet until recently, mycologists had no choice. They knew full well that *Aspergillus flavus*, the powdery fuzz that taints peanuts with carcinogenic aflatoxin, is the exact same species as *Petromyces flavus*. They knew that *Cordyceps takaomontana* is also *Isaria tenuipes*. But faced with such a dizzying array of shape-shifters,

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Cookbooks reflect the times we live in, and mushroom recipes prove it

Jo Henderson

There is no question that the mycologist and mycophagist are a special breed. We are foragers to be sure, but we specialize in foraging for what can be the most elusive of forest and field production – the fungi. For some of us, it replaces the Easter egg hunt of our youth. For others, it is species identification of a particular type and the thrill of perhaps discovering something new. But for most of us, it is the pleasure of consuming something delicious pulled from the

see RECIPES on page 7

Seattle University, PSMS join hands to honor Hildegard Hendrickson

A tree dedication and plaque unveiling will honor long-time PSMS member Hildegard Hendrickson, who disappeared while hunting mushrooms last June.

The 1 p.m. ceremony will take place at Seattle University’s Union Green on Sunday June 8.

Union Green is just on the west side of the university’s St. Ignatius Chapel, and accommodates autos. Street parking on 12th is nearby.

If you would like to help PSMS offset the cost of the tree and plaque, checks may be sent to PSMS with "HH" written on them.

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MAY 10 FIELD TRIP REPORT Brian S. Luther

What happens when you get 74 people who sign in on a field trip to a beautiful location in the mountains, with mostly warm, sunny weather? Well, everybody has a great time, that's for sure.

Our hosts were Jeff Stallman and Doug U-Ren and they had our favorite spot reserved and a big spread of morning munchies with hot coffee all ready early in the morning. Doug and others also brought wood and had a campfire already going. Doug's powerful generator also allowed us to make additional coffee much easier, without having to use the PSMS propane camp stove. Extra special thanks Doug and Jeff, you really did it right.

The exciting member news is that we found out that Rachel Arnold is expecting (in June). Congratulations Rachel and Greg! You're starting an incredible adventure, challenge and journey in life.

Five members volunteered to be Field Trip Guides to lead others out, in several different directions. Even so, edible collections were in short supply. Because morels were few and far between, we kept count and were up to about 13 morels for the whole group, according to Julia Benson.

Thirty species were displayed. Besides the scant morels already mentioned, a few *Ptychoverpa* (*Verpa*) *bohemica* were found and one person ran into a very nice fruiting of prime Oyster Mushroom (*Pleurotus ostreatus*) on downed cottonwood. Randy Richardson found a single *Boletus edulis* button in perfect condition, but had to go all the way back down to Cle Elum to find it. Interesting finds included one basidiocarp of *Chromasera cyanophila* (*Mycena lilacifolia*) and a small piece of the polypore *Bjerkandera adusta*. Jeff Stallman brought me the tiny (1 to 2 mm in diameter) bright orange coprophilous (dung inhabiting) ascomycete *Cheilymenia stercorea* that he found on a "cow pie." It has tiny excipular hairs that look like eye lashes and also has stellate hairs on the lower areas of the ascocarp.

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MEMBERSHIP MEETING

Michael Beug is Professor Emeritus of The Evergreen State College in Olympia where he taught chemistry, mycology and organic farming for 32 years. At our June 10 membership meeting he will speak on the topic, "For the Love of Ascomycetes: Morels, Truffles and More."

His first book, Ascomycete Fungi of North America, with co-authors Alan and Arleen Bessette, was published in March 2014 by the University of Texas Press. The book covers over 600 species and contains 843 color photographs.

He is a member of the North American Mycological Association (NAMA) where he serves as Editor of the Journal McIlvainea, Chair of the Toxicology Committee, and member of the Education Committee. Michael was winner of the 2006 NAMA Award for Contributions to Amateur Mycology. Michael is currently Vice President and has served four terms as President of The Pacific Northwest Key Council, a group dedicated to writing macroscopic keys for the identification of fungi. His specialties are the genus *Ramaria*, all toxic and hallucinogenic mushrooms, and Ascomycetes. He regularly writes about mushrooms in McIlvainea, The Mycophile, Fungi, and Mushroom: The Journal of Wild Mushrooming. He is a contributing editor of Fungi magazine. He is co-author of MatchMaker (with Ian Gibson), a free mushroom identification program covering 4,092 taxa with over 5,000 images of 1,984 illustrated taxa.

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BOARD NEWS Denise Banaszewski

So far we have 188 people signed up to go to NAMA. We expect it to fill up so if you want to go, sign up soon! We have people coming from many states as well as Belgium, Estonia, Italy and Canada. After a convincing presentation by Kim Traverse, we will hold a PSMS Fall Show October 25 and 26. Saturday October 25 will be open to PSMS members only (and their invited guests, who will need to pay an entrance fee), and Sunday will be open to the public. Kim Traverse and Milton Tam will be co-chairs. Finally, Michael Beug will speak at the June meeting. Michael has a new book out on Ascomycetes, which is beautiful (see review page 6.) That's it, the year is clearly winding down but we will have a board meeting in June, then again in August.

Ladybug, ladybug, where'd you get all those bloodsucking microscopic fungi?

Megan Daniels

There's a new ladybug in town, and it's not as charming and adorable as our old favorites. It's the Multicolored Asian Ladybug, *Harmonia axyridis*. They were introduced to North America in the 20th century to eat pesky aphids: one ladybug can eat 200 aphids a day. This is really their most charming characteristic – their other attributes make them undesirable invasive insects (Koch 2003). They appear to be displacing friendlier native species (check out the Lost Ladybug Project.)

They have also become household pests, since they overwinter in huge aggregations on or in our houses. If you have them in your home you know that if you piss them off, they produce a foul stink known as "ladybug taint." If you're a winemaker, ladybug taint can ruin a whole batch of wine if you accidentally squash some ladybugs along with your grapes.

Worse, ladybug allergy (that's right, ladybug allergy!) is increasingly a problem for humans whose houses are ladybug overwintering sites (Goetz 2009). No laughing matter, and to top it all off, they sometimes bite. They're just not very nice ladybugs.

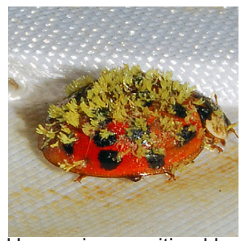
So, on to fungi. Today I present three: one friend of ladybugs; one foe; one just a nuisance. The nuisance is the coolest: Ladybugs don't get fleas – but these labouls are the closest thing. They are blood-sipping parasites that form small colonies on the backs and bellies of ladybugs.. Mordecai Cubitt Cooke, an early popularizer of fungi, dubbed them "Beetle Hangers" for their weird hook- or club-like appearance (Cooke 1892).

Beetle hangers belong to a diverse and surprisingly host-specific group of fungi, the Laboulbeniales. Of the 2,000 described species an impressive 80 percent parasitize beetles, and many live only on a particular species of beetle. One of the first descriptions of this group was by Harvard's Dr. Roland Thaxter. He did foundational work on the group, writing and illustrating a goliath five-part series. Among the descriptions and illustration is *Hesperomyces virescens,* the green beetle hanger, which infects a variety of ladybugs.

A green beetle hanger's entire life cycle takes place on a ladybug. Encounters with infested deceased ladybugs can spread the fungus. Green beetle hangers spread easily among ladybugs overwintering in groups – infection can increase by as much as 40 percent (Nalepa and Weir 2007, Weir and Beakes 1996).

While green beetle hangers may be irritating but harmless to ladybugs, another fungus of multicolored Asian ladybugs is actually beneficial. Multicolored Asian ladybugs are typically infected by parasitic fungi called microsporidia. Normally, microsporidia are disease organisms, but scientists were baffled to find them abundant in ladybug blood, causing no negative health impacts. On the contrary, it turns out they are a ladybug's secret weapon: when native ladybugs eat microsporidia-infected eggs of multicolored Asian ladybugs they are essentially poisoned. The microsporidia may even be behind the antibacterial activity of their blood (Vilcinskas et. al 2013).

Microsporidia are microscopic single-celled fungi. They are thought to have an ancient origin. In immune-compromised humans they cause a chronic disease called microsporidiosis. Incapable of reproducing outside of a host's cells, they survive and are transmitted from cell to cell and animal to animal as egg-shaped spores. Once a spore makes contact with a host cell a long tube acts like a syringe to inject the microsporidium. Once inside a host cell, it exploits its host's cell machinery to make copies of itself, producing new spores that repeat the cycle.



Harmonia parasitized by microfungus

photo courtesy Jerry Armstrong

Now we've met a nuisance fungus and a helpful bioweapon, but every story needs a villain. If you're sick of ladybugs getting into your wine and your house, here's a fungus to kill them. Beauveria is a genus of molds that kills bugs. Various strains of Beauveria have been developed as biological controls of pest insects. Maybe we can find a strain perfect for killing off ladybugs who've overstayed their welcome, as Roy and colleagues (2008) suggest.

These fungi don't have to be injected or "inhaled," they have the ability to drill their way into a ladybug and eat its insides. Then they burst gloriously forth and grow the deceased ladybug a fuzzy jacket.

One ladybug: three different fungi, each adapted to live with its host in a different way.

Editor's note: Megan Daniels is a graduate student in the Cornell mycology lab headed by Kathie Hodge. The lab's blog is at: https://blog.mycology.cornell.edu

FIELD TRIP REPORT

cont. from page 2

Just a reminder that if you're looking at the b/w hard copy of *Spore Prints* sent in the mail, you can view photos in living color at **www.psms.org**

The rare *Trametes gibbosa* was brought in to me also, presumably on dead cottonwood. Previous collections of this species that I'm aware of have been found in the UW Arboretum and at MacDonald Park in Carnation, WA in the last few years. Also, an unusual spring fruiting of the fall mushroom *Hygrophorus chrysodon* showed up. Surprisingly, very few snow bank fungi came in and not a single species of *Gyromitra* was found. A number of members also brought in native wildflowers for me to identify and we had a nice assortment of different species. For those who left before the delicious potluck a little after 5:00 pm, I have to tell you that you ***really*** missed out.

Brian S. Luther

Microscopic hairs of *Cheilymenia stercorea* under 100X magnification

BY ANY OTHER NAME

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they had to allow different names for things that might or might not be the same species.

Now, mycologists have a chance to set the record straight. A group of upstart scientists has rebelled against the dual-naming system, arguing that DNA analysis can endow fungi with a one-species, one-name system. Having won a major victory at a recent international scientific congress, they are poised to bring their field into a new era of genetic nomenclature. But their project is not without perils.

What's in a name

Naming a species is not just a Latin version of deciding that your new kitten seems more like a Snowball than a Bobo. It means deciding what an unknown entity, in the most basic sense, is. It hangs a living thing on a new twig of the tree of life, showing how shared characteristics reveal its relatedness to known forms, but also arguing that unique characteristics distinguish it from every species described so far.

People have been guessing wrong for millennia about where fungi fit and what they are. Aristotle, and then about 2,000 years later, Carl Linnaeus, who fathered the system of two-word Latin names, divided the living world into the plantlike and the animal-like. Fungi finally got their own kingdom in the 1960s, and since the early 1990s genetic evidence has been building to place the fungal kingdom closer to animals than to plants. Analyses have also shown that some things that look and act like fungi actually belong in other taxonomic groups. Slime molds, including the dog-vomit–like specimens in the national collection, are not fungi but protists. And the *Phytophthora*, including the *infestans* species famous for causing the Irish potato blight, are closer to some kinds of algae than to fungi.

Linnaeus' observational approach has been no match for a group of organisms that is often not what it seems. "He was hopeless," Hawksworth says. "He really lost the plot when it came to fungi."

Trouble arises

By the mid-19th century, the French brothers Charles and Louis René Tulasne were fretting that what appeared under a microscope to be the same fungus sprouted into different kinds of reproductive forms. The brothers were "incredible observers," Hawksworth says. By studying details in structures, the Tulasnes realized that at least some fungi sprouted more than one kind of reproductive "seed," as they called the sexual and asexual products. The Linnaean system, assigning names to a species based on its supposedly uniform reproductive anatomy, was in trouble with fungi.

Many fungi can reproduce either sexually or asexually, depending on circumstances. In *Monilinia fructicola*, which causes brown rot in fruit, spores wafting onto blossoms in spring can grow and produce asexual spores that spread to new blossoms, twigs or fruits and create more asexual spores. On rare occasions, when an infected fruit plops to the ground, one fungus finds a mate and forms a sexually reproducing stalked form. The stalked cups look nothing like the asexual fur on fruits and flowers.

But since the illustrious author, the brothers wrote in 1861 of Linnaeus, "always completely abjured the use of magnifying glasses, and therefore scarcely ever tried to describe accurately either conidia or spores, we fear (may he pardon the statement) that he really knew very few seeds of either kind."

At Beltsville's Systemic Mycology and Microbiology Lab, mycologist Amy Rossman pulls out three tall volumes by the Tulasnes, with full-page plates of delicate line drawings of nubbled globes or fatly bending projections, the brothers' minute records of fungal details.

The lovely drawings failed to inspire much discussion about what to do with names. The brothers "became rather reclusive," Hawksworth says. By and large,"the mycological establishment didn't want to accept what they were finding."

"Gentleman's agreement"

By the early 20th century it had become clear that many fungi could shift between one or more asexual forms, called anamorphs, and a sexual form called a teleomorph. But matching up the forms for the same species could be so difficult that mycologists devised what Lorelei Norvell of Portland, Ore., longtime editor in chief of the journal "Mycotaxon," calls it "a gentleman's agreement" to use two names.

The same plump, color-coded volumes of legalese that govern how to name plants and algae also cover fungi, a carryover from the centuries of treating fungi as plants. "If you have ever read the Internal Revenue Code," Norvell says of these rules, "it's the same sort of thrill."

By 1910, the code's authors had agreed on an early version of a rule that has become so widely discussed that it's just known as Article 59, as if it were a landmark ballot proposition. In two large fungal groups (Basidiomycetes and Ascomycetes that don't make lichens), the rule allowed fungi to have both a sexual and an asexual name. For speaking of the whole organism, the sexual name dominated. In practice, researchers often focused on just one form or the other, and names proliferated.

Sparks fly

The two-name system for fungi inspired grumbling and Article 59 went through revisions and re-revisions but the current turmoil started with the advent of molecular tools that at last allowed people to look fungi right in the DNA. Even if two specimens look entirely different and are never found together, if their DNA matches, they're the same species. DNA also lets mycologists position all those species on the evolutionary tree.

The movement eventually sparked outright rebellions. In 2006, Pedro Crous of the CBS-KNAW Fungal Biodiversity Centre in Utrecht, the Netherlands, penned a treatise on a big family of fungi, the *Botryosphaeriaceae*, and threw down a taxonomic

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gauntlet. He declared that he would not be citing both sexual and asexual names “even where both morphs are known.”

Jos Houbraken, also at the Fungal Biodiversity Center, maintains a non-inflammatory tone no matter what a reporter asks about the tumult in nomenclature. When he made his own early switch to a one-name system, reviewers of his submitted papers flagged the unconventional names as against the nomenclature code. In one case a reviewer objected that “pragmatism is not enough” to justify violating the rules. But other reviewers noted the off-code names supportively, and the journal published the paper.

The Melbourne incident

Actually changing fungal nomenclature rules requires discussion and voting at an international congress that is attended mostly by botanists. Thanks to the long tradition of treating fungi as plantlike, botanists get a vote on mycological matters. Mention of secession from the botanical code so far has just been talk.

In July 2011, about a dozen mycologists found themselves in Melbourne, Australia, at a special session held a week before the International Botanical Congress dedicated to nomenclature changes. Mycologists were outnumbered almost 20-to-1 by botanists, and after years of deadlock were “anticipating a bloody fight,” Norvell says. To top it off, many of the scientists were ill.“Everybody had it, and there was coughing like you wouldn’t believe.”

The battle-weary secretary of the deadlocked committee, Scott Redhead of Agriculture and Agri-Food Canada in Ottawa, had prepared three options for changing the two-name rules. He started with the most radical and least likely to succeed: Change the old Article 59 to remove the option for double names. “Here we are, braced for discussion, braced for a fight, and they take a vote on the first option and it passes.” Norvell says. “We just sat there looking like fish with our mouths open.” A tiny band of rebels, with help from a foreign power, had suddenly overthrown a century-old regime.

The single-name motion may have passed among congress attendees, but support for it among fungal taxonomists overall ran only about 50-50, says mycologist Keith Seifert at Agriculture and Agri-Food Canada. “Our side happened to win the vote,” he says. “Many fungal taxonomists feel disenfranchised, cheated and angry.”

But some who objected strenuously are now settling down to the immense task ahead. And it is immense: Taxonomists have to sort out which former names will be the ones to use for perhaps more than 10,000 fungi.

Sometimes it’s simple. Seifert takes the example of *Aspergillus flavus*, the asexual name for the powdery fuzz that is notorious for releasing carcinogenic aflatoxins into stored peanuts, corn and other commodities. Farmers, regulation writers, doctors and industrial microbiologists have long used the name *A. flavus*, and they may not have even realized that a sexual form was discovered and named *Petromyces flavus* in 2009. The new version of Article 59 gives priority to older names, so *Aspergillus*, from 1729, trumps *Petromyces*, from 1973.

The new code intentionally leaves a huge loophole: Taxonomists may petition to give priority to a widely used name regardless of its age. This is the part that worries Seifert.

“We need to get our buns in gear,” he says. Appeals to save names need to be ready for discussion in August at the 10th International Mycological Congress in Bangkok (where the botanists won’t be in attendance). Otherwise those names can’t be approved at the next botanical nomenclature congress, in 2017. Missing the August deadline would mean that cherished names couldn’t go before a nomenclature congress until 2023, creating a long period of uncertainty. Yet efforts to select names to preserve are lagging. “There is no going back,” Seifert says.

Shifting to single names gets especially tricky as DNA analyses keep redrawing species boundaries and relationships between taxonomic groups. Houbraken and his colleagues have concluded that the storied fungus long known as *Penicillium chrysogenum*, which gave Alexander Fleming his antibiotics, is actually *P. rubens*. And the fungus causing the disease penicilliosis in people with compromised immune systems doesn’t really belong in the genus *Penicillium* at all.

It’s a lot to deal with. Some mycologists propose taking the implications of DNA analysis even further into the taxonomic frontier. Systems for processing massive quantities of genetic material allow mycologists to explore communities of fungi they can’t identify in lab dishes. If DNA can sort out fungal species, then why not use it for naming in cases where no specimen can be found? Vexed by how to settle on one name for a confusing multitude of physical forms, mycologists may soon have to figure out how to name a thing when there is nothing to see at all.

Citations

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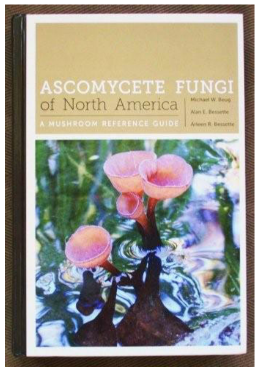
BOOK REVIEW: **Ascomycete Fungi of North America - A Mushroom Reference Guide**, by Michael W. Beug, Alan Bessette & Arleen R. Bessette. University of Texas Press, Austin. 2014. 488 pp. Hardbound. Approx. $80.

Brian S. Luther

The last important popular work for North America to focus exclusively on the larger Ascomycota was a Pacific Northwest regional guide by Edmund Tylutki (1979 & 1993, Mushrooms of Idaho and the Pacific Northwest – Vol. 1, Discomycetes, Univ. Press of Idaho, Moscow), so this new book is welcome.



Ascomycete Fungi of North America is the first book to help try to consolidate and make available the enormous volume of recent professional mycological literature on "Ascos" scattered throughout journals worldwide, and making it available to mushroom devotees.

The taxonomic category Ascomycetes is an outdated Class, but is still regularly used in reference to this, the largest group of fungi.

Recent DNA studies have contributed to significant advances in our knowledge of speciation within genera we previously knew only a few taxa in. The authors incorporate much of this information and discuss many of these changes.

In particular, avid mycophiles will find that there are a number of newly described species of morels (the genus *Morchella*), and many other genera, along with up to date nomenclature. Concerning morels, the authors mention (p. 121) that the nomenclature has still not been fully worked out on European and North American species, but progress is being made. The problem is that separate studies were published, with overlapping species. All of these new species names provide a significant challenge for those who studied and learned the older names, collected books decades ago with one or two species, and now find that there are many more species to learn, but worse yet, familiar names have been synonymized and different names taken their places, for previously well established genera and species.

But, this is progress and the more we learn from modern in-depth research, the better we understand the natural world and thus advancements mean making changes. Change is difficult for humans to accept – we're creatures of habit, but progress marches on. This is totally applicable to flowering plant taxonomy and nomenclature as well.

Plant families and genera I learned as an undergraduate in Botany at the University of Washington in the early 1970s have been turned upside down by DNA studies, with entire families disappearing.

Ascomycete Fungi of North America is organized as follows, with my comments.

Chapter 1 – Introduction. This is a brief discussion of what Ascomycetes are, accompanied by many photomicrographs of microscopic structures.

Chapter 2 – Key to Included Ascomycetes. This is a pictorial key, with key leads going to photos of several species to choose from, with one key lead ending with as many as 15 different species photos to select from, but usually fewer. Sometimes the same pictures are used both here in the key and also in the respective chapter treatments and other times different photos of the same species are shown.

Chapter 3 – Hypogeous Ascomycetes. The authors have provided a second key here for the genera in this group, in addition to the key leads to the species (as group pictures to select from) in Chapter 2. The genera are then listed alphabetically, starting with this chapter and likewise for the rest of the chapters.

Comments made by the authors (p. 112) clearly show their concern for habitat destruction relating to harvesting the edible species in this group. This chapter is a nice complement to the recent popular work by Matt Trappe, et. Al. (2007, Field Guide to North American Truffles, Ten Speed Press, Berkeley), which also covers Basidiomycete "false truffles."

Chapter 4 – Pezizomycetes. This chapter covers 11 different families, including many familiar, larger fungi we encounter. Species that used to be in the common spring fruiting genus *Discina* are now treated within the genus *Gyromitra*. It would have been nice if the authors had mentioned a few more details used to distinguish these former species of *Discina*. For example, the apiculae on spores of *G. leucoxantha* are distinctive in having apical clefts or notches and this is very useful in separating the species, but this character is not discussed.

Chapter 5 – Sordariomycetes. Included here are such well-known species as Ergot (*Claviceps purpurea*), *Cordyceps sp.*, Black Balls (*Daldinia sp.*), *Diatrype sp.*, *Elaphocordyceps sp.*, *Hypocrea sp.*, *Hypomyces sp.*, *Hypoxylon sp.*, *Nectria sp.*, *Ophiocordyceps sp.*, *Xylaria sp.* and others. As you can see, the old genus *Cordyceps* has been divided up and we have three genera now. Five species of *Xylaria* are illustrated here, but even more species of this genus are actually shown in the Chapter 2 key, with some duplication of photos, so the coverage is a bit scattered, unfortunately.

Chapter 6 – Leotiomycetes. Some of the common or familiar fungi treated here include the genera *Ascocoryne*, *Ascotremella*, *Bisporella*, *Bryoglossum*, *Bulgaria*, *Chlorociboria*, *Chlorosplenium*, *Cudonia*, *Lachnellula*, *Leotia*, *Mitrula*, *Sclerotinia*, *Spathularia*,

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Urnula and *Vibrissea*, to name a few.

Chapter 7 – Eurotiomycetes. The genus *Onygena* is discussed.

Chapter 8 – Geoglossaceae. Common earth tongues such as *Geoglossum*, *Microglossum* and *Trichoglossum* are some of the genera mentioned.

Chapter 9 – Neolectomycetes. The genus *Neolecta* is elaborated on.

Chapter 10 – Orbiliomycetes. Species of *Orbilia* are discussed.

Chapter 11 – Dothidiomycetes. This includes the Black Knot of Cherry (*Apiosporina morbosa*), formerly *Dibotryon* and others.

Chapter 12 - Taphrinomycotina. Here we find colorful macro-parasites on plants, such as *Taphrina*.

The chapters are followed by a Glossary, References, Photo Credits, Index to Common Names and an Index to Scientific Names. In the References the authors have not been consistent in listing journal issues after the volume numbers (some with and some without), especially in *Mycologia* and *Mycotaxon* and one reference has no volume, issue or page numbers given at all (Methven, et al, 2013.)

The color plates are good, for the most part, with a few exceptions. Compare for example the photo of *Sowerbyella rhenana* on p. 28, with the larger (and different) photo of the same species provided on p. 256. Also, the photo supplied for *Gyromitra leucoxantha* (p. 56, formerly *Discina leucoxantha*), only shows a curled up specimen and is not a good example of what the species looks like. The description of *Elaphomyces fallax* does not refer to a dark blue gleba, but that's what the photo shows (p. 81). Another problem picture is that of *Urnula padeniana* on p. 265 (what we used to call *Sarcosoma mexicana*). It's shown as being distinctly dark purplish, but this species never has these tones in nature, and in fact their description does not mention this color, so it's misleading. They have also labeled the anamorphic stage *Mycogone cervina* (p. 45, growing on *Helvella sp.*) as *Hypomyces cervinigenus* (which is the teleomorphic stage). It is true (as the author's state) that the teleomorphic stage is rarely encountered, but what's actually shown is the pinkish tan aleuriospore-forming stage. Even so, the extent of the photographic coverage of many species with small or minute ascocarps is outstanding.

Descriptions are concise, but detailed enough to provide an excellent understanding of the species being discussed. Some inconsistencies can be found, however. For example, comparing the very similar looking *Humaria hemisphaerica* and *Trichophaea hemisphaerioides*, I noticed that the authors failed to provide any information about the hairs for the first mentioned species (p. 172) whereas hair details are given for the latter species (p. 261.) Because of omissions like this, it becomes harder for readers to discern the differences between lookalikes, and the hairs by themselves are, in fact, different enough in these species to use alone to distinguish them.

Concerning gastronomy, very sound advice is given and emphasized to thoroughly cook morels before eating, as well as the potential problem (sometimes encountered) of combining alcohol and morels. Also appropriate warnings are noted regarding the possible consumption of some species of *Gyromitra*. However, *G. ancilis* (p. 144 - formerly *Discina perlata*) does not have this cautionary note, but it should, because it's a very common early spring fungus. Also, the authors don't say anything about *Aleuria aurantia* (p. 126) being edible, nor do they mention that *Caloscypha fulgens* can cause gastrointestinal upset if eaten (p. 133 - again, no mention of edibility.)

The paper, printing and binding is good quality and should provide years of hard use. Mycophiles and mycologists everywhere are fortunate that the authors compiled and published this book. **Ascomycete Fungi of North America** is an extremely informative and colorful guide to these fascinating fungi.

RECIPES

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earth by our own hands that often also has the benefit of offering medicinal properties!

It's difficult to know with certainty how long cultures have been foraging for and cultivating mushrooms. It is however fairly certain that almost every culture has some form of edible mushroom recognized and consumed by its people. Here in the Pacific Northwest, the practice is legion with varieties to suit every taste, and competition for harvesting them fierce. Bountiful fields are highly prized and their locations held secret. But, the thing that everyone seems willing to share are the time-honored and field-tested recipes.

In 1969 PSMS published its first book, Wild Mushroom Recipes, with a second edition published in 1973. The editor of the book and one of the charter members of PSMS, Pauline Shiosaki, recalls the undertaking as being very labor intensive over the year of researching, gathering, testing and selecting recipes to highlight various types of mushrooms. When asked how the decision was made to include a recipe in the book she revealed, "If the kids ate it with relish, the recipe passed muster and made it into the book."

In addition to other activities, the newly formed Mycophagy Committee has determined that the time might be ripe to compile a new, more modern cookbook. Over the next several months, they will be reviewing mushroom recipes from the PSMS books and other sources to determine whether this undertaking will be worthwhile. To begin, we

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have begun to look at how preparing, cooking, and availability of edible fungi have changed over time. Two comparable recipes for Mushroom Parmesan provide insight to some changes we have seen: Mushroom Parmesan from Wild Mushroom Recipes (PSMS, 1969), genus agaricus-lepista, p.30 and Baked Parmesan Mushrooms from the Damn Delicious Food Blog.

Given the availability of information on the web, any number of mushroom recipes might have been selected for this challenge. The PSMS and the Damn Delicious Food Blog recipes were chosen because they were prepared in similar ways (both baked at 375ºF) and because of the similarity of primary ingredients between them. But, they were also selected because each recipe tells us something about the times in which they were written.

The PSMS recipe uses 2 C of sliced mushrooms for a 4 person serving, mushrooms are sautéed in butter, baked in a buttered pan and are covered with buttered breadcrumbs. The mushrooms are then laden with a cream sauce containing eggs, milk and flour prior to baking. In addition, ACCENT (Monosodium Glutamate) is added as a flavor enhancer, along with salt and pepper. Calories per serving: 218. The Damn Delicious recipe uses 1 ½ lbs mushrooms for a 4 person serving. Olive oil replaces the butter in the prior recipe. The preparation is clean and flavors enhanced with the addition of the lemon zest as well as its juice, garlic and herbs. Calories per serving: 173.

There is something to be said for each recipe. The PSMS original recipe is indicative of everything about seventies cooking that we may remember: respectable serving size, sumptuous sauces made with full-bodied ingredients. (Pauline Shiosaki noted that this was the era of casseroles, which is why a mushroom recipe prepared this way was included.) The Damn Delicious recipe, in contrast, speaks to today's calorie and health-conscious approach to preparing foods.

As the Mycophagy Committee considers undertaking a new cookbook, it is our intention to evaluate recipes with an eye toward enhancing the ontribution of flavors from the mushroom ingredient. We will continue the tradition of sharing our knowledge through activities and events with occasional tidbits of food. We welcome and encourage feedback toward these endeavors. **PSMS Mycophagy Committee** members: Sweta Agrawal, Joyce Budisana, Jo Henderson.

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