Mycena News

The Mycological Society of San Francisco January 2010, vol. 61:01

January 19th MSSF Meeting Speaker

Tom Volk

Spores Illustrated

Tom Volk is a Professor of Biology at the University of Wisconsin-La Crosse. He teaches courses on Mycology, Advanced Mycology, Medical Mycology, Plant Biology, Plant-Microbe Interactions, Food and Industrial Mycology, and Latin and Greek for Scientists.

His fungus web page, **Tom Volk's Fungi** http://TomVolkFungi.net has a popular "Fungus of the Month" feature, and an extensive introduction to the Kingdom Fungi. Besides dabbling in mushroom cultivation, Tom has worked on the genera *Morchella* (morels), *Hydnellum* (a tooth fungus), *Armillaria* (honey mushrooms) and *Laetiporus* (chicken of the woods, or sulfur shelf), as well as several medical mycology projects. He has also conducted fungal biodiversity studies in Wisconsin, Minnesota, Alaska, and Israel. Having lectured in 33 states so far, Tom is a popular speaker at many amateur and professional mycological events throughout North America, including many NAMA and NEMF forays.

Thank You, Fungus Fair Volunteers!

MycoDigest: The Evolutionary Story of *Cordyceps* and its Allies

Thomas S. Jenkinson

For many field mycologists, one of the most thrilling mushroom finds in the wild must be the *Cordyceps* mushroom. The first time I observed one of these fungi in nature was not too long ago. I fondly remember the discovery, foraging with several mentors in the sweltering, deep-summer woods outside of Baton Rouge, Louisiana. I had seen plenty of textbook photos of these amazing mushrooms, pored over their life cycles, and read their descriptions. None of those experiences however, could prepare me for the thrill of seeing this organism in hand. Finally, there it was: *Cordyceps militaris*, a single bright orange, club-shaped mushroom, erupting from the head of a mummified insect pupa. Since that day, my fascination with these fungi has only been bolstered by the newest scientific research on the evolution of these organisms.

The insect-attacking *Cordyceps* species exhibit a fascinating life cycle exemplified by the type species, *C. militaris*. To complete the sexual phase of its life cycle, this fungus has evolved to invade and take over the body of an insect host. Spores of the fungus adhere to the host and germinate, producing enzymes that allow it to breach the insect's exoskeleton. Once inside the host, the fungus initially grows in a yeast-like stage, circulating toxins that eventually result in the death of the host. Fungal hyphae then feed on the unfortunate insect, growing throughout and consuming all internal organs. In the end, the internal tissue of the insect is replaced with a mass of mycelium, and all that remains of the host is a ghostly exoskeleton supporting the stroma (mushroom). The mushroom is often found bursting from the head of its victim's remains.

Photo courtesy of Thomas Jenkinson

Increasingly, popular attention has turned to this genus of mushrooms in part due to the recent BBC television production, Planet Earth. An episode in the series featured jaw-dropping time-lapse footage of a *Cordyceps stroma* fruiting from an infected ant. This footage has done wonders to pique the attention of the general public. In addition to the Planet Earth series, several recently published popular and scientific articles have cultivated a collective fascination in the genus.

Without exception, the most attention has been paid to the economically significant species *Ophiocordyceps sinensis* (= *Cordyceps sinensis*). Endemic to the Tibetan Plateau region, the "Chinese Caterpillar Fungus" fruits from the corpse of a parasitized ghost moth larva. There its harvest and sale serves as the main source of income for many rural Tibetans (Winkler 2008). The harvested caterpillar fungus is sold mainly in costal Chinese cities where it is referred to in Mandarin as "winter worm, summer grass." In China, the fungus and its associated host caterpillar are sold at exorbitant prices as an herbal panacea, most notably as an aphrodisiac. The harvest of this cash "crop" has already

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MycoDigest is dedicated to the scientific review of mycological information.

President's Post

What a flurry of activities we have had recently. J.R. Blair single handedly spearheaded the Fungus Fair once again and we all owe him a dept of gratitude. J.R. has been putting this thing together for months and it was no small task. With the remodeling of the Oakland Museum taking place, a venue change was necessary. J.R. was able to secure the Lawrence Hall of Science and plotted the layout. He then orchestrated all the physical needs of tables, signs and everything else with making our Fair what it is. On behalf of our ever increasing membership, I'd like to thank him for this gargantuan task. Take a well-deserved break J.R., you definitely deserve it.

We also had our annual Holiday dinner at the Hall of Flowers at 9th and Lincoln, on December 14th and what a feast it was! Pat George largely put this thing together with an assist from Lisa Gorman. Carol Reed and crew decorated our tables with garlands and porcini's (the very attractive, but non-edible type), and Curt Haney held his world famous raffle with numerous prizes for the volunteers who brought appetizers.

Julie Schreiber and Laurel Flynn were our chefs and we all benefited from their culinary expertise. The menu offered a choice of fettuccine or spaghetti squash with porcini mushrooms, or entrecote of beef with pommes Ana, with a bordelaise sauce with porcini mushrooms. We all had sautéed greens, a delicious pumpkin soup with mushrooms and crème fraiche, a salad of greens, endive, persimmons, pickled mushrooms and walnuts and olive bread rolls. For dessert we had a fall fruit and candy cap nougatine tart. There were many, many appetizers brought by guests and a holiday punch provided by Liana Hain. What a great night it was, spending time with familiar faces and like minded individuals.

There are a couple of events I'd like to mention, put on by our fellow clubs.

The Fungus Federation of Santa Cruz is putting on their Fair Saturday and Sunday January 9th and 10th. They are celebrating their 25th anniversary this year and they put on a great Fair. They always have beautiful displays and numerous demonstrations. You can get details at: http://www.fungusfed.org

SOMA is holding their camp on January16-18th. It is a fun filled 3 day event that is quite popular. Not to be missed is the dinner on Sunday, put on by Patrick Hamilton and his slaves. I mean enthusiastic helpers! I'm one of those! You can get details at: www.somamushrooms.org

I hope you all are having a good Holiday season, it's has been a good year for mushrooms so far. See ya, Dan

Announcements

SOMA Wild Mushroom Camp 2010 January 16-18, 2010

For the 13th annual SOMA Wild Mushroom Camp we are planting a theme: **Trees and Mushrooms**.

Mushroom forays, gourmet mushroom cuisine, classes & workshops on: mushroom identification, cooking, dyeing, felting, polypore paper-making, medicine making, photography, cultivation, and more!

Featured speakers: Tom Bruns and Tom Volk.

Register online at: www.somamushrooms.org

Sat/Sunday, January 21st-22d - Humboldt Bay Mycological Society Fungus Fair

Redwood Acres Fairgrounds, Eureka, CA.

Sat/Sunday, January 9th-10th, 2010
Fungus Federation of Santa Cruz Fungus Fair

Details TBA at: http://www.fungusfed.org

Fungus Fair Thank You

J.R. Blair

As the Fungus Fair was at a new venue there were inevitably a few glitches but it went incredibly well nevertheless. We ended up with about 1,900 total paid attendees for the weekend, pretty good for a new venue that is difficult to get to. It was such a big success largely due to all the great work done by our excellent volunteers. We are especially thankful to those of you who helped with the organization and preparation prior to the Fair. Dan Long, Ken Litchfield and several other Council members were instrumental in helping me with the layout and logistics of the new location. Thanks to all the volunteers who distributed fair posters, and we very much appreciate Kristin Jacob for providing us with a beautiful piece of art for our poster and T-shirts and to Lou Prestia and Ron Pastorino for designing the latter.

Thanks go to Norm Andresen for coordinating forays; to Bill Freedman, Fred Stevens, Thomas Jenkinson, Mark Lockaby, Scott Sahl, Marcus Bremer, Don Hughes, Dan Nicholson, and Wade Leschyn for leading forays; and to all the folks that helped bring mushrooms to the Fair, whether on an organized foray or on their own. And special thanks to Jim Miller, our duff czar, for bringing in bags of oak leaves and pine needles. We are indebted to Dennis Desjardin, Mike Wood, Fred Stevens, Tom Bruns, Dimitar Bojantchev, Norm Andresen, and everyone else who helped with the sorting and identification process as well as the volunteers who set up the specimen tables, staffed them over the weekend, and worked the continuing mushroom identification table for the public. It was particularly nice to have so many UC Berkeley mycology students helping us out in that regard.

Tremendous thanks go to the Culinary group and all the great work they did in feeding the volunteers Friday night and all weekend: Al and Sherry Carvajal, Bill and Carol Hellums, Jeanne Campbell, Dulcie Heiman (who seemed to be everywhere all weekend), and everyone else who helped with that. The excellent food enabled us to make our volunteers' time and efforts much more rewarding. Enormous thanks go to David Eichorn and his team for handling the soup sales and especially to those

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What's Bookin'?

Mushrooms of San Francisco combines the study of mushrooms with the exploration of the spectacular cliffs and beaches of San Francisco's Land's End. The field, lawns, and trails of Lincoln Park are used as a botanical garden of fungi, where most of the common mushrooms of the Bay Area can be found. English names and non-technical terms are used throughout, and every species is illustrated. This is the ideal way, and the ideal place, for a beginner to start studying mushrooms. Note: At the present time the GGNRA has placed Land's End off-limits to mushroom collecting. However, the MSSF hasd recently proposed to the GGNRA to conduct a scientific fungal survey of Land's End, but the GGNRA natural resources staff was unable to complete its review and approval process before the season started.

This book contains a map of Land's End and was dedicated to Larry Stickney.

Roger Bland, Ph.D., teaches physics at San Francisco State University. His research interests range from elementary particles to dinosaur ecology. He began studying mushrooms in France, while working at the giant European atom smasher near Geneva, Switzerland. Sally Bland prepared the illustrations for this book. Her drawings have appeared in several exhibitions of botanical illustrations, on greeting cards and on a poster. The Blands and their two twin sons continue to hunt mushrooms in San Francisco regularly.

Mushrooms of San Francisco (A Walk on Land's End) by Roger Bland, illustrated by Sally Bland. 1978, Land's End Press, Soft back, 64 pages, 5 X 8 inches, Price: $14.95

This book was published in 1978, and is out of print, so I contacted Dr. Bland, an MSSF member, who agreed to sell me the last of the new books he had in stock. It will be available for sale to members at the January MSSF General Meeting at a 10% discount. It is also available from the MSSF library. ~ Curt Haney

Lands End Study Deferred

On September 18, the Lands End Committee submitted a proposal to the GGNRA to conduct a controlled study of the mushroom fruiting in Lands End for the 2009-2010 season for the purpose of providing the GGNRA Natural Resources Division sufficient reliable information to make a determination whether public picking should be reinstated. J.R. Blair was principal investigator heading the study, and we had a roster of MSSF volunteers to perform the actual boots-on-the-ground work of walking the area, spotting the specimens, and taking voucher samples for J.R.

While we thought that there was ample time for the GGNRA staff to review and approve the proposal before the rains started, that did not occur. After the unexpectedly torrential rain of October 13, I alerted the GGNRA staff members with whom we were working about the need to expedite the review process, but the bottom line is that project was not approved as of the last week in November, and at that point, we agreed that it had to be deferred for a year. The GGNRA staff assured us that they want this partnership to work out, but explained that urgent issues regarding endangered species took priority in their work during the fall. Apparently, when a sharp-eyed ecologist from Sonoma County was driving north onto the GG Bridge through the Doyle Drive construction area and spotted what appeared to be an extinct-in-the-wild Franciscan Manzanita, all governmental agencies with any jurisdiction over the Doyle Drive project focused on that situation, and our mushroom study (of what we believe is a thriving natural population, not at all endangered), was put on hold.

The Committee thanks the numerous volunteers who were on call to carry out this worthy project, and you can officially stand down until October 2010, when we hope to have the project approved with plenty of time to spare. In the meantime, Lands End continues to be one of the region's primo hiking spots, and it would be helpful to the study if any hikers who spotted mushrooms would e-mail the name of species spotted to Eric at mullew@comcast.net.

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Past issues of *Mycena News* can be read on-line at www.mssf.org.

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It's Hard to Compete with a 25-year-old Porcupine

Bob and Barbara Sommer

When we were asked to stage a mushroom exhibit at the Sacramento Discovery Museum, we didn't know our audience in advance so we prepared a range of activities. It turned out that visitors were parents with young children of primary and preschool ages. The Discovery Museum has a hands-on policy aimed at getting kids engaged and active rather than viewing displays, no matter how realistic, as passive spectators. This was not the typical adulatory Fungus Fair audience of adults content to view and admire mushrooms displayed on tables. Here we found considerable apprehension and wrinkled noses.

For young children, activities with a strong sensory and motor component work best. The folios of water color paintings of mushrooms went unopened. The same was true of colorful mushroom stamps from around the world, a deck of mushroom playing cards, and a collection of spore prints. We managed to interest adults but not children in yarn colored by mushroom dyes. One of our most popular kids' activities was making finger prints from deliquescing Inky Caps. We kept a box of tissues handy to wipe fingers afterward. In retrospect, it would have been nice to follow this with drawing or writing using mushroom ink and a quill pen made from the fallen feather of a local bird.

The second most popular activity was sniffing some (definitely not all) aromatic mushrooms. The dried Candy Caps were the odds-on favorite for young visitors. They could recognize the maple syrup odor immediately upon entering the room. In a few cases this proved sufficient to overcome an initial mycophobia. These were little kids who, perhaps as a result of parental admonitions, were reluctant to associate themselves in any way with wild mushrooms. The pleasant fragrance of Candy Caps provided the needed push for a hesitant child to enter the room and approach the display table. We encouraged parents to sniff first, so that they could reassure the child that this was a safe and fun interesting activity.

Following the positive experience with the Candy Caps, we introduced the parents next to the smoky fragrance of dried morels. Parental interest was increased when we pointed out that this was an expensive fungus featured on the menus of fancy San Francisco restaurants. Kids acknowledged the smoky aroma but without any surprise or emotional response. It was like "No big deal; the mushroom smells smoky." Perhaps it had previously been on a grill.

Next we tried the dried Shrimp Russula (*R. xerampelina*), cautioning them that the mushroom smelled like dried fish. Responses varied from acknowledgment that the dried mushroom indeed smelled fishy to outright disgust. The latter was the most frequent response of the children, "ugh" rather than "awesome." While sweetness seems a basic and positive olfactory quality, a fishy odor seems to require maturation for appreciation. We didn't find any kids who enjoyed sniffing the Shrimp Russula. At the end of the session, we reconstituted dried Garlic Mushrooms (*Marasmius copelandi*) in water. The tiny fruitbodies looked unimpressive, but when we held them under a visitor's nose, there was immediate recognition. Unfortunately, similar to the dried fish experience, garlic is not a pleasant fragrance for young kids; again an "Ugh" response.

As docents at Fungus Fair display tables, we have asked visitors to sniff the underside of local Matsutake (Armillaria ponderosa) with mixed results. Some people immediately acknowledged the spicy cinnamon fragrance. Others interpreted the aroma differently, naming spices or products we had not considered. There were also people who could not detect an odor, despite repeated urging and hints on our part. Response to many odors seems both extremely variable and transient as habituation to odor sets in quickly. Exploring this variability would make a neat science project for a high school mycophile.

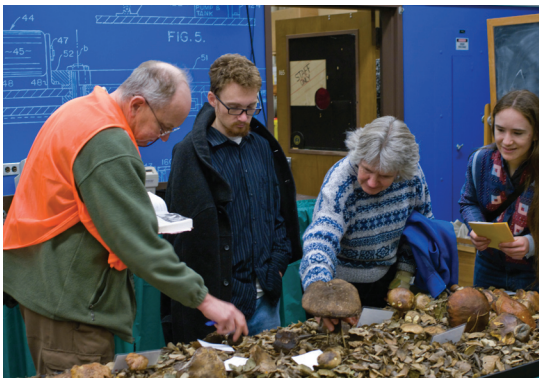
A third popular children's activity was coloring outline drawings of mushrooms with crayons. We considered this to be at cross purposes from our goals as it removed kids from the sensory experience of observing and interacting with real fungi, but young children familiar with coloring books enjoyed it. We would have preferred kids sketching real mushrooms, but the colored outlines and crayons had been prepared by museum staff before we arrived and the activity supervised by a museum volunteer.

Halfway through our session, the audience drifted away, leaving us standing in an empty room. When we investigated the reasons for the exodus, we found everyone next door at a live animal exhibit. There was an extremely large rabbit, three times normal bunny size, and at the front of the room and outside his cage was JR, a 25-year old porcupine munching an ear of Sloughhouse corn, a delicacy in the Sacramento area. A few folks visited our mushroom exhibit afterward, but it was clear that biologist E. O. Wilson's concept of Biophilia (people's attraction to living things) was valid. At least for children, mushroom fingerprints, coloring books, and even garlic odors could not compete with an oversize rabbit and a 25-year old porcupine.

Fungus Fair Thank You, continued

of you who made the many delicious soups. David E. also arranged the chef demonstrations and we thank David Campbell, Sven Revel, and Todd Spanier for entertaining the public with their expertise. In addition, Dorothy Beebee's dyeing demonstration was a big hit.

Thanks to everyone who helped with the Book, T-shirt and Mushroom Market sales expertly organized and supervised by Curt Haney and Roy Coto, Ron Pastorino and Lou Prestia, and Robin MacLean and Liana Hain, respectively. Our esteemed Treasurer, Henry Shaw deserves thanks for dealing with the treasury throughout the weekend. Thanks go to George Willis for his expert handling of all the vendors for the fair and to the vendors themselves for providing excellent mushroom related items for sale. We are grateful to Al Carvajal and his crew for staffing the Membership table signing up new and renewing members. We had an excellent suite of speakers: Christopher Hobbs, Britt Bunyard, Bob Mackler, Ken Litchfield, Daniel Nicholson, and J.R. Blair. Special thanks to the specialty tables and the folks who made them such popular rivals to all the other wonderful attractions at the fair. At Beginning ID Paul Koski and Thomas Jenkinson provided a popular introduction to the world of mushrooms. Toxicology, Ecology and Culinary were expertly organized and staffed by Jane Wardzinska, Chris Thayer and Pat George respectively.



Thanks to the members of the California Lichen Society and Sonoma Mycological Association members for their informative and interactive tables. Thanks go to Fire and Earth at the Psychoactive table for their reliable and authoritative presentation on a popular topic. Thanks for the delectable Edibles table go to Dan Nicholson and his volunteers and to Mo-Mei Chen for her wonderful display of Medicinal Mushrooms. And for an excellent display on Cultivation and for setting up and selling mushroom kits thanks go to Ken Litchfield and his acolytes from Merritt College and beyond. We are always grateful to Chris Thayer for his very fun mushroom collectibles display. Perhaps the most popular place in the Fair was the Family Center. Annie Blair and Don Hughes did a fantastic job putting together fun and interesting projects for the many kids that came to the Hall for the weekend.

Very special thanks go to the hard working Lawrence Hall of Science staff, without whom the Fair would be a diamond in the rough, particularly Christine Bartlett and Ted Robinson, and everyone else who helped or simply tolerated us. The Children's Area & Microscopy were well-received by the public thanks to their efforts, not to mention all the background stuff they did.

Finally, I want to express my deepest thanks a few people who made my job way easier than it should have been: Christine Bartlett, for working so hard and for being a great partner in putting together this wonderful event; Dan Long, for being the Prez and doing what a Prez should do and for helping me schlep stuff between our storage unit and the Hall; to Stephanie Wright for being the best volunteer coordinator one could hope for and for spending hour after hour checking in them all in; and to Annie Blair, for being there. We had over 200 volunteers for the weekend and you all deserve thanks, even if I did not list your name here. We depend upon you immensely. Look for an invitation to the Volunteer Appreciation Party later in the spring.

Happy New Mushroom Year!

Henry Shaw wrote: Thanks to all who planned and executed the Fungus Fair last weekend! I spent most of my free time at the mushroom display tables and had a great time. Although we may have had a lower attendance than our recent "gates" at the Oakland Museum, the visitors at LHS (in my humble opinion) seemed to be much more "engaged", on average. Almost every visitor to the tables had questions or wanted to learn more about the displays. (Here are a few photos by Henry; more at: http://www.flickr.com/photos/hfshaw/sets/72157622827576879).

Finally, we have three Fungus-Fair inspired haiku by Mino De Angelis:

Leaf litter, mushrumps,
Russula, Chanterelle, *Amanita*,
The rain's promise fulfilled

Short/fat, red/white
Amanita muscaria,
A silent fireworks

Under the pines
A three-headed *Suillus*,
Too pretty to pick

Culinary Corner

While the Culinary Group did not meet in November nor December, we have not been idle. Many of our members played a great part in making the Fungus Fair enjoyable both to the public and to the hard-working volunteers who created and produced the Fair. Culinary Group regular David Eichorn organized the kitchen volunteers, provided mushrooms (thank you, Monterey Market) and other ingredients to be used and set up the soup operation.

Members made a wide range of delicious cream soups, thin soups, thick soups, meaty soups, vegetarian soups, vegan soups; all brimming with mushrooms. 500 bowls of soup were served to the grateful public and to volunteers who just wanted a taste. Making soup were Jeannette Larsen, Andy Maxon of PSR, Meg Levine, Pat George, Maureen Grabowsky, Phil Brown, Eric Multhaup, Zoe Caldwell, and George Collier. Volunteers helped serve the great cauldrons of soup with baguettes and butter. They were busy.

Friday night the volunteers setting up the Fungus Fair were treated to a hot and delicious dinner prepared by Culinary Group members Al and Sherry Carvajal and George and Jane Collier. Both omnivores and vegetarians were well fed and well appreciated. Sherry, Al, George and Jane and crew also put together a lovely lunch both Saturday and Sunday for volunteers to help keep them going. Eating good food in the Lawrence Hall of Science dining room with it grand sweeping view of the bay is a memorable experience.

We also had a Culinary Group table at the Fair with members discussing the Culinary Group, culinary mushrooms and how to use them in recipes, and the Holiday Dinner, as well as passing out recipes, information about such things as the nutritional value of mushrooms and eating raw mushrooms (don't do it).

The Culinary Group is not just about food. Our members love mushrooms and love educating the public about them and how tasty some are.

For January, I've chosen a recipe I like a lot. It's adapted from "Animal, Vegetable, Miracle" by Barbara Kingsolver and family. It's very simple and truly a comfort food for a winter night.

VEGETABLE AND MUSHROOM BREAD PUDDING

3 cups milk
1 cup chopped green onions with some of the green part
Bring onions and milk to a boil in a sauce pan; set aside to steep

1 loaf stale multigrain bread broken into small pieces
Pour milk over the bread and allow it to soak

1 lb vegetables cut bite size (green beans, carrots, broccoli, kale, asparagus, etc.) blanched 1 minute in boiling water and drained

2 tablespoons butter
1 lb. wild mushrooms
salt and pepper to taste
Saute mushrooms in butter until tender. Season. Set aside

4 eggs
1/3 cup chopped parsley
3 tablespoons chopped fresh oregano (or a mixture of fresh herbs)
3 cups grated Swiss cheese

Beat eggs until smooth, add herbs and plenty of salt and pepper. Add the bread pieces with the remaining milk, vegetables and mushrooms with their juices and 2/3 of the cheese. Mix thoroughly and pour into a greased 8 by 12 gratin dish. Sprinkle remaining cheese on top and bake at 350ºF for about 45 minutes (until it's puffy and golden).

HAPPY NEW YEAR! - Pat George

Eating *Amanita muscaria*

I don't know where to start in writing this article. I know some people have strong views about eating *Amanita muscaria*. I'm not advocating eating it or any other mushroom for that matter, but wish to report on my own experiences.

Let me start with some back ground of where I'm coming from. I have been picking and eating mushrooms for about 8 years. When I started, identifying the Death Cap, *Amanita phalloide*s and the Destroying Angel, *A. ocreat*a were a top priority, as anyone new to this hobby should do. That was good enough for me. Nobody needed to tell me twice about eating any *Amanita*. There are plenty of other mushrooms to eat rather than to flirt with a deadly genus. I heard knowledgeable people say not to mess with them for about 7 years. By then, you would have a better understanding about what it takes to identify Amanitas. This year, with confidence, I picked and ate *A. calyptrata* or Coccoli. Baby steps! I also ate *A. muscaria* when it was prepared properly. I am very cautious. I have never suffered any ill effects of eating a mushroom that the books say you should not eat.

Amanita muscaria has to be one of the most recognizable mushrooms around. Even people who are not into mushrooms know it. It's distinctive red cap with pieces of universal veil on top, immerging out of a cup-like volva, are viewed and enjoyed by many. Not only that, it grows all over the place, here in Northern California. It holds a fascination with some because of it's inebriating effects. I have heard that the *A. muscaria* that grows in Europe is quite different than the one that grows locally. Both have some kind of mind altering effect when eaten. I'm not interested with that, and I have no direction for anyone who chooses to experiment with that facet of the mushroom.

The active compound in *A. muscaria* was long believed to be muscarine. It was later demonstrated that muscarine, found in a number of mushrooms, occurs in such minute quantities that it is clinically insignificant. Ibotenic acid and muscimol are what produces the inebriating effects. Both of these compounds are water soluble. Parboiling and discarding the tainted water renders this mushroom edible. Let me emphasize at this point that you cannot parboil the toxins out of the Death Cap or the Destroying Angel. They will kill you no matter what. This only pertains to *Amanita muscaria*!

When I ate it, it was parboiled twice in salted water. About a cup of mushroom cut up to about ½ inch cubes, to a gallon of water or more, with about 2 teaspoons of salt. The mushrooms were added to a rolling boil, and when the water returned to a boil, timed for about 15 minutes. The mixture was then poured through a colander at the sink. The water had an orange tint. Then, we did the same thing all over again. This time the discarded water was fairly clear. You would think that with all this boiling, everything would be mush. Not true. The boiling actually made the mushroom bits firmer. You could still see parts of the delicate gills when all was done. At this point you can prepare the mushroom as you would any other, sautéed with other ingredients or added to whatever you want. What did it taste like? It was unremarkable to me. It was OK, but porcini are still my favorite!

Can you think of any other mushrooms that will make you ill if not prepared properly? Morels come to mind.

I encourage you to read a paper that William Rubel and David Arora prepared. The title is: "A study of Cultural Bias in Field Guide Determinations of Mushroom Edibility Using the Iconic Mushroom, *Amanita muscaria*, as an Example". You can find it at http//davidarora.com. - Dan Long

MycoDigest continued

caused significant distortion to local economies, and has prompted local governments to take measures to limit the environmental impacts of harvesting and ensure a sustainable resource for future generations (Cannon et al. 2009).

I would like to emphasize that the intrigue and biodiversity of the genus *Cordyceps* does not end with these few ethnomycologically significant and well-documented species. In fact, new species of *Cordyceps* continue to be described from sampling locations worldwide. This increase in our knowledge of *Cordyceps* diversity is coupled with exciting new conclusions we are able to draw about the evolutionary history of these unique fungi. Modern techniques to extract and sequence DNA, and the computing power necessary to analyze sequence data, have finally put previously unresolved hypotheses about evolution and speciation in a testable framework.

First, I must clarify that not all species of *Cordyceps* parasitize animals. There are also members of this genus that specialize in attacking underground truffles of the genus Elaphomyces. All species of *Cordyceps* do, however, belong to the Ascomycete order Hypocreales, (I'll return to talk more about these relatives in a moment). One of the most fascinating conclusions we have been able to draw from DNA sequence evidence is that all members of the genus *Cordyceps*, in the old sense, were not each other's closest relatives, as previously thought. The old genus *Cordyceps* was an assemblage of distantly related species that had evolved the similar characteristic of insect parasitism. The distantly related Cordyceps lineages have now been formally transferred to new genera (*Ophiocordyceps, Metacordyceps*, etc.). With apologies to the taxonomists, in this article I will continue to use the generic name *Cordyceps* in the old sense for the convenience of the reader. If you are curious about the updated taxonomy please refer to Sung et al. (2007).

Perhaps at this point you are wondering if the truffle-attacking *Cordyceps* belong in their own evolutionary lineage, while all of the insect-attacking species share a common ancestor. Actually, DNA sequence data reveals that this assumption is not so. The truffle-attacking *Cordyceps* are more closely related to the medicinal caterpillar fungus, *C. sinensis*, than either lineage is to the insect-attacking type species of *Cordyceps, C. militaris*. These findings are very interesting from an evolutionary viewpoint, because they indicate a dramatic shift in the host organism of these *Cordyceps*. At some point in their evolutionary history, an ancestral cicada-pathogenic *Cordyceps* species is thought to have made an underground host-jump to the mycorrhizal truffle then underwent a radiation of species (Nikoh & Fukatsu 2000).

Host specificity of parasitic organisms is a likely stable outcome of evolution, but, sometimes, parasitic species adapt to attack a novel host, thereby opening a new ecological niche to occupy, leading to the potential evolution of new species. Biologically, the host jump to attacking truffles is quite significant. It has been shown that closely related *Cordyceps* species have made dramatic host shifts between arthropod orders. These host shifts between arthropod orders pale in comparison to the jump from an animal host to a fungal host, a jump between separate biological kingdoms.

So if these morphologically and ecologically similar insect pathogen species are not each other's closest relatives, then who are? The answers may be revealed by looking at a wider sampling of the Hypocreales, and in particular, the family Clavicipitaceae. A recent study provides genetic sequence evidence showing that the closest relatives to the lineage containing the truffle-attacking *Cordyceps* and *C. sinensis* is a lineage of fungi composed in part by plant symbionts (Spatafora et al. 2007). Ethnomycologically important species are present in these *Cordyceps* relatives as well, for example the causative fungus of rye ergot, *Claviceps purpurea*. The published evidence shows that the lineage containing the medicinal caterpillar *Cordyceps* is more closely related to ergot of rye and other grass symbionts than either lineage is to the type species of the genus *Cordyceps*. These fascinating developments show that the evolution of distantly related *Cordyceps* lineages, and their relatives in the Clavicipitaceae has been characterized by several shifts in nutritional mode from animal-based to plant and fungal-based nutrition. We can make a confident conclusion that the evolutionary ancestor of these Clavicipitaceae, including rye ergot, was a *Cordyceps*-like pathogen of animals.

These latest evolutionary conclusions about the flexibility of host associations within *Cordyceps* and their relatives also raise further questions about what makes this family of organisms so adept at breaking down host defenses. Members of this family are obviously well equipped with a chemical arsenal of secondary metabolites with which to alter host organisms. We have observed that an array of natural chemicals from both *Cordyceps* and others of the family Clavicipitaceae have the ability to affect human physiology and perception. I begin to wonder what additional compounds exist in *Cordyceps* and their relatives that remain to be discovered?

New questions like those above are a fundamental reason that research on the diversity and evolution of these species is vital to humans and our sustainability on Earth. Only when we know what we have can we make better decisions on how to protect it. I do suspect that the average Tibetan or Bhutanese caterpillar fungus harvester might not care too much that his/her harvest has been formally transferred to a new genus, better reflective of its evolutionary history. I'm sure, however, that all of us could find common ground in the imperative that populations of these natural wonders (and their allies) must be preserved, so that they may be passed on to next generations as intact as we found them. Until then, I will continue to be on the lookout for those wild *Cordyceps stroma* that tell the tales of their unlucky host below.

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MSSF Calendar January 2010

Monday, January 4th, 7 pm - Culinary Group Dinner
SF County Fair Building (aka, Hall of Flowers), Golden Gate Park, 9th and Lincoln. As our November dinner was canceled due to the Bay Bridge problems, we are having the menu planned for that event, centered on foraged food. For more details go to the MSSF website, www.mssf.org (click the Culinary link). Contact Pat George at (510) 204-9130 or plgeorge33@yahoo.com by Friday January 1st to reserve (limited to 60 diners). Remember to bring your own tableware as the venue does not provide dishes, utensils, etc. Also, bring an appetizer to share, preferably but not limited to mushrooms or other foraged foods. Our next Culinary Group dinner will be February 1st. Other dates for 2010 are March 1st, April 12th (adjusted because the first Monday is Easter Monday), May 3rd, September 7th (adjusted because Monday, 9/6, is Labor Day), October 4th and November 1st.

Thursday, January 7th, 10 am - Marin Mushroom Hike
Join Terry Sullivan for a series of weekly forays. Next dates: Wed 1/13 and Wed 1/20. For information and registration, go to Terry's blog: http://biologyhikes.home.comcast.net/~biologyhikes/mushroom.htm

Tuesday, January 19th, 7 pm - MSSF General Meeting
Randall Museum, 199 Museum Way, San Franciscio. 7pm, mushroom identification and refreshments provided by the Hospitality Committee. 8pm, Tom Volk presents *Spores Illustrated*.

The submission deadline for the February 2010 issue of *Mycena News* is January 18th.
Please send your articles, calendar items, and other information to: mycenanews@mssf.org

MSSF 2010 Membership Renewal

Membership in MSSF expires now. Unless you renew for 2010, you will no longer receive the ***Mycena News*** or have access to the "members only" section of the MSSF website. You will not learn about forays and other fun events. So, please renew today.

To find out if you need to renew, please check the label on the January Mycena News. If you are an e-member, and your download the Mycena News, you could go to the Members section of http://www.mssf.org and find your name on the "Membership Status" document.

It is easy to renew. You can do so by mailing a check to MSSF Membership, c/o The Randall Museum, 199 Museum Way, San Francisco, CA 94114 or by using the PayPal option on the MSSF website. If you have not changed any of your particulars (address, Phone, e-mail), the check is all that is needed.

The regular, adult/family membership fee is $25.00. For seniors over 65 and for full-time students, it is $20.00. For e-members, who do not receive the Mycena News by mail, but must download it for themselves from the website, the fee is $15.00.

If you have changed your name(s), mailing address, telephone number(s), or email address, please notify Alvaro Carvajal, the membership chair, so that he can update the database. You may notify him in writing at the time you renew. Or you may contact him directly by telephone (415-695-0466) or – preferably – by email at membership@mssf.org

A few of you will have already renewed for 2010 by the time you receive this notice. Thank you, and please forgive the bother of this reminder.

The rains are finally here and the hills are brimming with mushrooms, so get out there and look at (or pick) the beauties.

Happy New Year and Successful Foraging!