Fossil Mushrooms
By Kelly Ivors

In the January 2003 Mycena News, I wrote an article on fungal fossils that focused primarily on ascomycetous fungi. Since last year, an exciting new fossil discovery has been reported (Mycologia vol. 95, 2003) which deserves mention in this volume of Mycena News.

Amber (or ‘succinite’) is resin produced by many different types of trees that later hardened and became a fossil. It’s also a beautiful stone that can be cut and polished and is considered a valuable gem. Particularly prized are pieces of amber containing plant or animal material, however the most common inclusions in amber are insects. Such fossils have greatly increased the knowledge of the evolution of insects and plants, and allow us to determine if modern-day forms are more complex than their predecessors.

Until the most recent find, three fossil agarics (gilled mushrooms) were known to science. Archaeomarasmius leggeti is the oldest known fossil agaric (90-94 million years old) and was found in Atlantic coastal plain amber in East Brunswick, NJ in November 1994. Two amber fragments contained mushroom pieces, one with a stalk and a 0.1 inch-wide cap. Morphological features were similar to the extant genera Marasmius and Marasmiellus (family Tricholomataceae). The genus name Archaeomarasmius means “ancient Marasmius” and species name leggeti was given to honor J. J. Leggett, without whose alertness that specimen might never have been discovered.

The other three mushroom fossils, including the latest discovery, were all found in amber from the Dominican Republic and were estimated to be 15-20 million years old. Interestingly, the oldest known fossils of the fungus gardening attine ants are also from Dominican amber from the same time period! Coprinutes dominicana was the first fleshy agaric fossil found and was named such after microscopic examination indicated it had affinities with the present-day genus Coprinus. Protomycoena electra, which was represented by a single complete fruiting body, is similar to the extant genus Mycena (genus name means “first Mycena” and species name refers to ‘amber’). The most recent fossil agaric discovered was collected in the Yanigua mine in the eastern Dominican Republic and purchased from an amber dealer in August 2000. A single fruit body was present (Figure 1), as well as many basidiospores that were laid down.
in masses, suggesting that the spores were produced by the fruiting body in the amber. *Aurofungus yaniguaensis* appears to be a member of the euagarics clade, but its precise taxonomy is yet to be determined. Its generic name means “golden mushroom”, and the species name refers to the collection locality. The identification of a third fossil agaric from Dominican amber suggests that many more such finds are possible.

DNA analyses of most fungal fossils have yet to be completed as a dispute has arisen about how to handle amber specimens; whether to open them up to retrieve DNA, how to open them, and whether there should be rules guiding expeditions and the use of existing collections.

Surprisingly all of these ancient mushrooms have strong resemblances to the living mushrooms of today and have been described as looking “quite modern”, hinting that evolution has conserved basic forms of these fungi for a very long time indeed. As the fossils suggest, certain fruiting body morphologies have remained unchanged over tens of millions of years! However with just 4 fossils, the record is still too incomplete to provide a detailed picture of the history of morphological evolution among gilled mushrooms.

Further reading:


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**NAMA Mushroom Teaching Kits**

In addition to the NAMA Eastern Mushroom Teaching Kit, we are now offering a second Mushroom Teaching Kit with emphasis on the fungi of the Western section of the United States and Canada. Both of these programs are available for rental through our NAMA Education Section programs for grades K-8 (K-12). Mushrooms are the organisms in the fungi kingdom.

The Kits are a teaching tool for teachers, naturalists, and clubs, and for use at mushroom and garden fairs. The contents of the Kits are similar, with some geographical variation in the slides, dried fungal material and spore prints.

**These kits provide:**

- Hands-on classroom aids.
- Activity ideas which include artistic, cultural and scientific approaches to fungi.
- The basic information necessary to teach grades K-8 about fungi. Basic information is divided into grades K-3 and 4-8. It can be used for a 45-60 minute lesson or over an extended period of time. It can also be adapted for use in grades 9-12.

**Contents of the Mushroom Teaching Kits**

- Lesson ideas and activities for grades K-12 relating to fungi.
- Illustrations of fungi on 4"x5" poster board.
- 9 overhead transparencies illustrating basic mushroom anatomy, the variety of shapes and spore-bearing surfaces of fungi, and fungi ecology.
- Laminated spore prints.
- NAMA poster on mushroom poisoning.
- 35mm slides of different fungi.
- 25 plastic hand lenses.
- Dried fungi samples.
- Foam blocks and skewers (to mount fresh specimens for drawing in the classroom).
- Large magnifying glass, on a stand.
- 2 videos on the growth of slime molds.
- Taylor Lockwood’s DVD of his “Treasures of the Fungi Kingdom” shows.
- Fungi teaching materials developed by Dr. Walter Sundberg.
• The following books: Katya Arnold and Sam Swope, Katya’s Book of Mushrooms; David Arora and Jeannette Bowers, Mushrooms of the World Coloring Book; Emily Johnson, North American Mushroom Photo Postcards; Bryce Kendrick, A Young Person’s Guide to the Fungi; Nancy Parker, A New Home for ‘Lil Gnome.

Rental Information
The rental fee for each program for NAMA members and affiliated clubs is $40. For non-members, the fee is $50. The program is the property of the authors and of NAMA and is not to be copied or used for commercial purposes. We encourage non-members to join NAMA <http://namyco.org/join/index.html> in order to rent our programs at the member rates. The renter will pay return postage and $100 insurance. Send a request to rent the kit for one week to ten days together with a check or money order, made out to NAMA, to:

Western Mushroom Teaching Kit
Catharine Gunderson
1141 E. Cliff Drive,
Santa Cruz, CA 95062
cag@cruzio.com
(831) 425-8900

Eastern Mushroom Teaching Kit
Carol Dreiling
61 Ardmion Park
Asheville, NC 28801-4201
caroldrei@aol.com
(828) 254-6199

Upcoming Forays

Friday, February 6, S. F. Land’s End Foray for Randall Museum Mushroom Day: Meet at 10:00 am in the parking lot in front of the WW II monument to USS San Francisco at the north end of El Camino del Mar. Should last no more than 3 hours. To get there, go west on Geary Ave which becomes Point Lobos Ave. near the ocean. At El Camino Del Mar, turn right and proceed to parking lot. Foray Leader: Tom Sasaki (415-776-0791 or sasakitom@aol.com)

Friday, February 6, Pt. Reyes Foray for Randall Museum Mushroom Day: Meet at 9:00 am at Bear Valley parking lot in Point Reyes National Seashore. We will then carpool to the Sky Trailhead on Limantour Rd., then hike and forage 3.5 miles through the Mt Wittenberg area and back to Bear Valley. Once at Bear Valley, we will portage back to the Sky Trailhead to pick up vehicles parked there. Because of limited parking at Sky Trailhead, this foray is limited to 15 people and participants must be willing to provide carpooling. Note that while most of the hike is downhill, the hike does involve some exertion and the trail is rough in places. Heavy rain cancels. Contact Peter Werner (415-289-0168 or pgwerner@sfsu.edu) for reservations and further information.

Saturday, February 7, Beginners Hike in Joaquin Miller Park in Oakland: Meet at the Sequoia Arena parking lot off Skyline Drive, across from the Chabot Space and Science Center at 10 am. This foray is geared especially for beginners, should last no more than 2 hours and is a fairly easy walk; rain cancels. For more information, contact Jim Miller at 510-347-4707 or email: jwm2340@aol.com

Saturday, February 28 Salt Point Foray: Meet at the Woodside parking lot at 10:00 am there will be a $4:00 parking fee. We will go looking for Yellow foot Chanterelles, Black Trumpets, Hedgehogs, and others. Some of us will be spending the night at the park. We will share a potluck meal in the evening. For information call Mark Lockaby at 510-412-9964 or Marklockaby@sbcglobal.net

Saturday, March 13, Day-trip Foray to Mendocino or Sonoma Coast: Meeting time and location to be announced. Contact Peter Werner (415-289-0168 or pgwerner@sfsu.edu) for further information.
The Foragers’ Report
February 2004
by
Patrick Hamilton

“Look at all these mushrooms, jeez, we’re in mushroom heaven,” the gleeful and amazed giddy child-like foragers proclaimed as they pounced upon heretofore only seen, but not touched, patch after patch of golden chanterelles in the recently opened-to-foraging East Bay Parks. They delightfully continued, “Oh man, we can’t believe that the Park Superintendents have now allowed even us snobby mushroom society members to indulge in the fun—just like the cows that graze here we too can now really get into the woods of the East Bay lands, yes! The rangers are finally seeing the rationale of people eating some of the natural resources here and sharing the space with a grass guzzling low brow cow.”

Startled by too much good stuff, the mushroom dreamer awoke and slowly settled back into the reality of park closures, curiously non-sensibly intimidating rangers, and the exasperation so caused.

Heck, we still got fun places to go. See two paragraphs down.

For the many of you who do not subscribe to the yahoogroups discussion list allow a bit of some of what has been going on there: one thing, e-mails about the Mushroom Picking Guidelines written years ago by Mike Boom for this same Mycena News, caused much interest, pros and cons.

Another item: we have been reading the old usual grouchings by society members (some of whom are seen by David Arora to be a little high brow). You know, the MSSF’s common heartfelt and mostly non understanding gripe about not being able to pick in more places. A new approach to solve this as been brought up—namely non-violent “pick-ins” where many mushroom hunters will descend upon a park well known to be closed to picking and, using the media they have arranged for, be involved in a filmed-for-TV staged mass arrest, thereby garnering much support from the aghast public. Might work.

Or not. Besides, the beauty of the coastal mid to late winter woods can overcome any angst brought on by nasty, wrong-thinking, folks who disagree with our sensibilities.

If not, hey, there are mushrooms.

Hericium in Marin, cauliflower mushrooms in Sonoma, Pleurotus down on the The Peninsula, yellow chanterelles in the East Bay Hills, little candy caps and big matsutakes, edible treasures and inedible interests—the woods have had fungi since after Thanksgiving and, we, as one, are thankful.

And soon we will be looking for some of the very best for-the-table mushrooms—black and winter chanterelles (no sign of them yet, as of this writing, 01/15/04), springtime amanitas, delectable Agaricus. And then... morels.

Speaking of the latter—have you been keeping track of last year’s forest fires? I am sure that Norm Andresen will soon write a piece about how to access that info on the Internet and I’m equally positive that he has been keeping track of such. But it is good and satisfying fun for folks to pursue this knowledge for themselves. It can really enrich your personal mushroom hunting experiences.

To find a controlled burn or small fire area, just once, that no one else has been too and that is right then exploding in morels should absolutely be in your Mushroom Bible on the page that lists “Things that I will Do Before I Die.”

By the way, the 2004 edition of these bibles can now be purchased for $29.95 at, oh, never mind.

The always informative Mr. Mackler forwarded the following beginners’ foray report: “The annual foray to Bear Valley proved to be a welcome relief from a longish rainy spell but was short on specimens. However, the participants were able to share in the bounty of one decent chanterelle find. Items identified to species were: Amanita phalloides, Bolbitius vitellinus, Cantharellus cibarius, Clavulina cristata, Dacrymyces palmatus, Ganoderma brownii, Hygrocybe conica, H. flavescens, Hygrophorus eburneus, Hypomyces chrysospermum, Inocybe geophylla var. lilacea, Laccaria amethysteo-occidentalis, Lactarius alniola, L. rubidus, L. xanthogalactus, Lycoperdon perlatum, Paxillus involutus, Russula amoenolens, Sarcoscypha coccinea, Stereum birsutum, Tremella foliacea, Xerocomus chrysenteron. Unidentified to species were items from Calvatia, Cortinarius, Mycena, Psathyrella, Russula, Tricholoma and Tubaria.”

That’s all for now folks!

p.s. If you don’t get to that hallowed mushroom ground where morels grow just for you before you die, maybe that’s what’s up there above the Sierras—in heaven. Oh gosh, but just imagine St. Peter asking dicey questions about that mushroom picking ethic... What if it is different than God’s?
If you know the name of the genus of the mushroom you collect, but not the species, here’s something you can do. Use these simple field keys to the sections of 4 genera of gilled mushrooms that comprise more than 500 recognized “species” in our area. Examples chosen below can be found in “The Audubon Field Guide to North American Mushrooms”.

**AMANITA** ... spore print white; gills free to nearly free; universal veil present, leaving either a saclike covering at stem base or easily removable patches on cap; partial veil present on most species, leaving a membranous ring on the stem, terrestrial, associated with trees. [note: Although some are eaten, to be safe, avoid all Amanita.]

1. Mushrooms with universal veil leaving a saclike volva (or remnants) about unwollen stem base; cap margin distinctly striate to sulcate (pleated).
   a. Partial veil present, leaving ring on stem: *A. caesarea* (= *A. jacksonii*), *A. caespitoides*, *A. sprata*
   b. Partial veil absent: *A. farinosa*, *A. fulva*, *A. inamurensis* (= *A. ceciliae*), *A. parvicibuta*, *A. vaginata*, *A. velosa*.

2. Mushrooms with universal veil leaving conspicuous patches on cap surface and often only a marginate cup at base of stem; partial veil present, leaving a ring on stem.
   *A. caerulea*, *A. gemmata* (= *A. crenulata*), *A. muscaria*, *A. pantherina*, *A. velutina*.

3. Mushrooms with universal veil leaving a tough, membranous saclike volva at base of stem; partial veil absent; cap margin striate or smooth.
   *A. rubescens* complex

4. Mushrooms with universal veil leaving a membranous saclike volva at swollen stem base; partial veil leaving membranous ring on stem; cap margin smooth. [deadly]
   *A. phalloides*, *A. virosa* (= *A. bisporigera*)

5. Mushrooms with universal veil leaving patches on the cap and remnants about distinctly swollen stem base, partial veil leaving membranous ring on stem; cap margin smooth.
   *A. azurea* (= *A. franciae*), *A. brunneovariegata*, *A. atra*, *A. flavoconia*, *A. flavobrunneous*, *A. porphyria*, *A. rubescens*, *A. novinupta*

6. Mushrooms with universal veil leaving distinctive pyramidal or warts on cap; stem base often rooting; partial veil often leaving ragged remains along cap margin; smell often chlorinelike.
   *A. cinereopannosa*, *A. cokeri*, *A. silvicola*, *A. smithiana*

**CORTINARIUS** ... spore print rust brown; gills attached; partial veil present as a cobwebby covering over the gills, leaving at most only a ringlike band of brown hairs on upper stem; terrestrial, associated with trees.

1. Mushrooms with slimy (or shiny) cap and slimy stem.
   *C. collinitus*, *C. indecisus*

2. Mushrooms with slimy cap and dry stem; stem often marginatebulbed.
   *C. laxuosus*, *C. multiformis*

3. Mushrooms dry, with silvery grayblue colors; often strongly aromatic.
   *C. alboviolaceus*, *C. traganus* (= *C. camphoratus*)

4. Mushrooms dry, scaly-capped, dark purple. [only known harmless species]
   *C. violaceus*

5. Mushrooms dry or hygrophanous, often dull brownish, often small.
   *C. armillatus*

6. Mushrooms dry or hygrophanous, gills typically bright orange-red, or yellow.
   *C. cinerarius*, *C. crocipilus*, *C. suguinus*, *C. sempiternus*

7. Mushrooms dry or hygrophanous, often colored greenish-orange.
   *C. gentilis*

**LACTARIUS** ... spore print white; gills attached; no veils present; latex present on cut surfaces; terrestrial, associated with trees.

1. Mushrooms with saffron, orange, red, or indigo latex (cut gills), [edible]
   *L. deliciosus*, *L. indigo*, *L. paradoxicus*, *L. subpurpureus*

2. Mushrooms with abundant white, mild latex; cap & stem typ. orange; distinctive odor of fish in some species. [edible]
   *L. corrugatus*, *L. hygrobiondus*, *L. luteolus*, *L. velutus*

3. Mushroom with white, sometimes acrid, latex; cap & stem orange, red to grayish; gills often aromatic.
   *L. aquilinus*, *L. camphoratus*, *L. fragilis*, *L. rubidus*, *L. peckii*, *L. rufus*

4. Mushrooms with white, typically acrid latex, whole mushroom white.
   *L. deceptivus*, *L. piperatus*

5. Mushrooms with white latex, often staining flesh pinkish; cap brownish.
   *L. gerardii*, *L. liguatus*

6. Mushrooms with white latex often becoming yellow or purplish on exposure; cap in some species with lacelike marginal fringe.
   *L. controversus*, *L. muscoides*, *L. representans*, *L. scrubakatus*,...

**RUSSULA** ... spore print white to creamy yellow. Gills attached and brittle (easily flaked off); no veils present; no latex present on cut surfaces: terrestrial, associated with trees.

1. Mushrooms hard-fleshed, either white or buff or gray, some species on bruising staining pinkish on gills, or flesh turning red and then black, or just black.
   *R. brevipes*, *R. compacta*, *R. dissimulans*

2. Mushrooms yellowish to orange with a striate cap margin and distinctive odor of almond extract or marzipan (when young).
   *R. laurocerasi*

3. Mushrooms yellowish becoming ashy gray on bruising or in age.
   *R. crustosa*, *R. lycopyrus*

4. Mushrooms dry or hygrophanous, often dull brownish, often small.
   *R. emetica*, *R. fragilis*, *R. krombholzii*, *R. rubidus*, *R. peckii*, *R. rufus*

5. Mushrooms dry or hygrophanous, often colored greenish-orange.
   *R. gentilis*
The Mushroom Lab is Dead – Long Live the Mushroom Lab
I have some good news and some bad news. The bad news is that we have lost the mushroom lab at the Presidio National Park. Some of you who have been involved with the MSSF cultivation committee for the last 2 1/4 years know that last spring, after the end of the rainy season, one of the buildings in the Presidio had its roof collapse. This caused great consternation in the liability lawyers at the Presidio, who sent around the structural engineers to check out all the buildings around the park. The Native Plants Nursery building where our lab has been located was found to have several roof beams splitting ominously, one right over the lab.

During the summer the roof beams were shored up and we continued to teach our cultivation classes. But at the start of the rainy season the building was condemned anyway and all public programs and offices were ordered to cease operations and move out.

So we had to start looking for a new location and a number of potential opportunities presented themselves. The good news is that, after some talks and planning sessions, we have found a new home to move to with the Landscape Horticulture Department at Merritt College in Oakland. While we have lost the beautiful location at the Presidio National Park we have gained a collaborative relationship with an educational institution where our cultivation programs and projects can greatly expand. It is also a beautiful location with a hillside view of the bay from the gardens. And it is conveniently located near great hiking territory in the Oakland hills.

We have already been working closely with Merritt’s Landscape Permaculture classes where we provide the mushroom aspect to the course. We expect to start up our regular MSSF lab seminars again at the end of the rainy season beginning in June so we don’t interfere with the busy foray season. After the summer and early fall lab sessions we expect to begin teaching credit classes with the horticulture program. Instead of the typical fungal pathologies of plants, we will be concentrating on the positive aspects of promoting mushroom cultivation in gardening and farming situations. The introductory course will cover all aspects of mushrooms and cultivation including ID and taxonomy, garden and lab cultivation, soil building and composting, mycoremediation, wildcrafting, medicinal uses, and even a little applied culinary craft. Later we can incorporate specialized topics into various tracks offered by the horticulture program.

They also have various community events in which we will be able to participate. Every year for the last several years we have had a mushroom garden display at the March SF Garden Show at the Cow Palace. This year we will return again and we will assist them with their first display.

I would like to thank a number of people in the MSSF who have been integral to the success of our cultivation program over the last several years. Norm Andresen for all around help and all kinds of ideas and work for lab classes; Dan Long and Mark Lockaby for much regular support; Enrique Sanchez for much help in setting up and maintaining the lab and the garden; Sherry Carvajal for setting up, organizing and maintaining the lab and especially the pressure cooker technology; George and Jane Collier for many hours shared at the garden and the lab; likewise for Debbie Collins, and for working to help set up mycoremediation as well; all of them for help in transporting equipment and stuff from and to the lab and venues; Chris Melville and Rik Vandiver for technical expertise and work in the lab; and Kelly Ivors, Don Simone, and Phil Ross for their instruction expertise in classes. And thanks to Terri Beausejour for all her assistance in the beginning. There is no way our cultivation program could have been so successful without all the contributions made by all these members. There are also many more who have taken classes and variously assisted with the lab and the garden and we thank all of you and look forward to even more and better things for the future.

Mushroom Day at the Randall Museum
Come join us for the MSSF’s Mushroom Day at the Randall Museum on Saturday, February 7th from 10am to 3pm. We’ll have a laid back mini-Fungus Fair here and look forward to your assistance in setting up on Friday evening and especially participating on Saturday during the event. There are especially kid-oriented activities. If you would like to participate please contact Ken Litchfield at 415-863-7618 or klitchfield@randallmuseum.org.
In Boston, over many years, Elio taught courses on mushroom field identification and the use of the microscope. In his other life, he is a microbiologist who spent most of his career at Tufts University Medical School. There he chaired the department of Molecular Biology and Microbiology for 23 years before retiring to San Diego in 1995. He has authored and edited over a half dozen microbiology textbooks and technical books and is currently the curator of the “Registry of Mushrooms in Works of Art” (http://members.cox.net/mushroomsinart/).

Elio Schaechter received the Awards for Contributions to Amateur Mycology from the Northeast Mycological Foray in the 1991 and from the North American Mycological Association in 1993. In 1997 he published “In the Company of Mushrooms” (Harvard University Press), a book on “what are mushrooms and their relationship to people in various cultures and ages.”

“What are mushrooms, anyhow? Elio will take us on a relaxed, non-technical visit to the biological side of mushrooms and tackle such questions as why so many mushrooms are umbrella-shaped, why stinkhorns stink, why puffballs puff, why bird’s nest fungi have eggs, and others. He will include in his talk how mushrooms develop and how they ingenuously disperse their spores.”

Garlic soup is one of those lean times dishes that is now a staple of many fancy restaurants. There are many variations, this is a simple one to which you can add your favorite ingredients.

**Ingredients:**
- 1 quart (750 ml) of water or chicken stock
- 4 tbls. chopped garlic
- 1 three inch section of day old french bread or other coarse crusty bread
- 1 cup sliced mushrooms (any firm fleshed variety works fine)
- 4 tbls. olive oil
- 2 tsp. bittersweet smoked paprika
- 4 eggs beaten to a pale yellow

**Preparation Instructions:**
Heat water and add garlic. While garlic cooks (5-10 min.), saute the mushrooms in 2 tbls. olive oil, thin slice the bread and fry it in the other 2 tbls. olive oil, sprinkling a little paprika and salt in the oil.

Add the mushrooms, bread and oil to the water and simmer for another 10-15 minutes. You can leave the soup for several hours at this stage.

Just before serving, while soup is still very hot, pour eggs slowly over the back of a fork into the soup and swirl once or twice.

Serve immediately in deep bowls.
This is a great appetizer soup, or add a vegetable or salad and you have a nice warm meal for a winter day.
MSSF Calendar, February, 2004

Monday, February 2, Culinary Group’s Monthly Dinner: 7:00 pm. Meeting and dinner at Hall of Flowers in Golden Gate Park in San Francisco. For reservations or information, please contact Alvaro Carvajal (415-695-0466 or send email to alvaro.carvajal@sbcglobal.net).

Saturday, February 7, Mushroom Day at the Randall Museum: 10:00 am - 3:00 pm. Free. A great event for kids and adults, with MSSF displays, identification table, books, T-shirts, mushroom modeling for kids, and great homemade soups available for purchase for lunch. The Randall Museum is located at 199 Museum Way, San Francisco on the edge of the Corona Heights Park. For Museum information, contact 415-554-9600 or visit www.randallmuseum.org on the web.

Saturday-Sunday, February 7-8, Edible and Medicinal Mushrooms: Cultures and Techniques: Two-day hands-on workshop will introduce participants to the skills and techniques required to develop their own mushroom farm. $225 includes lunch both days. To register, visit http://ucjeps.berkeley.edu/regform_04.html or call (510)643-7008.

Tuesday, February 17, MSSF General Meeting: Doors and mushroom ID at 7:00 pm. The speaker at 8:00 pm. will be Elio Schaechter

Monday, March 1, Culinary Group’s Monthly Dinner: 7:00 pm. Meeting and dinner at Hall of Flowers in Golden Gate Park in San Francisco. For reservations, please contact Alvaro Carvajal (415-695-0466 email: alvaro.carvajal@sbcglobal.net).

See page 3 for list of Forays and dates