LONG ISLAND MYCOLOGICAL CLUB

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L.I. SPOREPRINT

HAPPY NEW YEAR!

VOLUME 18, NUMBER 4, WINTER, 2010

FINDINGS AFIELD

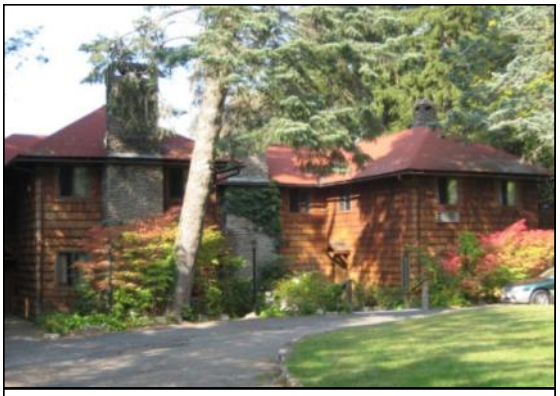
For many years, we have been encountering a small black-scaled *Lepiota* which remained unnamed, none of the available guides being helpful in providing an identity. This past season, I returned to it, and by using Matchmaker (see last issue) determined that the species was very likely *Lepiota atrodisca,* considered a Western species.

Originally described in 1938 by Zeller as a new species from Oregon, with a pileus when mature of sooty black fibrillose scales, free gills, and a slender stem with a superior membranous annulus and a black margin, this fit our specimen precisely. Moreover, the spore was dextrinoid, smooth, ellipsoid, 5-7(9) X 3-4 mμ, and the cheilocystidea present, originally described by Zeller as "not particularly characteristic" were subsequently more exactly characterized by HV Smith as cylindrical to narrowly clavate, about 35 X 8 mμ, as we also found.

Since then, this species has been reported in the East, by at least the NJMA and by COMA. It will now be added to the LIMC checklist.

NEMF 2010: KERHONKSON, NY SEPT. 23-26

This marked the third Catskill area foray since 1994, and without doubt the driest, judging by the total species number, 292, compared to previous totals in the mid to high 300's. The base for activities, a departure from the usual academic center or resort, was the old world style Ukrainian Cultural Center, Soyuzivka, a 400 acre wooded expanse with two miles of trails and comfortable private rooms in scattered cabins nestled among the trails. A charming place, worthy of returning to at a more rain blessed time.



A rustic cabin in the Soyuzivka complex.

Gary Lincoff was Chief Mycologist, and the faculty included both professional (Tim Baroni, Roy Halling, Roz Lowen) and amateur mycologists (Noah Siegal, Walt Sturgeon, John Plischke III, Doug Basset, etc.). Rod Tulloss, world recognized expert who is in a class of his own, officiated over the Amanitas, which unfortunately were not plentiful. Workshops and lectures included: an introduction to poroid fungi-D. Basset; Ascomycete workshop-R. Lowen; the genus Marasmius- D. Smullen; Amanita workshop- R. Tulloss. Enough to keep even the most advanced mycophile occupied.

Despite the low species numbers, 19 new species were added to the cumulative NEMF foray list, including some genera which were entirely unfamiliar, such as *Batkoa*, a member of the *Entomopthoraceae*, obligate parasites of insects. Others were equally unfamiliar lichens, anamorphs and slime molds, usually overlooked by foragers, but in a depauperate time, everything is fair game. The one new genus added you will not encounter anywhere, as it is a newly proposed member of the Rhodocybe family, *Entocybe*, coined

(Continued on page 6)

MEMBERSHIP RENEWAL FORM ENCLOSED

PRESIDENT'S MESSAGE

Happy 2011! Last year was a so-so one in terms of finding mushrooms. Two forays stand out in my mind. The first was when David Epstein found his first morel. The look of sheer delight on his face was so wonderful and brought back memories of when I found my first. The other foray was out east when Gosia and Elena found *Tricholoma zelleri*. I had never seen this species before but had an inkling that it was zelleri. It took me quite awhile to be sure that it was indeed *T. zelleri* as most books don't really show the beauty of it.

We did, however have a really nice picnic with homemade food. Mushroom day was great as usual. (I always look forward to seeing the beautiful *Aleuria aurantia* that Roger finds.) Our annual luncheon was well attended and successful. This year we encourage more of you to attend our forays. Even if there is a lack of abundance, there is always the opportunity to learn and to be among like-minded people.

Here we are in the midst of very cold weather. There are many months until spring. What to do? Some will go through catalogs looking for new seeds, plants or mushroom kits that will arrive in the spring. Not I! Out come the mushroom books to study for the upcoming season. Most of us lose mushroom names if we don't use them frequently so now is the time relearn species and perhaps add some new ones.

Another thing to do is to look at the upcoming NAMA Foray in Pennsylvania(you must hold a NAMA membership to attend) and the NEMF Foray in upstate New York. Both of these outings have interesting venues and great staff. I've already sent in my check for NAMA. Even though they don't take place until August, the allotted spaces fill up quickly.

Dues are due for 2011.

Happy hunting to all!

EDITOR'S NOTE

Attentive readers will note that our science adviser, Benjamin Wolfe, has been awarded his PhD after successfully defending his dissertation on the evolution of symbioses in the fungal genus *Amanita* on Dec. 13 at Harvard. In this issue we are privileged to present the first in a series of articles Ben has written explaining his research in lay terms providing non-scientists with a portal to understanding this fascinating area of research. His next position is a post-doc on the genomics of cheese microbes at Harvard's Center for Systems Biology, while continuing work on some ongoing Amanita projects. We hope that he will find the time to educate us on this topic as well, although we should not expect samples.

While we usually do not highlight the annual forays until the Spring edition, the upcoming NAMA foray is extraordinary for having brought two major figures in mycology out of retirement, Alan Bessette and Ernst Both. They will both be among the faculty honoring the late Richard Homola, to whom this foray is dedicated. Information regarding this foray will be found on page 5 and a link to the NAMA foray registration form has been placed on the LIMC website main page. Early registration is strongly recommended.

MATERIAL FOR THE SPRING, 2011 EDITION SHOULD REACH THE EDITOR BY FEBRUARY 27TH

(Submissions may be forwarded by email in any format or typed.)

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FORAY RESULTS SUMMARY

OCT. 2, PECONIC HILLS & MANORVILLE DEC: 65 species total, a marked improvement from earlier forays, reflecting the arrival of Autumn rains. There were 8 species of the Bolete family including one new Suillus- *S.tomentosus*, one of the rare bluing species; many *Cantherellus cinnabarinus & C. ignicolor*; 5 sp. of Amanita including *A. submaculata,* new to our list. *Laccaria trullisata* was plentiful and the presence of good amounts of *Lactarius indigo,* found by Tony Mish, marked its first appearance here in many years.

Rhodocollybia unakensis

OCT. 9, MUTTONTOWN EQUESTRIAN: 45 species, with no genus predominating. Edibles included Hen-of-the-Woods (rather scarce this year), Agaricus, Lycoperdon, and Marasmius oreades (Fairy Ring Mushroom). Several new to the list, including *Rhodocollybia egregia/unakensis,* an uncommonly encountered wood rotter; and *Mycena olida v. Americana*, thought by some authors to be synonymous with *Mycena minutula* Peck.

OCT. 16, SOUTHAVEN: 69 species, Russula and Amanita predominating with 9 species each; also, 5 spp. each of Lactarius and Cortinarius. Edibles were confined to the 5 spp. of Suillus collected plus a few Leccinum.

OCT, 23, EDGEWOOD: 46 spp. , with no genus predominant, and edibles of Horse Mushrooms, Sheep Polypore, Suillus, *Boletus projectellus* and a few *Armillaria gallica.* Two species of Rhizopogon, reportedly edible, but no bold takers as yet.

Tricholoma zelleri

OCT. 30, PECONIC HILLS & CRANBERRY BOG: 60 species total marked our first foray at Cranberry Bog, which produced 4 new identifiable sp., while some are still to be identified. New *were Hygrocybe coccineus, Hygrocybe nitida, Lactarius proximellus*, *Chroogomphus rutilus* and *Tricholoma zelleri.* Four other sp. of Tricholoma were found, including the bog dweller *T. fumosoluteum.* Edibles included *Hygrophorus ponderatus, Leccinum aurantiacum, Rozites (Cortinarius) caperata, Suillus spp., Cantherellus ignicolor,* 3 spp. of Laccaria, and *Tricholoma niveipes.*

Suillus tomentosus

NOV. 6, ROCKY PT: Total species reduced to 29, with colder weather, and Tricholoma predominating with seven species. *T. flavovirens (equestre)* in good numbers was the targeted edible, and *Cantherellula umbonata* was also collected for the table.

NOV. 13, ROCKY PT (WESTERN ENT): As other pine barrens areas had stopped producing, we accessed this previously unforayed area, which produced a 28 species array similar to the previous week. Again, Tricholoma dominated with 8 spp. , two of them *(T. equestre, T. niveipes*) collected for the table, along with *Hygrophorus hypothejus* and Grayling *(Cantherellula umbonata).* One new species, *Cystoderma cinnabarinum.*

NOV. 20, CHRISTIE: Only 24 species, rather lackluster, with the only edibles some Brickcaps and fair amounts of Autumn Oysters. One new species, *Mycena maculata,* identified by Aaron, was widespread.

Chroogomphus rutilus

NOV. 27, WELLWYN: The 13 species encountered were all wood rotters, gilled and non-gilled, with goodly amounts of Oysters as well as the toxic *Galerina autumnalis,* which provided an educational contrast to the Brickcaps we also found. *Coprinus (*now *Coprinellus) micaceus* was the only other edible. Thus ended our season.

Lactarius proximellus

Letting go of old habits to make new friends: evolutionary origins of mushroom mutualisms in *Amanita*

by Ben Wolfe, PhD

Prologue

Across the planet, in almost every habitat where scientists have looked, there are millions of species interacting in symbiotic relationships. Symbiosis – the living together of different species – has become widely recognized as a major force in the ecology and evolution of life on earth. The evolutionary transition from a primordial soup in the oceans to more complex life on land is the direct result of the evolution of symbiotic associations. But symbiosis is not always a friendship with benefits.

In some cases one partner may take more from the relationship than it gives, leading to parasitism. At the far end of the spectrum from parasitism are symbiotic interactions where both species obtain clear benefits from the association, known as mutualism. In these associations, both parties are receiving benefits from living together, and are accessing resources or acquiring services that they could not do living on their own.

Despite making major advances in understanding the importance of symbiosis across all realms of the natural sciences, it is still unclear how most of these intimate symbioses evolved and what forces maintain symbiotic interactions.

From a garage in New Jersey, the origins of mushroom mutualisms

On a rather unassuming block in the town of Roosevelt, New Jersey, a converted garage contains the secrets to discover the origins of one of the most widespread mutualisms on earth. In this garage owned by Rod Tulloss, thousands of specimens of fungi from the genus Amanita line carefully organized shelves. Hundreds of species from around the world have been collected and sent to Tulloss, who has become the global expert and caretaker of Amanita since his retirement from Bell Laboratories.

Amanita has long been the poster child for mushroom forming fungi. With over 500 species in the genus, Amanita is found on all continents around the world and is one of the most commonly collected mushrooms. Because this genus is commonly encountered and because of its incredible diversity of form and colors, Amanita has "popped-up" all over popular culture. From the mushroom with the red cap and white dots (*Amanita muscaria,* or the fly agaric) that has been the inspiration for video games and the backdrop for fairy tales, to the world's deadliest

A small sampling of the diversity of color and form in the genus *Amanita.*

mushroom (Amanita phalloides, the death cap mushroom), humans have been captivated by this group. Amanita is even reported to have changed the course of world history. Holy Roman Emperor Charles VI was poisoned by what is believed to be a dish of poisonous *Amanita phalloides.* His death led to the War of the Austrian Succession, which reshaped the political landscape of Europe in the 1700's.

So what can Amanita mushrooms tell us about the origins of mutualism? Species in the genus Amanita form ectosymbiotic mutualisms with the roots of plants, known as ectomycorrhizas ("ecto-" because they form on the outside of roots, "mycorrhizas" from Greek for fungus roots). As these fungi grow hyphae in forest soils, they come into contact with the roots of trees. If you take a shovel full of soil from under any oak or pine tree and look very closely at the roots you unearthed, you can see this symbiosis in action. Look closely, and you will see what look like tiny wool socks wrapped around the ends of some roots (Illustration, Page 7). The socks will vary in color and texture from dark black and fuzzy to tawny brown and smooth. In each of these symbiotic structures, known as ectomycorrhizal root tips, an ectomycorrhizal fungus has colonized the outside of the plant root. The fungus provides the host plant with nutrients obtained from nooks and

(Continued on page 7)

Gleanings

■**OLDEST FOSSIL BASIDIOMYCETE:** Microscopic examination of a fossil fern (*Botryopteris antigua)* embedded in chert that had painstakingly been prepared as a slide in the late nineteenth century revealed evidence of clamp connections. These are present only in Basidiomycetes, developing at cell division to maintain the binucleate condition, and present unequivocal evidence of their existence 330 Ma (million years ago). The fossils originated in north-Central France, and extend the time of the oldest Basidiomycete back by 25 Ma. Inasmuch as molecular clock estimates have suggested the minimum age of the Basidomycota may be as much as 500 Ma, future emendations should not be ruled out.(*Oldest fossil basidiomycete clamp connections, M. Kringa et al, Mycoscience, online, Aug. 2010)*

■**COLLYBIA TO GYMNOPUS TO CONNOPUS:** Now that many of us have become accustomed to using the epithet *Gymnopus acervatus* in place of *Collybia acervata,* comes new research demonstrating that this species does not comfortably fit in either Gymnopus or Rhodocollybia, and is unique enough in this complex to merit its own genus. Molecular analysis in combination with very careful microscopic scrutiny strongly suggests the presence of two clades: a eastern North American/ Scandinavian clade and a western NA clade that might be reproductively isolated. The European and eastern NA clade is thought to be conspecific. At this point, the authors do not propose different species for the clades. *(A new genus to accommodate Gymnopus acervatus (Agaricales), Karen Hughes, David Mather, Ronald H. Petersen, Mycologia, 102(6), 2010, pp. 1463-1478)*

■**DRACULA, LORD OF THE FLIES:** Orchids are well known as prodigious mimics, in some cases imitating female moths so exactly as to entice the male to attempt mating and thereby fertilize the orchid. Now comes evidence that one genus, *Dracula* ("Little Dragon") can imitate the appearance and smell of mushrooms, thereby enticing a genus of fruit-flies (*Zygothrica)* to attempt feeding and inadvertently to pollinate them. At this point, the evidence is observational consisting of (700 hours) observation of fruit-fly pollination combined with the spectacular resemblance of *Dracula* flowers in appearance, fragrance, timing and location to mushrooms. More experimental evidence is being undertaken by the authors. *(A mushroom by any other name would smell as sweet: Dracula orchids, Bryn T. M. Dentinger and Bitty A. Roy, McIlvainea 19 (1) 2010.* Full text accessible at http://www.namyco.org/publications/mcilvainea/mcil_journal.html)

■ **PÉRIGORD BLACK TRUFFLE GENOME SEQUENCED:** A team of European researchers led by mycologist Francis Martin at the French National Institute for Agricultural Research in Nancy have determined that *Tuber melanosporum* has the largest and most complex fungal genome known. It has been shown to contain genes that encode the production of flavor related enzymes and metabolites, thereby demonstrating that its distinctive flavor is intrinsic and not the result of regional microbes, as in the case of wine or cheese. Because of the many bogus claims of marketed truffle origins, a database of genetic markers to verify geographic origins is being compiled. *[Nature 464, 1033-1038 (15 April 2010)]*

2011 NAMA
Dr. Richard Homola Memorial Foray
Thursday, August 4 – Sunday, August 7
Hosted by The Western PA Mushroom Club
At Clarion University, Clarion, PA

Faculty includes Dr. Alan Bessette, Arleen Bessette, Ernst Both, Gary Lincoff, Rod Tulloss, and Walt Sturgeon, etc.

The foray is limited to 225 people. It will probably sell out early, and registration is now open. If you plan to attend, early registration is suggested. You must be a member of NAMA to attend, and if not, the $35 fee can be paid upon registration.

FOR ADDITIONAL DETAILS AND TO DOWNLOAD AN APPLICATION, ACCESS:
http://namyco.org/events/index2011-0.html
A LINK WILL ALSO BE AVAILABLE ON THE LIMC WEBSITE

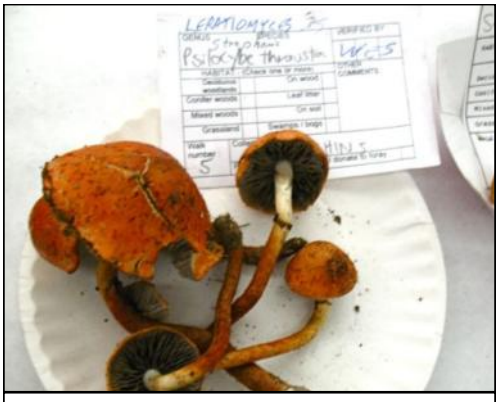
NEMF 2010 *(Cont'd from page 1)*

by Tim Baroni, author of "A World Monograph of the genus Rhodocybe." The dual lecture by him and Roy Halling on the Macrofungi of tropical America dealt with a topic, biogeography and the evolution of fungi in relation to the current distribution of species, which has received less systematic attention than this fascinating area deserves.

The evening lecture by Gary Lincoff lived up to his reputation for informative and amusing mycolore. Among the tidbits he offered was the factoid that consuming Clitocybe and alcohol is a no-no, as they contain an antabuse like compound that, like *Coprinus atramentarius*, causes a severe gastric reaction. Not that many Clitocybes are worth eating, anyway. More useful was the admonition not to consume Hen-of-the-Woods *(Grifola frondosa)* if you are taking anti-depressants containing MAO inhibitors, which can cause allergic reactions due to the presence of tyramine, a protein compound.

AT THE TABLES, NEMF 2010

Mycologist's awards for forager's finds included *Camarops petersii, Climatocystis borealis, Pluteus aurantiorugosus*, and others which we rarely encounter here on Long Island. The tables also yielded some interesting species, e.g., *Amanita longicuneus, Bolbitius callisteus,* and *Fibropileus abortivum,* the latter apparently a newly minted name for *Entoloma abortivum,* so new that it baffled Google, which directed me to Kellogg's FiberPlus. Neither did Index Fungorum contain any record.



Stropharia, Psilocybe or Leratiomyces?

If you need any further evidence that the state of mycological science is far from settled, take a look at the above photograph of a specimen as exhibited on the collection tables. This species has been identified as belonging to three different genera by as many identifiers, one correcting the next.

Of course, forays are more than informational; they are also culinary. And in this case, mycophagy under the skilled hand of Elinor Shavit was superlative: a panoply of innovative dishes that people could not get their fill of. Just the memory of it makes my mouth water. This and the camaraderie of the approximately 240 attendees more than made up for any lack of fungi.

(To view the complete collection list access: http://nemfdata.org/lastforay.htm)

Next year's NEMF foray will be held at Paul Smith's College in the Adirondacks, north of Saranac Lake, NY on August 11-14 2011, and will be hosted by Central NY Mycological Society, Mid York MS, Susquehanna Valley MS, and Rochester Area MA. Information will be updated on the NEMF website http://www.nemf.org/files/2011/2011.html and registration will commence in mid-January.

WELCOME NEW MEMBERS

Liliane Blattner

Patricia & John Guarino

Pamela Harms

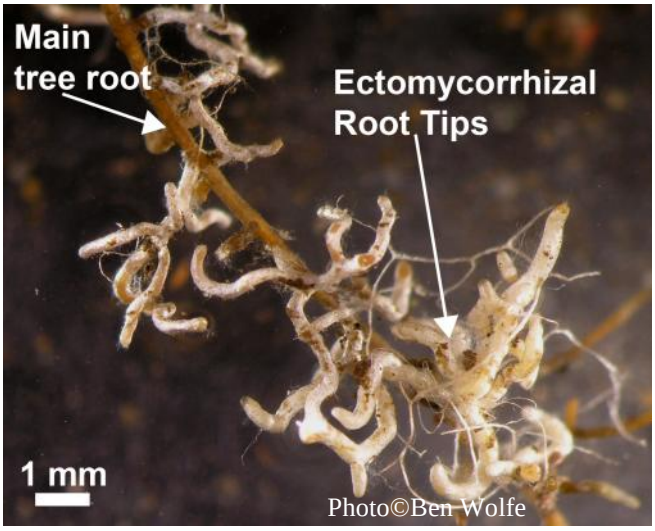
Lorraine & Ernesto Martinez

Gosia & Chris Onufrik

Elena Watson

Mushroom mutualisms *(Cont'd from p. 4)*

crannies in the soil. In return, the plant provides the fungus with sugars that it has produced in above-ground leaves through the process of photosynthesis.



Ectomycorrhizal root tips from the roots of an oak tree in Harvard Yard, collected by the author.

The filaments, or hyphae, of these fungi spread far out into forests soils away from the ectomycorrhizal root tips, sometimes colonizing multiple trees at the same time. One individual tree in a forest can be colonized by hundreds of species of ectomycorrhizal fungi. This massive network of ectomycorhizal fungi can make up to one third of the total biomass of microbes in soils, and is a major conduit for the movement of nutrients within forests.

Amanita isn't the only group of mushrooms that has figured out how to forge beneficial partnerships with trees. At least a dozen different groups of mushrooms form the ectomycorrhizal symbiosis, including some other famous fungi such as the truffles (Tuber species), the chanterelles (Cantharellus species), and the porcinis (Boletus species). While building the evolutionary histories of all fungi as part of the Fungal Tree of Life Project, mycologists have recently recognized that this fungal-plant symbiosis has evolved many times, representing numerous independent origins of the ectomycorrhizal symbiosis. These symbiotic ectomycorrhizal fungi, that rely on host plants for their carbon, have evolved from saprotrophic ancestors, which are free-living fungi that obtain their carbon by decomposing dead organic matter in the environment. Cellulose is the most abundant polymer on the planet and is a major component of dead organic matter in soils and saprotrophic fungi have some of the most efficient systems for degrading cellulose. These fungi release a battery of enzymes, known as cellulases, from their hyphae to degrade cellulose and other complex molecules in soil, and transform them into simple sugars such as glucose that can be used for growth.

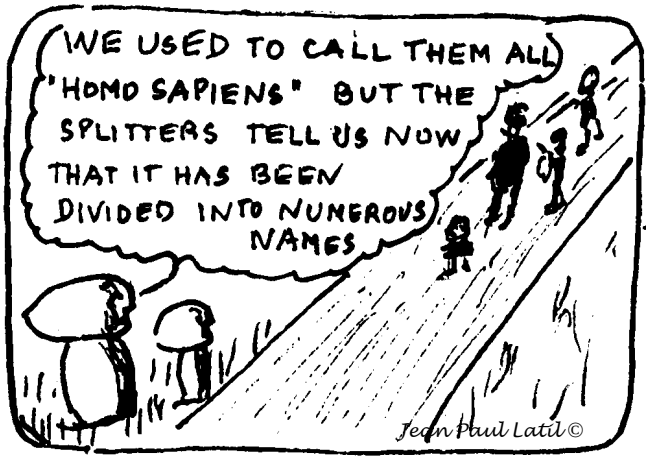
What remains a mystery is whether once this symbiosis evolves, do symbiotic species remain symbiotic, or do they transition back to living without a host? Do these ectomycorrhizal fungi, with their saprotrophic ancestry, retain genes that could be used for decomposition of organic matter such as cellulose? If so, these fungi have the potential to become free-living again, giving up on a long-term relationship with trees.

Using the vast collection of Amanita species from Tulloss' garage in New Jersey, I set out to uncover the evolutionary origins of symbiosis in this group of ectomycorrhizal fungi. Amanita is ideal to address this question because in addition to containing hundreds of symbiotic species, Amanita also contains some species that have been described as living in grasslands far away from woody plants. These species are free-living, obtaining their carbon through decomposition like other saprotrophic species. By determining when the symbiotic Amanita species evolved in relation to the free-living species, we can determine how the ectomycorrhizal symbiosis has evolved in the group.

After spending three days sorting through the thousands of specimen in Tulloss's collection, I chose 108 species of Amanita from around the world and brought them back to our lab at Harvard. From the gills of each of these dried mushrooms, I took a small piece of tissue and extracted the DNA. I sequenced thousands of base pairs of DNA from each of these species to determine the evolutionary history of Amantia. After constructing the first phylogenetic tree of Amanita, I realized I had made an exciting discovery. In the phylogeny that I constructed all ectomycorrhizal Amanita species clustered together in one part of the tree, and evolved from the free-living Amanita species that were at the base of the tree. In other words, the mutualism evolved once in Amanita and there are no indications that ectomycorrhizal species have reverted to saprotrophic growth. Just like the bacterial endosymbionts of insects, once this mutualism evolved, there was no going back to free-living growth. Enduring friendships have been forged and maintained.

To be continued……..

NEXT ISSUE: A SAPROTROPH IN THE CLOSET– GOODBYE TO INDEPENDENCE (2nd installment)



IN THIS ISSUE

"The true, strong, and sound mind is the mind that can embrace equally great things and small." ***James Boswell, Life of Johnson***

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