

[NOTE: “Mycological Dispatches – 2001” was published by the North American Mycological Association in *McIlvainea* 15(1): 23-38. Budgetary constraints and journal space limitations dictated that the original manuscript be shortened -- considerably. Both author Norvell and *McIlvainea* Editor Guttman agreed that the NAMA readership would best be served by eliminating summaries of papers dealing with the more esoteric, little-known fungi, molds, and pathogens and eliminate most of the references to earlier literature. The original manuscript is posted here to aid those on wish to pursue a mycological mystery tour of their own. If nothing else, the use of the “find” function may prove very handy.]

## MYCOLOGICAL DISPATCHES — 2001

### Summaries of recent research papers on North American macrofungi, lichens, slime molds and assorted microfungi

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*The usual (albeit re-titled) summary of scientific research papers on North American fungi — and other studies with implications for all mycology — contains more titles than last year and is designed to serve as a “I must have read it somewhere, but where?” guide. Be forewarned: while all papers appearing in Mycologia, Mycotaxon, Mycological Research, Mycoscience, Taxon, and Nature (along with other reprints received from proud authors) from late 2000 through July 2001 were considered, the McIlvainea budget dictates publication of only a small fraction of the 144 papers originally summarized and 101 references to earlier papers. In the interests of brevity, bibliographic citations have been boiled down to the essentials and many entries with reduced fonts have cryptic summaries to entice you to embark on your own voyage of discovery. Note: Arrows highlight species synonyms (the arrow points → the preferred epithet).*

#### I. AGARICALES AND GILLED OTHERS

• “**Phylogeny of Agaricales re-examined**” [Redhead. 2001. [Mycological Research](#) 105:3-4]. — Where do we stand in the morphology vs. molecule wars? Names, orders, families, species, and genera are whipping about so swiftly that we need a bookmark to note where we’ve been, where we are, and where we’re going. This page-long overview of papers published in the last eight years helps us keep score. “The results are intriguing. There is little support for some agaric families such as the ‘*Tricholomataceae s. lat.*’, which is spread over much of the [agaric evolutionary] tree, while other ‘families’ are either nested within other ‘families’ or have emerged as newly recognized entities. There is a *Mycena* and allies’ clade, a *Pleurotaceae* clade, an *Agaricaceae* clade (but including the type of *Coprinus*, i.e. *Coprinaceae s. str.*), and a 90% residual *Coprinaceae* clade (excluding the type but including *Psathyrella*). ... Using [long subunit data], there is little or no support for families such as the *Cortinariaceae*, *Hygrophoraceae*, and *Strophariaceae*. Many genera are strongly supported as monophyletic (e.g. *Agaricus*, *Amanita*, *Hygrophorus s. str.*, *Pleurotus*, *Tricholoma*) but many others are poly- or paraphyletic (e.g. *Collybia s. lat.*, *Marasmius*, and even *Gymnopus s. str.*). Many genera are orphaned, without being placed in recognized families. One of the more spectacular revelations is a ‘clade X’ of omphalinoid fungi (*Omphalina*’ *rosella* and *Rickenella* sp.), which nests outside the main agaric clade.”

Interesting. Singer – still regarded by many as *the* rebellious taxonomic “agari-cademic” of the twentieth century — wouldn’t recognize the place.

Publications cited by Redhead include DNA-based phylogenies by (i) Hibbett & Vilgalys (1993) on the genus *Lentinus* [[Systematic Botany](#) 18:409-433]; (ii) Hibbett & Donoghue (1995) on the *Polyporaceae* [[Canadian Journal of Botany](#) 73:S853-S861]; (iii) Hibbett et al. (1997) on **mushrooms & puffballs** [[Proceedings of the National Academy of Sciences, USA](#) 94: 12002-12006]; (iv) Lutzoni (1997) on *Omphalina* and allies [[Systematic Biology](#) 46:373-406]; (v) Bruns et al. (1998) on **ectomycorrhizal basidiomycetes** [[Molecular Ecology](#) 7:257-272]; (vi) Johnson and Vilgalys (1998) on *Lepiota sensu lato* [[Mycologia](#) 90:971-979]; (vii) Drehmel, Moncalvo & Vilgalys (1999) on *Amanita* [[Mycologia](#) 91:610-618]; (viii) Hopple & Vilgalys (1999) *Coprinus* and dark-spored allies [[Molecular Phylogenetics and Evolution](#) 13: 1-9]; (ix) Pine, Hibbett, & Donoghue (1999) on **cantharelloid** and **clavarioid** fungi [[Mycologia](#) 91:944-963]; (x) Moncalvo et al. (2000) **154 agaric species** [[Systematic Botany](#) 49:278-305]; and (xi) Thorn et al. (2000) on the *Pleurotaceae* and other pleurotoid-lentinoid fungi [[Mycologia](#) 92:241-252].

### A. *Agaricus* and *Lepiota* and *Coprinus comatus*. Oh my...

- “A phylogeny of the genus *Agaricus* based on mitochondrial *atp6* sequences” [Robison, Chiang, Horgen. 2001. *Mycologia* 93:30-37; *DNA trees*]. — Efforts to improve the supermarket *Agaricus bisporus* through breeding require understanding its evolutionary relationships with other *Agaricus* species. Sequence data once more support close kinship of *bisporus* with *subperonatus*, *subfloccosus*, *bitorquis*, and *campestris*. Also sequenced were *benesi*, *californicus*, *crocodilinus*, *lilaceps*, and *subrutescens*.
- “Notes on *Lepiota* and *Leucoagaricus*: Type studies on *Lepiota magnispora*, *Lepiota barssii*, and *Agaricus americanus*” [Vellinga. 2000. *Mycotaxon* 76:429-438; *line drawings, descriptions*]. — One advantage imported scientists bring to our shores is the ability to reconcile species bearing different names in different countries. North Americans have become weary of hearing that some favorite “endemic” really represents a species originally named in Europe. Vellinga, who received early and extensive taxonomic training in the Netherlands, nicely turns the tables. Last year’s *McIlvainea* readers will recall her lively recapitulation of the discovery that *Lepiota “clypeolaria”* from western North America and what she originally interpreted as Europe’s *L. ventricosospora* turn out to represent Murrill’s *Lepiota magnispora*. Here Vellinga synonymizes three European with three American names. Supplying the full *magnispora* synonymy list (including *ventricosospora* and some *clypeolaria* varieties), she also treats *Leucoagaricus* (<— *Lepiota*) *barssii* (<— the European *pinguipes*, *macrorhizus*, & *pseudocinerascens*) and *Leucoagaricus* (<— *Lepiota* & *Leucocoprinus*) *americanus* (<— the European *bresadolae*).

“*Leucoagaricus viridiflavoides*, a new species from Florida, with notes on related taxa” [Akers, Angels, Kimbrough 2000. *Mycotaxon* 76:39-50; *B&W photos, line drawings, new species description*]. — The authors describe a new *Leucoagaricus* with blue-green bruising yellow flesh, noting its similarities to Sri Lanka’s *L. viridiflava*, Puerto Rico’s *L. “cyanotinctus”*, and the Lesser Antillean *Leucocoprinus* (transferred here to *Leucoagaricus*) *sulphurellus*. The surprising discovery of this species in the most studied region of Florida (Alachua County) “underscores the need for further research on fungi of Florida and also reflects how much more there is to learn about *Lepiota* s.l.”

Earlier ***Agaricus*-related** publications include (i) “The Agaricales of California: 6. *Agaricus*” [Kerrigan. 1986. Mad River Press] and (ii) DNA-based phylogenies by Bunyard, Nicholson & Royle (1996) [*Fungal Genetics and Biology* 20: 243-253]. ... ***Lepiota*-related** publications not previously noted in *McIlvainea* include (i) **type studies** by HV Smith (1966) [*Mycopathology and Mycological applications* 29: 97-117] and Sundberg (1976) [*Mycotaxon* 26: 210-211] and (ii) Smith & Weber (1987) on *L. americana* and allies [*Contributions to the University of Michigan Herbarium* 16: 211-221]. Johnson & Vilgalys [1998. *Mycologia* 90: 971-979] provide a phylogeny that treats *Agaricus*, *Lepiota* s. l. and (see immediately below)

- “*Coprinus* Pers. and the disposition of *Coprinus* species *sensu lato*” [Redhead, Vilgalys, et al. 2001. *Taxon* 50:203-241] & “*Rhacophyllus* and *Zerovaemyces* – teleomorphs or anamorphs?” [Redhead, Seifert, Vilgalys, Moncalvo. 2000. *Taxon* 49:787-798]. — The controversial *Coprinus* paper foreshadowed last year in *McIlvainea* (see Redhead’s “Bully for ...”) is having far-reaching impact. Many workers have grouched that, as broadly conceived, *Coprinus* encompassed just too many contrasting characters – even at the macroscopic level (e.g. species with/without volvas, with/without veils, with/without black spores, with/without auto-digesting gills that are/are not attached). With a key to light the path, the *Taxon* article lists scores of new nomenclatural combinations necessitated by splitting one large genus into four smaller genera. Now transferred to the Agaricaceae, *Coprinus* in the “strict” sense contains only the type (*C. comatus*) and two other species diagnosed by floccose scaled whitish/tan caps, white gills that turn pink before liquefying black, and ringed hollow stipes containing central “strings”. Transferred to the new Psathyrellaceae, three other coprinoid genera include (i) *Coprinopsis*, with *atramentaria*, *cinerea*, *lagopus* and other coprinoids diagnosed by completely hollow stipes and temporary and scaly veils; (ii) *Coprinellus* with *micaceus*, *disseminatus*, and other species diagnosed by globular celled veils or rounded cap cystidia; and (iii) *Parasola* with *plicatilis* and other coprinoids completely lacking veils and having non-liquefying gills. ... Initially *Rhacophyllus* and later *Zerovaemyces* were generic names used for an agaric-like fungus bearing sheets of miniature sclerotium-like bodies in place of lamellae. It turns out that both names apply to the anamorphic (i.e. asexual spore producing) state of a *Coprinopsis* species. Redhead and crew note, “in the case of *Rhacophyllus*, it is not the missing lamellae, or the missing pileus, but the missing hymenium and basidia that support the interpretation of it as an anamorph despite its gross agaricoid appearance, i.e., stipe and pileus. In all these cases [including *Asterophora* & *Ugola*] the “basidiome” initials have been, and can be interpreted as, anamorphs because basidia are absent.” To the pantheon of perfect-imperfect pairs like *Coprinopsis*-

*Rhacophyllus*, the authors add a new ‘anamorphic’ genus *Decapitatus* for the asexual modified “heads” (caps) that fall off *Mycena citricolor* to act as propagules.

See also the proposals by Redhead et al (2001) pertaining to conservation of the name *Psathyrella* with a conserved type [[Taxon](#) 50: 275-277].

#### Brief glimpses: *Coprinus*

“**Morphological variations in oidium formation in the basidiomycete *Coprinus cinereus***” [Polack, Aebi, Kües. 2001. [Mycological Research](#) 105:603-610]. Microphotos & line drawings of asexual spore formation of what some call *Coprinopsis cinerea*.

“**Intraspecific competition in two unit-restricted fungal decomposers, *Coprinus cinereus* and *C. congregatus***” [Schmit. 2001. [Mycological Research](#) 105:112-118]. Zone lines in dead wood are often caused by incompatibility between individuals of the same species. Schmit used isolates from what we would call *Coprinopsis cinerea* and *Coprinellus congregatus* to find out whether interspecific and intraspecific competition function in the same way. They do.

“***Coprinus* species at the Grantley Hall Foray**” [Schafer. 2001. [Field Mycology](#) 2(1):25-28]. — Excellent color photos (with drawings of cap setae and spores) of “*Coprinus*” species now shifted by others to *Coprinellus [callinus, disseminatus]*, *Coprinopsis [cinerea, pachyderma]*, and *Parasola [auricoma, kuehneri]*.

“**Use of *Psathyrella* cf. *hymenocephala* (Coprinoaceae) as a spice in Haiti**” [Paul, Akers. 2000. [Mycologist](#) 14(4): 161-164; B&W photos and drawings, culture “recipe”] — The Haitian spice “djon djon” is found to represent a single species instead of a species mix as previously supposed.

### B. The *Russula* Connection

- “**Systematics of pleurotoid Russulaceae from Guyana and Japan**, with notes on their ectomycorrhizal status” [Henkel, Aime, Miller. 2000. [Mycologia](#) 92:1119-1132; beautiful B&W photos, line drawings, descriptions, DNA trees] & “**A molecular phylogeny of the Russulales including agaricoid, gasteroid and pleurotoid taxa**” [Miller, McClean, Walker, Buyck. 2001. [Mycologia](#) 93:344-354; DNA tree]. — Did you know that there are pleurotoid *Lactarii* and *Russulae* that grow on wood? In their paper on these unusual ‘russulean’ beasts, Henkel and crew accompany up-dated descriptions and photographs of three South American and Japanese pleurotoids (once placed in the now-dismantled *Pleurogala*) with DNA sequences from mycorrhizal tips and mushrooms that help establish the three species as ectomycorrhizal. A comparison with north-temperate non-pleurotoid species on an evolutionary tree shows that the two pleurotoid *Lactarii* cluster with *L. deceptivus* and *L. piperatus* in *Lactarius* while the Guyanan *L. campinensis* is found with *Russula adusta* and *R. romagnesi* on a “weakly supported” *Russula* branch. Steve Miller and coauthors compare 40 agaricoid (*Lactarius*, *Russula*) and epigeous (*Arcangeliella*, *Cystangium*, *Macowanites*) / subterranean (*Gymnomyces*, *Martellia*, *Zelleromyces*) gasteroid species. DNA sequences support two *Russula* subgenera – *Genuinae* (*R. xerampelina* et al.) and *Compactae* (*R. brevipes* et al.) – separated from two other subgenera — *Heterophyllae* (*R. brunneola* et al.) and *Ingratae* (*R. foetentula* et al.). Traditionalists may puzzle over the close relationship between the “milky” *Lactarius piperatus* and “dry” *R. brevipes* and over the shameless cohabitation of gilled and gasteroid genera in one family. Although all may eventually be absorbed into “super”-genera, no such rash action is proposed here.

Earlier pertinent publications include (i) Smith (1971) on Agaricales **origin & evolution** [[Evolution of the higher Basidiomycetes](#) pp. 481-504]; (ii) Bruns et al. (1989) on **mushroom → false-truffle** evolution [[Nature](#) 339: 140-142]; and (v) Redhead & Norvell (1993) on *Pleurogala* [[Mycotaxon](#) 48: 371-380].

- “**Type studies of sequestrate Russulales. I. Generic type species**” [Lebel, Trappe. 2000. [Mycologia](#) 92:1188-1205; line drawings, SEM photos, descriptions]. — *Reminder*: Traditional (“Linnaean”) mushroom taxonomy is a pyramid scheme built upon the type specimen or collection. The “type” ties an individual to a concept (“type description”). Higher level taxa **also** have types, so that there are type specimens for species, type species for genera, type genera for families, type families for orders, and so on. Here the authors examined type specimens of the type species for *Arcangeliella*, *Cystangium*, *Elasmomyces*, *Gymnomyces*, *Macowanites*, *Martellia*, and *Zelleromyces* — sequestrate russuleans evolutionarily linking puffballs or truffles to agarics. Finding the peridium cuticle structure to be a more stable generic character than growth form, sphaerocysts, basidiospores, lactifers, and oleifers (“of little or no use”), they suggest merging

*Martellia* → *Gymnomyces* and *Elasmomyces* → *Macowanites* while redefining *Gymnomyces* and *Cystangium*.

Earlier North American “sequestrate Russulales” related papers include (i) Zeller and Dodge on North American (1919) *Arcangeliella*, *Gymnomyces*, *Macowanites* and (1936) *Elasmomyces*, *Arcangeliella*, *Macowanites* species [*Annals of the Missouri Botanic Garden* 6: 49-59 & 23: 599-638]; (ii) Singer & Smith (1960) [*Memoirs of the Torrey Botanical Club* 21: 1-112] and Smith (1962, 1963) [*Mycologia* 54: 626-639 & 55: 421-441] on the **russulean sequestrates** (called “astrogastraceous secotioid” fungi); (iii) Thiers (1984) on the **secotioid** syndrome [*Mycologia* 76: 1-8]; (iv) Miller (1988) on basidiospore morphology in **hypogeous / gasteroid** Russulales [*Canadian Journal of Botany* 66: 2561-2573]; and (v) Miller & Lebel (1999) on southeastern US *Zelleromyces* species (*Mycotaxon* 72: 15-25). Another current paper analyzing Spanish *Gymnomyces*, *Martellia*, and *Zelleromyces* collections [Calonge, Martin 2000. *Mycotaxon* 76: 9-15] also supports a mixed-up relationship between the hypogeous genera and the epigeous *Russula* and *Lactarius*. Separation of Elasmomycetaceae and Russulaceae is artificial, with *Gymnomyces* and *Martellia* found to be closer to *Russula* than *Zelleromyces*, which is, in turn, closer to *Lactarius*.

ALSO SEE: “**Key to blackening species of *Russula* of section *Compactae***” [Kibby. (2001). *Field Mycology* 2:95-96]. Color photos and microdrawings of *R. nigricans* & *R. anthracina* accompany the key to British and European Russulas (*R. acrifolia*, *R. adusta*, *R. albonigra*, *R. anthracina*, *R. atramentosa*, *R. densifolia*, *R. fuliginosa*, *R. nigricans*).

## C. Other “white”-spored Gilled Fungi

### *Armillaria* Tech-notes

“Use of flow cytometry, fluorescence microscopy, and PCR-based **techniques to assess intraspecific and interspecific matings of *Armillaria* species**” [Kim, Klopfenstein, et al. 2001. *Mycological Research* 105:153-163]. — Studying the *Armillaria* life cycle is fraught with peril, primarily because while most basidiomycetes have two haploid nuclei per cell, the “dikaryotic” stage occurs only briefly in many *Armillaria* species. Using flow cytometry with RFLP analysis to measure DNA content of *A. cepistipes*, *A. sinapina*, and two as-yet undescribed biological species may be an effective answer.

“**A fast method for production of *Armillaria* inoculum**” [Mansilla, Aguín, Sainz. 2001. *Mycologia* 93:612-615]. — Incubation of host-wood rods in benomyl-dichloran-streptomycin produced inoculum in 15 days (opposed to 3 months with the best traditional method), greatly reducing the time needed to test for suspected pathogens.

### *Clitocybe*

- “**Notes on western North American snowbank fungi**” [Redhead, Ammirati, Norvell, Seidl. 2000. *Mycotaxon* 76:321-328]. — Eight years ago, Redhead and cohorts discovered that a common snowbank mushroom, called *Lyophyllum montanum*, had been hanging out in the wrong genus since it was first named. The genus *Lyophyllum* is diagnosed by the presence of microscopic granules in the basidia that are visible after mounting in acetocarmine solution. Unfortunately, the protocol is a tricky one requiring (i) heating (and reheating) a gill in acetocarmine over a flame and (ii) drizzling rust – generally scraped from an iron bolt left out in the rain – into the slurry. Despite shattering numerous watch-glasses over alcohol burners, a generation of mycologists found no granules in their “*Lyophyllum montanum*” basidia. Naturally, they assumed the worst: their acetocarmine was bad, the rust was contaminated, or their methodology sucked. Happily, it turns out that they were getting negative results because there **are** no carminophilous granules to be found in specimens of *montanum*, which, in fact, belongs to a *Clitocybe*. Over-eager western mycologists immediately adopted the proposed new name, *Clitocybe glacialis* (a new species epithet was needed because there already was a *C. montana*), first presented by Redhead’s group on a poster displayed at the 1994 International Mycological Congress. In the paper that makes *Clitocybe glacialis* official, Redhead and cohorts also straighten out another western snowbank species. *Neohygrophorus angelesianus* (<- *Hygrophorus angelesianus*, *Clitocybe mutabilis*) is the type species of a genus reserved for mushrooms having amyloid spores and cap/stipe tissue pigments that change from gray to red in KOH. Here the authors redescribe the type species, place the southeastern US *Clitocybe cokeri* and Algerian *C. umbrina-purpurascens* into Singer’s previously monotypic *Neohygrophorus*, and provide a key to the three species.

- **“Beware of those brown clitocybes! – a new poisonous mushroom in Europe”** [Stijve. 2001. *Field Mycology* 2(3):77-79; *color photos*]. — Tjakko Stijve’s warning to Europeans about the newly discovered toxicity of *Clitocybe amoenolens*, originally described from Morocco, carries with it an alert to North Americans as well. Stijve reports that two victims suffered itching fingers and toes and benumbed hands and feet for two weeks and three others (hospitalized after classic painkillers proved ineffective) felt violent pains in their swollen extremities. Ingesting the Asian “bamboo mushroom” (*Clitocybe acromelalga*) results in violent pain and red fingers and toes for 4-5 weeks, symptoms sometimes accompanied by joint tissue disorders. “... The pains are often so bad that the victim is crying out while rolling over on the ground! Sedatives are not effective; the pain can only be mitigated by placing the hands and feet in running water. Some soothing is achieved by drawing blood from the extremities, and by injecting adenosin triphosphate.” Among North American mushrooms that might contain similar toxins Stijve lists *Clitocybes gibba*, *costata*, *squamulosa*, *sinopica*, *ectypoides*, *americana* and *Lepistas gilva*, *ameliae*, *inversa*, and *flaccida*.

### *Collybia* versus *Dendrocollybia*

- **“Infrageneric phylogeny of *Collybia* s. str. based on sequences of ribosomal ITS and LSU regions”** [Hughes, Petersen, Johnson, Moncalvo, Vilgalys, Redhead, Thomas, McGhee. 2001. *Mycological Research* 105:164-172; *B&W photo, description*]. — After years of being whittled away by perplexed mycologists, it now appears that the genus *Collybia*, in the narrow sense, has reached its final form: all *Collybia* is divided into three species. The once proud genus of teeming scores of species (now found in *Gymnopus*, *Rhodocollybia*, *Flammulina*, *Callistosporium*, *Caulorhiza*, inter al.) has just lost one last species — *racemosa*. Those used to species being jettisoned from a genus for cause should have no difficulty accepting the transfer of *C. racemosa* to a new monotypic genus, *Dendrocollybia*. The erection of a new genus is also justified by differences you can see: *Collybia tuberosa* (the type species of *Collybia* with fusiform-ellipsoid, red-brown, ~shiny sclerotia), *C. cookei* (with irregular yellow-orange matte sclerotia), and *C. cirrhata* (without sclerotia) lack the distinctive side-branches on their stipes that gives *D. racemosa* its species name. They also are generally found on blackened mummified host mushrooms, while hosts of *D. racemosa* are almost never observed. The authors suggest that *D. racemosa* mushrooms have a different enzymatic system that leads to a quick digestion (rather than mummification) of the host mushroom.

### *Flammulina*

- **“*Flammulina* RFLP patterns identify species and show biogeographical patterns within species”** [Methven, Hughes, Petersen 2000. *Mycologia* 92: 1064-1070]. — Where have Enoki-take and her sisters wandered? Intrigued by the fact that the originally monotypic *Flammulina* now encompasses eight species (and counting), Methven and colleagues decided to track DNA differences in specimens representing the type of the genus, *F. velutipes*. They suggest that division of the species into three major molecular lines (“haplotypes”) may have been caused by ancient native populations separated long enough for DNA mutations to become established throughout large populations over surprisingly wide geographical areas. In North America there are two lines: the midwestern/eastern *F. velutipes* BD haplotype and the western BC haplotype (also found in eastern Asia). Haplotype AD is found in Europe, South America, and Tasmania-New Zealand; and of particular interest is the suggestion that a little prurient *velutipes* hybridizing has occurred in Argentina and Austria. Haplotype AD’s failure to appear in North America (despite extensive sampling) suggests that Europe → North America spore dispersal may not occur or may occur extremely rarely and that human activity has not introduced AD to this continent. (It’s also possible that the AD haplotype occurs very rarely and has not yet been detected.)

*Flammulina velutipes* is one of the most popular edible fungi in Japan, so it is not surprising that there is much written on its growth, development, and genetic-make-up. Six months worth of papers include: (i) Kitamoto et al. (2000) on oidium formation from dikaryotic mycelia [*Mycoscience* 41: 417-423]; (ii) Kitamoto et al. (2000) on mycelium & fruit-body metabolism during development [*Mycoscience* 41: 461-466]; (iii) Kitamoto et al. (2001) on glycogen phosphorylas & trehalose phosphorylase function in fruit-body formation [*Mycoscience* 42: 143-148]; (iv) Sakamoto et al. (2001) on differential protein expression in the fruiting dikaryons & non-fruiting monokaryons [*Mycological Research* 105: 177-182]; and (v) Song, Jeong, & Choi (2000) on identifying nitric oxide synthase in *F. velutipes* [*Mycologia* 92: 1027-1032].

### *Hygrophorus and allies*

- “**Hygrophoraceae of the Greater Antilles: *Hygrocybe* subgenus *Hygrocybe* section**” [Cantrell, Lodge. 2000. Mycological Research 104:873-879], “**Hygrophoraceae of the Greater Antilles: *Hygrocybe* subgenus *Pseudohygrocybe* section *Firmae***” [Cantrell, Lodge. 2001. Mycological Research 105:215-224; *both with line drawings, key to subgenera and species, & species descriptions*], & “**Fungal portraits: *Hygrocybe psittacina***” [Kibby. 2001. Field Mycology 2(1):3-4; *excellent color photo and discussion*].

*Camarophyllopsis*. *Camarophyllus*. *Cuphophyllus*. *Gliophorus*. *Hygrocybe*. *Humidicutis*. *Neohygrophorus*. *Pseudohygrocybe*. What on earth happened to good old *Hygrophorus*? It’s turned into an order (Kovalenko 1989) or at the very least a family (Arnolds 1985, Singer 1986, Dictionary of Fungi 1995), that’s what! While evolutionary biologists are still working out the order versus family versus clade controversy, there is general agreement that the old all-inclusive genus *Hygrophorus* just won’t do. Fortunately even the most conservative mushroomers seem to have accepted (and more importantly recognize) that the colorful *Hygrocybe* is different from *Hygrophorus* (which still exists with a goodly number of species). Can grudging acceptance of the seemingly unpronounceable *Cuphophyllus* be far behind? (Probably.)

Kibby’s photo juxtaposes the brilliant orange-yellow and bright blue-green forms of the variable but always colorful *Hygrocybe psittacina*. The two Cantrell and Lodge papers provide an insight into the colorful hygrocybean horde that is one of the main-staples of the neotropical rain forest. Mainlanders will find useful descriptions of fungi that also occur in more temperate forests as well. The first paper describes and keys *Hygrocybe acutoconica*, *H. calyptiformis* var. *dominegensis* (new), *H. conica* var. *brevispora*, *H. incolor*, and *H. konradii* var. *antillana* (new). The second paper describes and keys new species *Hygrocybe brunneosquamosa*, *H. cinereofirma*, *H. flavocampanulata*, *H. laboyi*, *H. miniatofirma*, *H. neofirma*, and *H. olivaceofirma* as well as earlier described *H. chloochlora*, *H. hyphoemacta*, *H. occidentalis* vars. *occidentalis* & *scarletina*, *H. prieta*, and *H. trinitensis*.

Hygrophoraceous books and papers include (i) Hesler & Smith’s 1963 monograph North American species of *Hygrophorus*; (ii) Largent’s 1985 “5. Hygrophoraceae” (Agaricales of California); (iii) Arnold’s 1986 “Notes on *Hygrophorus*” [Persoonia 13:137-160]; (iv) Laursen, Ammirati, & Farr (1987) on Alaskan species [Arctic and Alpine Mycology II]; (v) Arnold’s 1990 treatment in Flora Agaricina Neerlandica [2:70-111]; (vi) Lodge & Pegler (1990) on species from Puerto Rico [Mycological Research 94:443-456]; (vii) Arnold (1995) on species from New York [Mycotaxon 53:1-27]; (viii) Boertmann’s 1995 The genus *Hygrocybe* [Fungi of Northern Europe: 1]. Note that *Neohygrophorus* is covered in the *Clitocybe* discussion above.

### *Mycena (& *Hydropus*)*

- “**The ontogeny of the fruit bodies of *Mycena stylobates***” [Walther, Rexer, Kost. 2001. Mycological Research 105:723-733; *rather spectacular B&W photos and line drawings depicting the step-by-step development of a *Mycena* from primordium to mature specimen*] — *Mycena stylobates* is a fairly common, very small grayish-buff *Mycena* found on leaf and twig litter and sword ferns in shady forests or on dead leaves of sedges and grasses in damp depressions in temperate North America, Europe and Africa. It belongs to section *Basipedes*, limited to species producing small, flat circular discs at stipe bases attach mushrooms to substrate. Although at least one mycologist (Kavina 1928) interpreted the basal disc as a volval remnant, most consider it a holdfast. Here the authors provide spectacular B&W photos or drawings to depict the step-by-step development from primordium to mature specimen while guiding the reader through the process in easy to understand language to explain formation of certain key features. Covered here are the bending inwards of cap margin, formation of a ring-like cavity between young pileus, basal disc, and stipe initial, gelatinization of cap hyphae, gill formation, and stipe elongation. The authors also discuss the usual developmental terms (notoriously turgid and incomprehensible to anyone lacking a glossary) and note the lack of a known term describing development of the ‘primary veil’ found in *M. stylobates*. Noting that other authors (Singer, Agerer) have suggested a relationship between cyphelloid and agaricoid mushrooms, they somewhat intriguingly conclude that a *M. stylobates* fruitbody might represent an assembly of several cyphelloid fruit bodies, arranged in a circle around the central stipe.

Other *Mycena* publications cited include (i) Smith's 1947 North American species of *Mycena*; (ii) Redhead (1981) on Canadian species on wetland monocots [Canadian Journal of Botany **59**: 574-589]; and (iii) Maas Geesteranus's 1992 Myccenas of the northern Hemisphere.

**See also: "Cultural properties of a luminous mushroom, *Mycena chlorophos*"** [Niitsu, Hanyuda, Sugiyama. 2000. Mycoscience 41:551-558] & **"Fruit-body production of a luminous mushroom, *Mycena chlorophos*"** [Niitsu, Hanyuda. 2000. Mycoscience 41:559-564]. Both papers present nifty color photos of a southeast Asian mushroom.

**"*Hydropus floccipes*"** [Pegler, Legon. 2001. Mycologist 15:60]. Mention of this British collection (shown in a good color photo) is included to remind you that *Hydropus* contains species once treated in *Mycena*.

### ***Panellus & Pleurotus***

- **"Biogeographical patterns in *Panellus stypticus*"** [Jin, Hughes, Petersen. 2001. Mycologia 93:309-316]. — *Panellus stypticus* glows in the dark in eastern North America but remains invisible in the dark in Europe or the west. In 1942, Ruth Macrae discovered that luminescence was controlled by a single dominant gene allele. Since then numerous mating studies showed that all European and North American populations were intercompatible. Here DNA-sequence data from 67 North American, Eurasian, Australian, and New Zealander collections revealed two eastern North American and European haplotypes, each one separate from Pacific rim (North America, Asia) haplotypes. This leads to the speculation that current fungal species were already established before the separation of the northern super-continent, Laurasia, from Pangaea.

Earlier *Panellus* publications include papers by (i) Macrae (1942) on inheritance of luminescence [Canadian Journal of Research C20:411-434]; (ii) Miller (1970) on North American species [Michigan Journal of Botany 9:17-30]; (iii) O'Kane (1990) on location of bioluminescent tissues during basidiocarp development [Mycologia 82:595-606]; and (iv) Petersen & Bermudes (1992) on geographically separated interbreeding populations [Mycologia 84:209-313]. (Note: Those of you still placing "*serotinus*" in the genus *Panellus* may find that species under *Sarcomyxa serotina* in the index of newer field guides.)

- **"Phenetic plasticity in *Pleurotus djamor*"** [Nicholl, Petersen. 2000. Mycotaxon 76:17-38]. — *Pleurotus djamor* fruiting bodies from widely separated regions may look different; but just when do "strains" become "species"? The authors relied on morphological characters and mating studies to determine whether independent species are concealed with *P. djamor* strains (evolutionary relationships within the complex were not examined). Strains, which are treated as the same biological species if they mate compatibly in a petri dish (no matter that New Zealander and North American strains will never meet in the "real world" without human interference), might be called different morphological species when they are physically distinct. Here morphological characters and mating studies were used to discern whether independent species lurk within some *P. djamor* strains. Is a dark brown primordium and non-hygrophanous pileus different enough to elevate a New Zealand strain to a morphological species? Or a phenetic species when the mating behavior + morphological characters produce separate branches on a computer-generated phenogram? The authors – who did not find enough support to recognize any strains as biological, morphological, or phenetic species – suggest that strains may be in the act of becoming species, given the tendency for collections from the same broad area to cluster together (with some outlandish interference) in their phenograms. In addition to "biological" trees, Nicholl and Petersen provide a nicely amended description of *Pleurotus djamor*.

### ***Tricholoma* Tech-notes**

**"Rapid in vitro ectomycorrhizal infection in *Pinus densiflora* roots by *Tricholoma matsutake*"** [Guerin-Laguette, Vaario, et al. 2000. Mycoscience 41:389-393; *color photos*]. — Pine roots inoculated and incubated in forest soil without adding carbohydrates were colonized by fungal hyphae after one week and formed a Hartig net after only four weeks. Not bad!

**"Detection of *Tricholoma matsutake* by specific ITS primers"** [Kikuchi, Matsushita, et al. 2000. Mycological Research 104:1427-1430]. The presence of matsutake – whether associated with shiro soil, mycorrhizal root tips, mycelium, or fruitbodies – can now be confirmed using polymerase chain reaction (PCR) typing.

## D. Cortinarioids Redux

- **“Phylogenetic relationships within *Cortinarius* subgenus *Myxacium*, sections *Defibulati* and *Myxacium*”** [Seidl. 2000. *Mycologia* 92(6): 1091-1102; *DNA trees*] & **“*Cortinarius vernicosus*: a new spring species of subgenus *Myxacium* from Washington State”** [Seidl. 2000. *Mycotaxon* 76: 113-124; *B&W photos & SEMs*]. — Austria’s Meinhard Moser, the world’s “cort” expert, divides the largest agaric genus into seven subgenera (*Cortinarius*, *Dermocybe*, *Leproclybe*, *Myxacium*, *Phlegmacium*, *Sericeocybe*, *Telamonia*). *Myxacium* “slime balls” have a gelatinous sheath covering both cap and stipe. In sequencing 23 species representing all seven *Cortinarius* subgenera, Michelle Seidl targeted 10 species in two *Myxacium* sections separated by the presence (*Myxacium*) or absence (*Defibulati*) of clamp connections. Her data suggest that sections *Defibulati* and *Myxacium* share a common ancestor (i.e., they are “monophyletic”) but that three other glutinous species (*C. delibutus*, *C. salor*, *C. vibratilis*) from different ‘*Myxacium*’ sections do not. As it appears that the presence of a glutinous outer veil alone is not enough to diagnose a subgenus, Seidl proposes restricting *Myxacium* to demonstrably related sections *Defibulati* and *Myxacium*. Her analyses also support the hypothesis that *Dermocybe* is a subgenus of *Cortinarius* and not stand-alone genus in its own right. ... Seidl’s newly named *Cortinarius vernicosus* (included in the above analyses in section *Myxacium* as “*vernus* nom. prov.”) has a slimy foxy cap, a slimy white cylindrical stipe, and violet young gills, and fruits in the spring in disjunct western and eastern Washington mature to old-growth conifer forests.

See also Liu, Rogers, & Ammirati’s paper on the DNA sequence-based phylogeny of *Dermocybe* and related cortis [1997. *Canadian Journal of Botany* 75: 519-532].

- **“DNA studies in the *Galerina marginata* complex”** [Gulden, Dunham, Stockman. 2001. *Mycological Research* 105:432-440; *DNA trees*]. — To slime or not to slime, that is the question. Or, is that slime merely a wet mushroom cap you’re looking at? Most North American field guides tend to think they’ve “done” *Galerina* when they display *G. autumnalis*, a small, mycenoid, annulate, tawny-capped, brown-spored mushroom that — ounce for ounce — packs more toxin in its tissue than the deadly destroying angel. European field guides, however, display a toxic look-alike, *G. marginata* (also recorded from North America). Both mushrooms are the heftiest representatives of an otherwise “wimpy” genus. They look almost identical except that *G. marginata* lacks a viscid pileus. Or does it? As the authors point out, “viscosity is a notoriously difficult character to assess because it varies with the age of the fruit-body and the weather conditions during its development. Varying degrees of viscosity tend to be described differently and applied inconsistently by different persons applying terms such as lubricous, fatty, fatty-shiny, sticky, viscid, glutinous, or (somewhat) slimy.” The tacky lip test used by perplexed collectors in dry weather wherein a cap sticking to the inside of a lip is assumed to be innately viscid is generally ineffective when it comes to small, shriveled, fragile specimens. Recourse to DNA analysis and evaluation of anatomical differences prompted the authors to synonymize five species under one name, *Galerina marginata*. Sunk in synonymy are *G. autumnalis*, *G. oregonensis*, *G. unicolor*, and *G. venenata* (the last the mushroom that caused two poisonings in Portland, Oregon, which in turn produced the research flurry that exposed the deadly potential of this group. Many who have tried to differentiate these five species based on fine character differences will applaud, but the remaining North American contingent will view the loss of the name “*autumnalis*” marginal, at best.

Earlier *Galerina* publications include the (i) 1964 Smith & Singer 384-page **world** monograph published by Hafner; (ii) Wells & Kempton 1969 study of **Alaskan** species [*Lloydia* 32: 369-387]; (iii) 1992 Horak & Miller study of **Alaskan** and **Yukon** species [*Canadian Journal of Botany* 70: 414-433]; (iv) *Galerina* section in Watling’s 1993 **British** Cortinariaceae [British Fungus Flora/ Agarics and Boleti: 7, Royal Botanic Garden Edinburgh]; (v) 1996 Horak, Desjardin, and Hemmes’ study of **Hawaiian** species [*Mycologia* 88: 278-294]; (vi) studies of *Galerina* and *Phaeogalera* in the **Faroe Islands** [Gulden & Versterholt. 1999. *Nordic Journal of Botany* 19: 685-706; *color photos*] and **Iceland** [Gulden & Hallgrímsson. 2000. *Acta Bot. Isl.* 13: 3-54]; and (vii) Breitenbach & Kränzlin’s 2000 indispensable *Fungi of Switzerland* V. **NOTE:** Because the world monograph is 40 years old, you can’t be too picky: all the others have useful keys, descriptions, and illustrations.

- **“A revision of the *Inocybe lanuginosa* group and allied species in North America”** [Matheny, Kropp. 2001. *Sydowia* 53:93-139; *phenograms, photos, line drawings, key, descriptions*]. — All leave the *Inocybe* in the forest, save the stouthearted few actually able to differentiate the smooth white *I. geophylla* and purplish sister species/variety *I. lilacina*, the blushing *I. pudica*, the “spermatic” *I. fastigiata*, the “green-corn” *I. sororia*, the teeny shaggy mop-top *hystrix*, the unpronounceable purple *I. tahquamenonensis*, and

the fuzzy brownish-black wood-loving *I. lanuginosa*. Europeans (Fries, Britzlmayr, Pearson, Masee, Bresadola, Heim, Kühner, Favre, Moser, Alessio, Horak) have all had their crack at this difficult genus. Kuyper's 1986 revision of European smooth-spored *Inocybes* and Stangl's 1989 compendium of Bavarian species caused no little consternation to North American *Inocyboscenti* when they discovered the blushing *I. pudica* should hence-forth be called by a misnomer, "whitei", that *fastigiata* (and probably *sororia*) and a whole host of other "fiber heads" are really "*rimosa*", and that *lanuginosa* was in a fearful muddle. That North America's only *Inocybe* monograph was written by CH Kauffman in the early 20<sup>th</sup> century and that Washington state's DS Stuntz devoted over 40 years to *Inocybe* and died before completing his monograph are also not particularly reassuring. *Inocybe* is NOT an easy genus, even for those who dedicate their lives to her.

In the current paper, Matheny and Kropp spent two years of anatomical and molecular research untangling the *lanuginosa* complex. Those previously secure in calling any blackish tufted *Inocybe* hanging out on a rotting log *lanuginosa* will be disheartened to learn now about *leptophylla*, *stellatospora*, and *teraturgus*. Carefully evaluating different morphologies and different sequences 425 North American and European collections of dark brown squarrose-scaly capped, dark shaggy stiped, and nodulose lumpy spored *inocybes*, the authors discovered four species – (i) the tan gilled, pleurocystidiate *lanuginosa* (restricted to rotten woody substrates near conifers in both Europe and North America (<– *ovatocystis*, *nodulospora*); (ii) the occasionally terrestrial *leptophylla* with larger, more highly nodulose spores and no pleurocystidia; (iii) the typically terrestrial *stellatospora* with shaggy squamulose cap and stipe, *lanuginosa*-like spores, and non-*lanuginosa*-like cystidia (<– *longicystis*); and (iv) the Scandinavian and Great Lakes sphagnum-loving *teraturgus* with larger spores and pleurocystidia. The authors also "epitypify" *I. lanuginosa* (previously typified only by an 18<sup>th</sup> century Bulliard painting) with real live dead mushrooms and discuss the eastern North American tiny brown shaggy *diminuta*, soil-loving brown shaggy *subcarpta*, and purplish shaggy *I. tahquamenonensis*. We await with anticipation new *inocybean* insights: can a twenty-first century North American *Inocybe* monograph be far behind?

Earlier work on North American *Inocybes* includes "new and noteworthy" papers by (i) **Kauffman** [1918 (first North American monograph) – North American Flora 10:227-260, Papers of the Michigan Academy of Science, Arts, and Letters (Oregon) 1925 – 4:311-344 & 1930 – 11:151-210]; (ii) **Stuntz** [1947 (Washington) – Mycologia 39:21-55]; 1954 (Michigan) – Papers of the Michigan Academy of Science, Arts and Letters 39:53-84]; (iii) **Smith & Stuntz** (Mt Rainier) [1950 – Mycologia 42(1):80-135]; (iv) **Grund and Stuntz** (Nova Scotia ± western US) [Mycologia 1968 – 60:406-425; 1970 – 62:925-939; 1975 – 67:19-31; 1977 – 69:392-408; 1980 72:670-688; 1981 – 73:655-674; and 1983 – 75:257-270]; (v) **Nishida** (California) [Mycotaxon 1988 – 33: 213-222 & 1989 – 34: 181-196]; and (vi) **Cripps** (Montana) [1997 – Mycologia 89(4):670-688].

ALSO NOTE: "Molecular data confirm *Setchelliogaster tenuipes* and *S. reophylla* as Cortinariales" [Martin, Moreno. 2001. Mycotaxon 78:257-264; B&W spore/cystidia photos] — Analyses contradict placing *Setchelliogaster* in the Cribbiaceae, Crepidotaceae, Secotiaceae, or Bolbitiaceae. The authors propose *S. reophylla* as a variety of *S. tenuipes*.

## E. Other Brown-spored Genera

- "A revision of some *Crepidotus* species related to Mexican taxa" [Bandala, Montoya. 2000. Mycological Research 104:495-506; *microdrawings, SEM photos, descriptions*]. — Range extensions into Mexico and/or proposed new synonyms uncovered by the authors' continuing reevaluation of this brown-spored pleurotoid genus include the vivid, cinnabar-colored *Crepidotus cinnabarinus* (also known from eastern Canada and USA), the yellow to orange *C. croceitinctus* (<– *C. subcroceitinctus*), the nondescript white *C. palmarum* (<– *C. luridus* + two varieties that grow on wood, not palm leaves), and *C. quitensis* (<– *C. carpaticus*, *C. harperi* (+ var. *minor*), *C. unicus*, and *C. wakefieldii*). The two authors retain *C. croceitinctus* and *C. macedonicus* as separate species based on differences in cap cuticle and cheilocystidia and the presence of granular gill edges and paler coloration in *C. macedonicus*.

In addition those noted in McIlvaine in 2000, early North American *Crepidotus*-related publications include Hesler & Smith's 1965 monograph, Bigelow's 1980 "*Crepidotus nyssicola*" (Mycologia 72: 1227-1231), and Luther & Redhead's 1981 "*Crepidotus cinnabarinus* in North America" [Mycotaxon 12: 417-430]. Pertinent European publications by Senn-Irlet (Switzerland), Pilát (eastern Europe), and Nordstein (Norway) may also be consulted.

- “*Stropharia albivelata* and its basionym *Pholiota albivelata*” [Norvell, Redhead. 2000. Mycotaxon 76:315-320]. The reason the Northwest Forest Plan-cited *Pholiota albivelata* might have been considered rare is that field workers with a *Pholiota* search image simply ignored this *Stropharia hornemannii* look-alike. Spiny crystalline acanthocytes that diagnose the genus *Stropharia* were found on recently collected *albivelata* mycelia, showing that once again spore print color can lead you astray. We dismantled *Pholiota* Section *Albivelatae* and transferred both *P. albivelata* and *P. cubensis* to *Stropharia*. We named the latter species *earlei* (in honor of Earle, its first discoverer) because the name *S. cubensis* had already been used for the infamous species known today as *Psilocybe cubensis*.

## F. A Mini-MycoFlora

- “**Studies on Gulf Coast agarics** (Basidiomycota: Agaricaceae): notes on some interesting and rare species.” [Lewis, Cibula. 2000. Texas Journal of Science 52(4-Supplement):65-78]. A mushrooming survey of forests in the Texas/Mississippi Gulf Coastal plain temperate—> subtropical transition zone provides new insights into and descriptions of *Hygrophorus firmus* var. *trinitensis*, *H. mississippiensis*, *Amanita hesleri*, *A. levistriata*, *Lactarius petersenii*, *Oudemansiella canarii*, *Boletus albisulphureus*, *Fistulinella jamaicensis*, and *Rhizopogon baxteri*.

## II. NON-GILLED BASIDIOMYCETES

### A. Boletales

- “**Biology of the ectomycorrhizal genus *Rhizopogon***. V. Phylogenetic relationships in the Boletales inferred from LSU rDNA sequences” [Grubisha, Trappe, Molina, Spatafora. 2001. Mycologia 93: 82-89]. — Mulling over the various gene trees generated by molecular mycologists can be fascinating. Consider the false-truffle, *Rhizopogon*, long recognized as belonging in the Boletales as a sister genus to the tubed *Suillus*. This paper suggests that there are two different lines (termed “radiations”) in the order: the **boletoid** radiation (represented by *Boletus*, *Tylopilus*, *Boletellus*, *Xerocomus*, *Alpova diplophloeus*, and *Melanogaster*) and the **suilloid** radiation (represented by *Chroogomphus*, *Gomphidius*, *Suillus*, *Truncocolumella*, *Alpova olivaceotinctus*, and *Rhizopogon*). Contrary to previous findings, *Suillus* is not a sister group to *Rhizopogon* but more closely related to *Truncocolumella* and the Gomphidiaceae. The Oregon team also found that, as broadly circumscribed, *Alpova* contains species descended from different ancestors (hence its appearance above in both radiations). The authors recommend returning *A. olivaceotinctus* to *Rhizopogon* where Smith originally placed it.

Earlier publications include papers or books by (i) Zeller (1949) with keys to **gastromycetes** [Mycologia 41:36-58]; (ii) Smith & Thiers’ 1964 ***Rhizopogon*** monograph [Ann Arbor]; (iii) Trappe (1975) on the genus *Alpova* and *Rhizopogon* [Beiheft Nova Hedwigia 51:279-309]; (iv) Miller & Miller (1988) ***Gastromycetes: morphology and developmental features*** [Mad River Press]; (v) Castellano et al. (1989) ***Key to spores of the genera of hypogeous fungi*** [Mad River Press]; (vi) Kretzer & Bruns (1997) on DNA-based analysis of *Gastrosuillus* [Mycologia 89:586-589].

- “**Molecular and anatomical evidence for a three-way association between *Pinus sylvestris* and the ectomycorrhizal fungi *Suillus bovinus* and *Gomphidius roseus***” [Olsson, Münzenberger, Mahmood, Erland. 2000. Mycological Research 104:1372-1378; *illustrations, keys, descriptions, DNA trees*]. — In Europe, *Suillus bovinus* and *Gomphidius roseus* always fruit together. DNA probes and microscopical exams show that pine tuberculate mycorrhizas are mixed associations involving both mushroom species. *Suillus*-like tuberculate mycorrhizas, found to contain typical asexual spores of *G. roseus*, bore haustoria from *G. roseus* hyphae penetrating cortical root cells, *Suillus bovinus* rhizomorphs were collected under *G. roseus* fruit bodies, and mycelium representing both species were present at the base of *G. roseus* fruit bodies. In puzzling out the meaning of all this, the authors raise the possibility that *G. roseus* might be a fungal parasite. Stay tuned!

### B. The Gomphales

- “**Molecular phylogenetics of *Ramaria* and related genera**: evidence from nuclear large subunit and mitochondrial small subunit rDNA sequences” [Humpert, Muench, et al. 2001. Mycologia 93:465-477]. — Sequence data have nudged the colorful, highly branched *Ramarias* into the Gomphales with *Clathrus*,

*Clavariadelphus*, *Gautieria*, *Gomphus*, *Hysterangium*, *Kavinia*, and *Pseudocolus*. This Oregon research team sequenced DNA from 34 *Ramaria* and 44 other specimens to tease out ramarian generic, subgeneric, and species concepts. Four *Ramaria* subgenera include: (i) the striate-spored, clamped, terricolous large, cauliflower-like *Ramaria* (e.g. *R. botrytis*); (ii) the smooth/warty spored, clamped/unclamped, terricolous *Laeticolora* (e.g. *R. formosa*); (iii) the spiny-spored, clamped, duff-inhabiting *Echinoramaria* (e.g. *R. cyanocephala*); and (iv) the smooth/warty spored, lignicolous/duff-inhabiting *Lentoramaria* (e.g. *R. stricta*). (As you may have guessed, *Ramaria*, as we have known it, contains several different lineages: not all “ramarias” share a common “grandparent”.) Contrary to an earlier view aligning *Gautieria* with *Chamonixia* (a bolete ally), the former subterranean false puffball is allied here with *Ramaria* subg. *Ramaria* species. Stinkhorn species sampled appear closer to the Gomphales than to the *Bondarzewia-Favolus-Ganoderma-Lactarius-Russula* outgroup. Further testing of *Ramaria amyloidea*, *R. araiospora*, *R. celerivirescens*, and *R. stuntzii* implied that highly branched shapes and lignicolous habits developed before non-branching shapes and terricolous habits (contrary, respectively, to the 1971 Petersen and 1973 Marr & Stuntz hypotheses). The new DNA trees show cantharelloid, club, resupinate, and sequestrate morphologies evolving independently.

Keys and/or descriptions of North American *Ramaria* species can be found in (i) *Ramaria* of western Washington [Marr & Stuntz 1973]; (ii) Corner’s 1966 Species of *Ramaria* without clamps & 1967 A monograph of *Clavaria* and allied genera; (iii) the Petersen series (some with junior authors) in American Journal of Botany [1974 (61:739-748), 1976 (63:309-316)], J. Elisa Mitchell Scientific Society [1974 (90:66-68)], Nova Hedwigia [1979 (31:25-38)], Canadian Journal of Botany [1986 (64:1786-1811)], Karstenia [2000 (40:139-142)], Mycologia [1967 (59:767-802), 1985 (77:903-919), 1988 (80:223-234)], Mycotaxon [1988 (33:101-144)], Persoonia [1989 (14:23-42)]; Sydowia [1982 (35:176-205), 1987 (40:197-226)] as well as his 1975 *Ramaria* subg. *Lentoramaria* with emphasis on North American taxa & 1981 *Ramaria* subg. *Echinoramaria*; and (iv) Scate’s 1981 Pacific Northwest Key Council Trial key to the species of *Ramaria* in the Pacific Northwest.

### C. Polypores

- **“Update on Roger Phillips’ *Mushrooms and other fungi of Great Britain & Europe*. Part 1: Aphyllophorales, Gasteromycetes & Jelly Fungi”** [Henricki. 2001. Field Mycology 2:90-93]. — An invaluable resource for anyone using Phillips’ 1981 tome, these nomenclatural updates will also help users of Phillips’ 1991 North American guide. Taxonomic revisions should be particularly reliable, for Henricki or others have actually “scoped” all dried specimens, correcting both descriptions and photos in the process. Phillips himself should be commended, not only for retaining vouchers of all specimens he photographed but also for encouraging the revision. Would that all field guide authors would take both photo *and* specimen. Let us pray that the old days of “photo and throw” are coming to an end.

#### ~ Briefly noted ~

**“Molecular phylogeny of species in the genera *Amylostereum* and *Echinodontium*”** [Tabata, Harrington, Chen, Abe. 2000. Mycoscience 41:585-593]. Evolutionary trees generated from two different DNA regions from 4 coniferous “corticoids” (*A. areolatum*, *A. chailletii*, *A. laevigatum*, *A. ferreum*) indicate that *Amylostereum* should be placed not in the *Stereum*, but in Donk’s 1961 *Echinodontium*, family

**“Notes on British *Ganoderma* species”** [Mattock. 2001. Field Mycology 2:60-64.] A useful key couplet to help distinguish two groups accompanies descriptions and color photos of *G. pfeifferi*, *G. resinaceum*, and *G. carnosum*. — **“Stipes and spores in two British *Ganoderma* species”** [Ainsworth. 2001. Field Mycology 2:64-65]. B&W photos highlight a comparison of *G. lucidum* & *G. resinaceum*.

**“Phylogenetic relationships of *Hapalopilus* and related genera inferred from mitochondrial small subunit ribosomal DNA sequences”** [Ko, Jung, Ryvardeen. 2001. Mycologia 93:270-276]. DNA sequence-based trees comparing 13 polypores (including *Hapalopilus albocitrinus* & *H. mutans* from the US) with 54 other species suggest that circumscribing polypores based on hyphal structure alone (mono- versus dimittic) will lead to artificial “polyphyletic” (descended from mixed ancestors) genera.

**“Mitochondrial control of fungal hybrid virulence”** [Olson, Stenlid. 2001. Nature 411(24 May):438] — Mitochondria control the degree of virulence in hybrids of *Heterobasidion annosus*, a costly forest pathogen that causes root-butt rot in conifers.

**“A highly diverse population of *Heterobasidion annosus* in a single stump of *Picea abies*”** [Swedjemark, Stenlid. 2001. Mycological Research 105:183-189]. Comparisons of 296 isolates from a sliced spruce trunk +

roots revealed 27 “genets” (individuals) restricted to the upper stump with 12 found only in the roots. It’s hard work evolving from a saprotroph to a parasite!

“**Morphology, rate and spatial density of seta differentiation** during *in vitro* development of the fruit body of *Phellinus contiguus*” [Butler. 2000. Mycological Research 104:1493-1500; *B&W photos and line drawings*]. Eavesdropping on the growth of this resupinate polypore on agar, Butler discovered that light exposure triggers formation of hairlike setae (projecting sterile, pointed, thick, brown-walled hyphal ends).

“**Outcrossing or inbreeding:** DNA markers provide evidence for type of reproductive mode in *Phellinus nigrolimitatus*, *Basidiomycota*.” [Kausrud, Schumacher. 2001. Mycological Research 105:676-683]. Matings show one thing; molecular tests another. Turns out that traditional single-spore-isolate pairings may not provide reliable enough data on fungal reproduction in the natural environment.

“**Fungus ashes and tobacco: the use of *Phellinus igniarius* by the indigenous people of North America.**” [Blanchette. 2001. Mycologist 15:4-9; *color/B&W photos*]. Colorful Alaskan Inuit boxes once held ashes for mixing with tobacco to give it a ‘powerful kick’.

“**Studies in neotropical polypores 8. Poroid fungi from Jamaica:** a preliminary check list” [Ryvarden. 2000. Mycotaxon 76:349-360]. Ryvarden lists 119 polypores (42 new to Jamaica) and describes the new *Trametes tyromycoides*. North Americans wondering what separates one pored turkey-tail from another should seek out this key to 19 neotropical *Trametes* species, for it includes the temperate *T. ectypus*, *T. elegans*, *T. maxima*, *T. membranacea*, *T. modesta*, *T. pavonia*, *T. villosa*, and *T. versicolor*.

“**Studies in Neotropical polypores 12. New and noteworthy polypores from Mexico**” [Ryvarden, Guzmán. 2001. Mycotaxon 78:245-256]. Included in the keys to neotropical *Antrodiella* and *Tyromyces* species are the new *Antrodiella tuberculata*, *Tyromyces mexicanus*, and *T. subviride*.

“**Some Aphyllophorales tested for organic dyes**” [Cedano, Villaseñor, Guzmán-Dávalos.” 2001. Mycologist 15:81-85]. Dyeing protocols and a list of colors obtained (with/without mordants) accompany excellent color photos of *Albatrellus cristatus*, *Coltricia perennis*, *Ganoderma applanatum*, *Gloeophyllum sepiarium*, *Phellinus gilvus*, *Pycnoporus sanguineus*, *Trametes maxima*, *T. versicolor*.

#### D. Crusts, Paints, & Jellies

- “**Phylogenetic analyses of *Aleurodiscus* s.l. and allied genera**” [Wu, Hibbett, Binder. 2001. Mycologia 93:720-731]. — This wood-perching corticioid-cup genus contains such common North American species as *A. amorphous* (an early “crown” invader of dead and dying fir branches) and *A. oakesii* (found on living bark in eastern North America). As you might expect, the recent allocation of many species into “new” genera (—> *Acanthobasidium*, *Acanthofungus*, *Acanthophysellum*, *Aleurobotrys*, *Aleurocystidiellum*, *Gloesoma*) based on “hidden” characters has been controversial. The new genera have been segregated based on spore ornamentation, presence/absence of acanthophyses, presence/absence of clamp connections, and phenoloxidase reactivity. This DNA-based reevaluation of *Aleurodiscus* limits and segregation implies that all “aleurodiscoids” (species with pink to orange hymenia) descend from the same ancestor as *Stereum* and *Xylobolus*, making them ripe for inclusion in a common family, the *Stereaceae*. Here the type species of *Corticium* (*C. roseum*) does **not** share the same ancestor, so that there is support for two separate and independent families, the *Stereaceae* and *Corticaceae*. *Acanthobasidium*, *Aleurocystidiellum*, and the smaller, post-segregated *Aleurodiscus* are supported as valid independent genera, but the others listed above are suspect (Turns out that the listed characters aren’t as useful as some hoped). Although a gray to white hymenium is probably a “primitive” (more properly, “plesiomorphic”) character, aleurodiscoid species were found on several different evolutionary branches. Once again, color fails us. Drat.

“**Two undescribed heterobasidiomycetes from Ontario**” [Bandoni, Krug. 2000. Mycoscience 41:371-378]. The ear-like jelly *Platyglea jacksonii* grows on basidiocarps of the corticioid *Hyphodontia sambuci*, and the convoluted jelly *Sigmogloea tremelloidea* was found overgrowing the perithecia of a *Conciochaeta* beneath pine stump bark.

#### III. PUFFBALLS AND TRUFFLES

- “***Battarrea phalloides* and *B. stevenii*, insight into a long-standing taxonomic puzzle**” [Martin, Johannesson. 2000. Mycotaxon 76:67-75; *drawings, DNA trees*]. — Is there a difference between *Battarrea phalloides* (type of the genus) and *B. stevenii*? Some guides recognize only one species while others name two. The two woody desert fungi are remarkably similar, but scientists recognizing two species note that *B. stevenii* has slightly differently colored, slightly larger, slightly less ornamented basidiospores, a much larger

size, a more coarsely scaly stipe, and no mucilage in volva and stipe interior (most key leads stress the non/gelatinous volva). After noting that the characters listed above were found in both species as identified by different workers — and armed with a formidable array of European, African, Mexican, and Australian collections and a DNA sequencer — the authors found no consistent molecular differences and conclude that only one species is present: *B. phalloides*. A note to those who have always wondered whether to include that bothersome “a” in “Battarraea” — “The original spelling being *Batarrea*, the only admissible modification under Art. 60.1 is the one supported by [numerous authors] to write *Battarraea*. The reason is that the person’s name was Battara.” While moderns may correct the original species name to reflect the actual spelling of a person’s name, adding an “a” after the “r” unnecessarily gilds the nomenclatural lily.

- “***Disciseda verrucosa* (Gasteromycetes) in Mexico**” [Pérez-Silva, Esqueda, et al. 2000. *Mycotaxon* 76:337-341; *B&W habit and SEM photos, description*]. — One can spend many enjoyable hours searching beneath sagebrush for the small woody puffballs, the stalked *Tulostoma* and its stalkless sister *Disciseda*. While rabbit dung does have the nasty habit of pretending to be *Disciseda*, I have successfully nabbed several spiny-spored oddments from arid sandy Montana, Washington, and Oregon roadsides and (most recently) on Mount Frery trail on Antelope Island in the Great Salt Lake. This paper provides B&W photos and a description of a *Disciseda* with a bay-brown to violet inner cuticle and (sub)globose spores ornamented by “finger-like” extensions. This species, originally described from New Zealand, is the ninth *Disciseda* report for Mexico.

“**Effects of fungicides on *Tuber borchii* and *Hebeloma sinapizans* ectomycorrhizas**” [Zambonelli, Iotti. 2001. *Mycological Research* 105:611-614]. — If you’re trying to grow truffles and not “poison pies”, you’ll appreciate knowing what fungicide will eliminate the *Hebeloma* without adversely affecting the desired crop. Oxycarboxin appears to completely suppress growth of *H. sinapizans* but not the tuber.

#### IV. ASCOMYCETES

- “**Thoughts and musings on tropical *Xylariaceae***” [Rogers. 2000. *Mycological Research* 104:1412-1420; *photos, entertaining discussion*]. — Most of us know the *Xylaria* family from the candle-snuff fungus (*Xylaria hypoxylon*) and dead man’s fingers (*Xylaria polymorpha*) that produce hard blackened fruit-bodies that eventually are coated with the white “ash” of asexual conidiospores. Others may be aware of carbon balls (*Daldinia concentrica*) and *Hypoxylon* species that form hard black lumps on log and twig. The family is far more diverse than that, however. Washington State’s Jack Rogers delivered the Benefactor’s Lecture at the British Mycological Society’s 2000 Tropical Mycology symposium on the ‘essence of xylariaceousness.’ In a section entitled “Xylariaceousness: whence and whither?” he provides the cardinal features of the family (perithecial fruitbodies embedded in hard dark stromata, cylindrical asci with an amyloid apical ring, ascospores with dark multi-layered walls and germ slit, and an asexual stage that produces conidia “holoblastically from a sympodially, or occasionally percurrently, proliferating conidiogenous region” [whew!]). Probing the family’s tortuous evolutionary path — “evolution in the group is surely more akin to a much-branched shrub than to a tree” — Rogers observes that a *Collodiscula* species characterized by two-celled ascospores lacking germination sites “represents a stage along the road to becoming ‘truly xylariaceous’ (i.e. having a single-celled mature ascospore with a germ slit).”

The three genera most folks recognize fall into different groups according to physical appearance or to substrate relationships. *Daldinia* forms gelatinously ringed stromata while *Hypoxylon* and *Xylaria* form relatively massive, non-gelatinous, superficially attached stromata. *Daldinia* and *Hypoxylon* invade living stems that quickly spread and only fruit when the host is stressed, forming hardened black crusts on dead/dying tree limbs. Depending on species, *Xylaria* variously (a) moves from dead to living material, (b) fruits on dead stuff but vegetates in live, (c) fruits on seeds and fruits, or (d) takes up housekeeping in ant or termite nests. *Hypoxylon fuscum* (a weed on alder in these here parts) turns out to be a latent pathogen. “I believe that the success of the *Xylariaceae* as endophytes can be explained by my ‘sneaky’ hypothesis. Pathogens such as *H. fragiforme* apparently invade the living host without profoundly disturbing it. This capacity to ‘sneak’ into a host without initiating symptoms seems widespread among the *Xylariaceae* and probably originated, or was at least exploited, during the Cretaceous radiation of angiosperms. Indeed, the first host-specific associations were probably initiated in this way... Thus, the parasite would invade the host and remain quiescent until a change in host status allowed it to destroy bark and wood, i.e. until a signal allowed the enzymatic machinery to destroy cellulose and lignin.” If all this bores you, take note: “*Xylaria* ...

species in dried collections are often shrunken, wizened corpses, bearing little resemblance to the stromata in nature. Moreover, *Xylaria* stromata frequently pass through developmental stages that can make newly mature and overmature collections appear to be separate taxa. Such taxa should be observed and photographed throughout their development..." So hop to it!

See earlier "xylariaceous" papers on (i) systematics biology and evolution [Rogers. 1979. *Mycologia* 71:1-42]; (ii) new *Hypoxyylon species* [Roger and Samuels. 1985. *Mycotaxon* 22:367-373]; (iii) the *Hypoxyylon serpens* complex [Petrini & Rogers. 1986. *Mycotaxon* 26:401-436]; (iv) *Xylaria* in Mexico [Gonzalez & Roger. 1989. *Mycotaxon* 34:283-373]; and (v) A revision of the genus *Hypoxyylon* by Ju and Rogers (1996). — In 2001 Johannesson et al. [*Mycologia* 93:440-446] discovered the North American "endemic" *Daldinia loculata* fruiting on fire-damaged birch and its mycelium growing in healthy trees." and Mazzaglia et al. [*Mycological Research* 105:670-675] show DNA support for recent *Hypoxyylon*, *Biscogniauxia*, and *Entoleuca* morpho-species

~ Briefly noted ~

**"Entomogenous *Cordyceps* and related genera from Mexico** with discussion on their hosts and new records" [Guzmán, Morón, Ramírez-Guillén. 2001. *Mycotaxon* 78:115-126]. Pity the poor "tlaloomites". Not only parasitized by *Sphaeria* (<— *Cordyceps*) *sobolifera*, infected cicadas were highly prized Aztec edibles. Among fifteen other Mexican insect-loving species are the common *Cordyceps militaris*, *C. pruinosa* (found on an unknown Quintana Roo host), the June bug larva-loving *C. melolonthae*, and fly parasite *C. dipterigena* (both also found in the eastern US).

**"*Guanomyces*, a new genus of Ascomycetes"** [González, Hanlin, Ulloa. 2000. *Mycologia* 92:1138-1148; *nifty B&W photos*]. Just in case you are ever asked, there **is** a genus that covers fungi on bat dung. The tiny (visible under a hand lens) *Guanomyces polythrix* was isolated from dung from Devil's Cave (Cueva del Diablo) in Tepoztlán, Mexico. DNA analyses place it in the the Sordariales, a micro-ascomycete order that only rarely produces visible fruiting bodies.

**"Scanning electron microscopy of germinated ascospores of *Monosporascus cannonballus*"** [Waugh, Stanghellini, Kim. 2001. *Mycological Research* 105:745-748.] Really super scanning electron microphotos of the destructive root pathogen causing vine decline of melons, whose name tells us that there is one ascospore per ascus that is reeeeeeeallly huge. Who said that Latin names have to be dull?

**"The larger cup fungi in Britain: part 2: Pezizaceae (excluding *Peziza* & *Plicaria*)"** & "The larger cup fungi in Britain: **part 3: The genera *Peziza* & *Plicaria***" [Spooner. 2001. *Field Mycology* 2:17-20 & 2:51-59]. The first paper provides a glossary and keys to *Boudiera*, *Iodophanus*, *Pachyella*, *Licariella*, *Sarcosphaera*, and *Sphaerozone*. The second provides keys British *Peziza* and *Plicaria* species that will also aid North Americans. The second, accompanied by an excellent color photo of *Peziza badia*, also updates the names of old friends.

**"Homothallism in the postfire ascomycete *Rhizina undulata*"** [Vasiliauskas, Stenlid. 2001. *Mycologia* 93:447-452]. This common coniferous "root-rotter" is self-fertile (homothallic); hence its rapid and lethal infection of fire-damaged trees.

## V. LICHENS

- **"Major fungal lineages are derived from lichen symbiotic ancestors"** [Lutzoni, Pagel, Reeb. *Nature* 411(21 June):937-940]. — Of the 1/5 of all known extant fungi that form obligate symbiotic associations with green algae and/or cyanobacteria, 98% are ascolichens. (Basidiolichens such as *Omphalina ericetorum* and *Multiclavula* represent the other 2%.) For years there has been sometimes acrimonious debate about whether lichens evolved independently on several separate occasions (i.e. put a fungus next to an alga, turn your back, and presto! a lichen is born) or whether lichen evolution is pretty much a one-time thing. Supporters of the former view point to the high diversity and mixed occurrence of lichenized (42%) and non-lichenized (58%) species within the Ascomycota. This major paper offers persuasive evidence that lichenization may have been a rarefied event that preceded the evolution of many major fungal lineages of non-lichen forming species (including *Penicillium* and *Aspergillus*) that appear to be descended from lichen-forming ancestors.

~ Briefly noted ~

**"New combinations of *Cladina* epithets in *Cladonia*** (Ascomycotina, Cladoniaceae)." [Ahti, DePriest. 2001. *Mycotaxon* 78:499-502.]; *Cladina*, rest in peace! Molecular analyses indicate that the reindeer lichen genus segregated in 1866 from *Cladonia*, abandoned around 1900, and then resurrected by Hale & Culbertson's 1970 Checklist of North American Lichens, is in fact a synonym of *Cladonia*. Among 14 species transferred in this

paper is the yellow reindeer lichen *Cladonia kriegeri* (<— *Cladonia mitis*). You can also glimpse vibrant color photos of other Cladonias (*C. fimbriata*, *C. floerkeana*) on the back cover of the winter issue of the 2000 Mycologist 14(4).

“Potential use of restriction analysis of PCR-amplified DNA fragments in construction of **molecular data-based identification keys of lichens**” [Guzow-Krzeminska, Wegrzyn. 2000. Mycotaxon 76:305-313]. Obviously buying a PCR amplifier and other niceties isn't an option for someone who can't afford even a microscope, but comparing unknown to known “RFLP” profiles to screen a batch of lichens or mushrooms may soon standard operating procedure in college lab classes.

“**A gene genealogical approach** to recognize phylogenetic species boundaries in the lichenized fungus *Letharia*.” [Kroken, Taylor. 2001. Mycologia 93:38-53.]. The bright green “wolf lichen” (*L. vulpina*) represents not one, but two species, each fruiting in the same locales. DNA sequences also reveal several newly hatched species pairs with one partner evolutionally distinct from its look-alike mate.

“**Molecular approaches and the concept of species and species complexes in lichenized fungi**” [Grube, Kroken. 2000. Mycological Research 104:1284-1294]. Lichen specialists base species on morphology, chemistry, algal partner, substrate, reproductive mode, and – now – sequence data. In the face of tangled and conflicting species concepts, the pragmatic authors recommend nomenclatural restraint, noting that temporary informal names for sequence-derived species / groups will do just fine until other characters support molecular taxa. Nonetheless, while “formally named cryptic species cause problems in distributional studies” citing old material and literature references, formal names *are* useful in “high resolution” eco-physiological studies combining two or more character sets to determine species.

## VI. MYXOMYCETES

- “**Myxomycetes of the Great Smoky Mountains National Park**” [Stephenson, Schnittler, Mitchell, Novikov. 2001. Mycotaxon 78:1-16], “**Myxomycetes of Sonora, Mexico I**” [Pérez-Silva, Herrera, et al. 2001. Mycotaxon 77:181-192], & “**Myxomycetes from different forest types in Puerto Rico**” [Novozhilov, Schnittler, Rollins, Stephenson. 2001 Mycotaxon 77:285-299]. — The “Great Smoky” list, begun 17 years before the official launch of the current All-Taxa Biological Inventory, contains 168 (75 collected by the authors) slime mold species, including new North American records *Lamproderma granulolum*, *Licea microscopica*, *L. rufocuprea*, and *L. sambucina*. Wonderful SEM photos of *Diaachea subsessilis*, *Didymium rubeopus*, *Trichia affinis*, *Hemitrichia parviverrucospora*, and *Metatrichia horrida* accompany the list of 17 new Mexican records (*Fuligo cinerea* being the sole “slime” previously reported for Sonora). A 4-week Puerto Rican sea-to-mountaintop survey yielded 44 species (10 new records) and the realization that fewer myxomycete species are found with increasing elevation, no doubt a result of the change of forest types as one toils upward.

~ Briefly noted ~

“**Biodiversity in a slime mould: arthropods associated with *Brefeldia maxima***” [Kylin. 2001. Mycologist 15:70-73.]. Three different categories of arthropods were seen on or near a single Polish national park specimen: (i) those that ate it, (ii) those that ate those who were eating it, and (iii) those that just boogied on by. The mini-zoo contained six different orders of insects, four of arachnids, some centipedes, slugs, snails, AND one pied flycatcher that snarfed up the abundant insects clustered around the immature aethalium.

“**Two new species of Myxomycetes from a tropical deciduous forest of Mexico**” [Estrada-Torres, Lado, Rodríguez-Palma. 2001. Mycologia 93:744-750] Gorgeous SEMs of banded spores accompany *Cribaria fragilis* and *Diderma acanthosporium* descriptions.

## VII. DISPERSAL, DISTRIBUTION AND ECOLOGY

- “**Ectomycorrhizae: co-evolution, significance, and biogeography**” [Halling. 2001. Annals of the Missouri Botanical Garden 88:5-13. *B&W mushroom photos*]. — Trekking the western hemisphere in pursuit of boletes, cortis, amanitas, and other ectomycorrhizal fungi for over two decades, Halling has had time to reflect on the migratory patterns of his prey. “Mycorrhizal associations have been around for a long time, at least since life forms migrated to terrestrial habitats. As these new habitats or niches became available, fungal and plant partners ... likely explored and exploited new niches for resources. Some host-specific fungi and plants have co-evolved in earnest and migrated together, to a greater or lesser extent, over the millennia depending on habitat availability and the existence of potential partners. This fungus-plant union that

occupies most of the terrestrial part of our planet would appear responsible for the very appearance of the earth's natural landscape." Summarizing the development of the root-fungus symbiosis, Halling outlines conditions leading to co-evolution of fungi with plants and notes different biogeographic patterns. *Pulveroboletus ravenelii*, a bolete that partners with pine and several hardwoods in North America but only with oak in Central and South America, is an example of a generalist showing a "relictual disjunct distribution" that may have once grown over a much wider general area. There are also genera that have many species in one location with one type of partner but few in another with a different host. The fact that in North America *Rozites* has only three conifer-loving species (e.g. *R. caperata*) while having 18 species associated with *Nothofagus* (southern "beech") in the southern hemisphere suggests that it probably originated in Gondwanaland (the southern super-continent that splintered off from the mega-continent, Pangaea). Distributional patterns reflecting "generic and specific distributions along a cline" include species that occur (i) from north temperate regions to southern Colombia (e.g. *Cortinarius iodes*, *Lactarius indigo*, *Laccaria amethystina*); (ii) from north temperate regions south to Costa Rica (e.g. *Boletus frostii*, the obligate *Russula* parasite *Asterophora parasitica*, *Russula nigricans*); (iii) as montane neotropical oak endemics (e.g. *Lactarius costaricensis*) in genera with many widespread north temperate representatives; and (iv) as restricted endemics (e.g. *Boletus flavoniger*) in only a few neotropical sites from genera widely distributed in the north temperate zone.

- **"Species richness, abundance, and phenology of fungal fruit bodies over 21 years in a Swiss forest plot"** [Straatsma, Ayer, Egli. 2001. *Mycological Research* 105:515-523]. — Every week, May through November since 1975, Swiss workers have monitored a 75-hectare fungal research preserve for all macrofungi, (except for 1980-1983, when only edible fungi were recorded). Over the 21-year span when all fungi were tallied, the team recorded a daunting 71,222 mushrooms and 408 species. There are lean years (18 species in 1989) and rich years (194 in 1992), but surprisingly, each year brings new species — 81, 13, 29, 8, 29 for the first 5 years (1975-1979) and 2, 1, 3, 5, 7, 1, 18, 4, 74, 33, 16, 15, 17, 22, 11, 19 for the last 16 (1984-1999). Eight species were found in all 21 years: 6 ectos [4 *Russula*, 1 *Lactarius*, and 1 *Xerocomus* species] and 2 sapros [a *Gymnopus* and a *Rhodocollybia*). The researchers found that over time, saprophytes increased in species abundance (i.e. they produced more mushrooms) but not in species richness (i.e. the number of species remained the same). Also, almost every year showed unique species. For instance, 33 species were found **only** in 1992 and there was even one species found only in the leanest year, 1989. "Many species are transient; unique species are not the only transient ones. Species may be transient because: (1) they establish themselves for a certain number of years and then disappear from the plot; and (2) their mycelial biomass and the amount of resource they captured fluctuates over the years, independent from the 'productivity' level. Of course our data relate to fruit bodies, not to mycelia, and the mycelia need not be transient at all." Long-term studies on permanent plots such as this one and the Oregon Mycological Society chanterelle study begun in 1986 will provide fungal food for thought for years to come.

**"A gradient analysis of communities of macrofungi and slime moulds on decaying beech logs"** [Heilmann-Clausen. 2001. *Mycological Research* 105:575-596.] Statistical analysis of 277 fungi and 25 slime molds shows that the fast and predictable fungal community development during early decay becomes increasingly slow and diversified as logs continue to decompose.

**"Differential responses of ectomycorrhizal fungi to heavy metals *in vitro*"** [Blaudex, Jacob et al. 2000. *Mycological Research* 104:1366-1371] *Suillus luteus*, *S. variegatus*, and *Pisolithus tinctorius* are more tolerant of copper, cadmium, and zinc than *Paxillus involutus*, which shows a higher tolerance to nickel. Some ectomycorrhizal fungi may possibly protect host plants from heavy metal contamination.

**"Fungi from Chernobyl:** mycobiota of the inner regions of the containment structures of the damaged nuclear reactor." [Zhdanova et al. 2000. *Mycological Research* 104:1421-1426] & the more user friendly **"Hot fungi from Chernobyl"** [Moore. 2001. *Mycologist* 15: 63-64] provide a list of 37 species and 19 species found 12 years after the catastrophic nuclear reactor accompanied by photos of power plant and lethal petri dish cultures in living color.

- **"Animal nitrogen swap for plant carbon"** [Klironomos, Hart. 2001. *Nature* 410(5 April):651-652] & **"Fungi slay insects and feed host plants"** [Wang. *Science News* 159(7 April):213]. — *Laccaria bicolor* is not your average mycorrhizal mushroom. It apparently infects springtails with less than benign consequences — for the insect. Authors studying the feeding habits of those cute little hoppers you may have noticed under the dissecting scope tested a number of different mushrooms to find out which ones the springtails preferred. They were startled to find that all but 5% of the springtails died when fed *L. bicolor*. Turns out that the *L.*

*bicolor* mycelium paralyzes the little animals, sucks up nitrogen from the insect bodies, and transmits leftover nitrogen to its partner plant. “Instead of the fungus being preyed on [by the insects], it was the [insects] that were being preyed on by the fungus... It was as shocking as putting a pizza in front of a person and having the pizza eat the person instead of vice versa.” Klironomos and Hart discovered that after 2 months, 25% of eastern white pine seedling’s nitrogen had come from the insects. What other fungi are engaged in similar (and unsuspected) skullduggery?

“**Intraspecific variation in fruiting phenology in an ectomycorrhizal *Laccaria* population under Douglas fir**” [Selosse, Martin, Tacon. 2001. *Mycological Research* 105:524-531.] In a French Douglas fir plantation most *Laccaria bicolor* and *L. laccata* populations fruit at different times, but a *L. bicolor* “genet” used to inoculate seedlings throughout the plantation fruited everywhere simultaneously. It’s possible that “economically important” ectomycorrhizal fungi such as matsutake, chanterelles, bolete and truffles species may also be genetically, rather than ecologically, triggered.

- “**Fungi and beetles / Diversity within diversity**” [Anderson. 2001. *Field Mycology* 2:82-87; *color photo and watercolors*]. — They got there first, but that usually doesn’t cheer the boletivore confronting a wriggling mass of larvae, flies, beetles, and slugs in a previously prime bolete. Roy Anderson provides an excellent overview of the beetles (including *Oxyporus rufus* — **not** a ruddy colored polypore as you might suppose) that devour or flee from boletes, amanitas, russulas, polypores, and a host of other fungi. An intriguing issue is raised: over-collecting — while perhaps not threatening future fungal fruitings — may present a serious threat to invertebrates that are “totally dependent upon live, above-ground fruiting bodies each year.”

“**Effects of ungulate grazers on arbuscular mycorrhizal symbiosis and fungal community structure in tall grass prairie**” [Eom, Wilson, Harnett. 2001. *Mycologia* 93:233-242]. Moderate/intense grazing by cattle of tall prairie grasses in Kansas apparently decreases fungal diversity but stimulates mycorrhizal colonization of grass roots.

“**Behavioural ecology: Down on the fungal farm**” [Whitfield. 2001. *Nature* 411(31 May):536]. Leaf-cutter antine ants that grow their own fungi mobilize at the first sign of pest fungi. “When rogue spores were found by the inhabitants, large numbers of workers congregated at the infected site to gather up spores in their mouthparts and cart them away. If the spores reached the stage of germination, the ants turned to weeding by removing chunks of leave along with crop and pest fungi.”

“**Nematode-trapping fungi in conventionally and organically managed corn-tomato rotations**” [Timm, Pearson, Jaffee. 2001. *Mycologia* 93:25-29]. Just in case you wondered: although organically raised crops are dependent on manure and other fungal enticing fertilizers, they appear to attract no more nematode-trapping fungi than crops raised in a mess of chemicals.

- “**Lichenicolous fungi, mainly from the USA, including *Patriciomyces* gen. nov.**” [Cole, Hawksworth. 2001. *Mycotaxon* 77:305-338]. — With the number of known species rising to 894 (from 457 in 1976), fungi that grow on lichen thalli “are proving to be a major source of unexplored fungal diversity.” Those aware of Hawksworth’s recent marriage will appreciate the name of the type of a new genus named in honor of his bride — *Patriciomyces valentinianus*. The esteemed Hawksworth is not to be dismissed as a total romantic, however, for he describes the fungus found on a Missouri fire tower as having “superficial colonies ... that are pale orange, somewhat translucent when moist [with] arachnoid, discontinuous subicula ... and hyphal walls ... often with small, refractive wart-like protuberances....” Can this marriage be saved?

“**Mycorrhizal association of the extinct conifer *Metasequoia milleri***” [Stockey, Rothwell, Addy, Currah. 2001. *Mycological Research* 105:202-205.] A **fossilized** 48.7myo Middle Eocene extinct tree has the same VA mycorrhizae now found in the Dawn Redwood, *Metasequoia glyptostroboides*.

- “**Airflow patterns around mushrooms and their relationship to spore dispersal**” [Deering, Dong, Rambo, Money. 2001. *Mycologia* 93(4):732-736; *nifty photos*]. — What can a lowly student accomplish in a single semester? A Miami University advanced mycology class study of airflow patterns around models and fresh mushrooms shows that the airstream divides at the leading edge of the cap, wind speed increases a few millimeters above and below the cap, and a mantle of very slow-moving air develops closer to the lower surface. Tall bell-shaped mushroom caps (e.g. *Coprinus comatus*) “stopped” airflow and reduced wind speed below the cap the most, reducing the number of spores blown back into the cap and increasing the likelihood of a spore landing on a good substrate.

**“Aliens in the flowerbeds: The fungal biodiversity of ornamental woodchips”** [Shaw, Kibby. 2001. *Field Mycology* 2:6-11.] Color photos illustrate denizens of mulched gardens such as *Agrocybe praecox*, *A. putaminum*, *Stropharia percevalii*, *Volvariella gloiocephala*.

**“Large-scale forest girdling shows that current photosynthesis drives soil respiration”** [Högberg, Nordgren, et al. 2001. *Nature* 411(14 June):789-792]. Ectomycorrhizal mycelium depends on “assimilates” from its plant partner. Tree girdling temporarily boosts use of root starch reserves, hastening decomposition of starved roots and associated mycelium. Girdling early in the growing season damages roots more severely, suggesting that seasonal subterranean carbon allocation is more important to root respiration than soil temperature.

## VIII. HOME BREWS AND CULTIVATION

- **“Growth rate of fungi in bathrooms – experimental survey”** [Hamada, Fujita. 2000. *Mycoscience* 41:297-302; *photos*]. — Any research paper that begins “How long after cleaning does it take for fungi to colonize the cement between bathroom tiles?” – particularly in a learned Japanese mycological journal – is bound to pique your interest. It turns out that the major molds found in wet moist bathrooms are *Cladosporium* and *Exophiala* and the major yeast is *Rhodotorula* (recognizable to all but the truly fanatic bathroom scourer as the pinkish-red gook that clings to white grout, porcelain, and fiberglass surfaces). You won’t be heartened to know that the pink yeast was frequently detected even when no pink colonies were in evidence, particularly when the yeast turns out to provide a substrate for the molds. Who wants to have a dynamic example of fungal succession in their own home laboratory? It also turns out the mold *Paecilomyces*, itself a harbinger of the secondary molds *Trichoderma* and *Fusarium*, grew more quickly on cement treated with soap or malt extract (no stupid mold that) than on cement “deficient in nutrients” whereas the temperant *Rhodotorula* was inhibited by either treatment. It took about two months for *Cladosporium* to colonize cement. Cracks, readily invaded by both yeasts and molds, induce fungal contamination even when the bathroom is kept comparatively dry. “Treatment to preserve the cement surface is therefore important in avoiding fungal contamination.” You’re just not scrubbing hard enough!

- **“The kombucha consortia of yeasts and bacteria”** [Jarrell, Cal, Bennett. 2000. *Mycologist* 14:166-167]. Remember kombucha? In 1993-95, web-savvy mushroomers could hardly escape the endless user-group nattering about whether the “manchurian mushroom” was panacea or poison. This thorough exploration of what *really* makes up the “mushroom” is both entertaining and thorough. Be forewarned: one woman’s kombucha culture differs from all others: “it’s not so much a case of ‘the’ Kombucha culture, but of a great number of them.”

**“Indoor cultivation of paddy straw mushroom, *Volvariella volvacea*, in crates”** [Reyes. 2000. *Mycologist* 14:174-176]. How to grow your oriental mushrooms at home for fun and profit.

“Teaching techniques for mycology: 14. **Mycorrhizal infection of orchid seedlings in the laboratory**” [Weber, Webster. 2001. *Mycologist* 15:55-59; *color photos, protocols for inoculating Rhizoctonia species onto seedling roots*]. “Orchids are unusual because in all natural situations they are dependent on mycorrhizal fungi throughout their life-cycle... [they] parasitize their fungal partner which, paradoxically, is often itself a serious pathogen of other plants.”

## IX. FUNGAL PESTS, PESTILENCES, CURES and PANACEAS

- **“Reverend Berkeley’s devil”** [Money. 2001. *Nature* 411:644-645; *summary*] & **“PCR amplification of the Irish potato famine pathogen from historic specimens”** [Ristaino, Groves, Parra. 2001. *Nature* 411(7 June):695-697]. — These companion pieces (the former a user-friendly explanation of the technical paper following) discuss *Phytophthora infestans*, the fungal pathogen that eradicated the Irish potato crop in 1845-46, resulting in the deaths of one million and the birth of my great grandmother in America. Money notes, “By identifying a fungus as the cause of the epidemic, the Reverent Miles Berkeley broke ranks with his fellow clergy who blamed the devil.” Ristaino, Groves and Parra used PCR to track the origin of the deadly pathogen from herbarium sheets reposing in British and American national herbaria. Money notes that ten to fifteen years ago, a fungicide resistant strain emerged. This “significant present-day menace to agriculture” had been thought a direct Irish descendent, but the research team has shown that the two strains are not the same. Money concludes “The new findings mean that some ideas about the origin of historical plant disease

epidemics will need to be reevaluated. But this application of molecular archaeology should hearten herbarium directors ... fighting to preserve their treasured archives.”

“**Fungal foes in your garden: 47. Clematis wilt**” [Fox. 2000. *Mycologist* 14:184-185]. Color photos accompany symptoms and control of *Phoma* (<– *Asochyta*) *clematidina*. — “... **48. Lily blight**” [Fox. 2001. *Mycologist* 15:40-41]. Color photos accompany symptoms and control of *Botrytis elliptica*, *B. cinerea*, and *B. liliorum*. — “... **49. Peony blight**” [2001. *Mycologist* 15:88-89]. Color photos accompany symptoms and control of *Botrytis paeoniae* and *B. cinerea*.

“**Follicolous and caulicolous fungi associated with Proteaceae cultivated in California**” [Taylor, Crous, Swart. 2001. *Mycotaxon* 78:75-104]. B&W photos and line drawings accompany new species descriptions and a list of all fungal pathogens recorded on all Proteas cultivated for the US (excluding Hawaii) cut-flower industry. (On the list 1 *Corticium* and 2 *Ganoderma* species hide among the mildews, molds, and wilts). — **Foliar and stem pathogens of Proteaceae in Hawaii**. [Taylor, Crous, Palm. 2001. *Mycotaxon* 78:449-490]. B&W photos and line drawings accompany new species descriptions and a list of 561 fungal pathogens recorded on all Proteas cultivated for the Hawaiian cut-flower industry. Included are such causative agents as *Phytophthora* root and collar rot, Elsinoë scab disease, *Colletotrichum* anthracnose, *Rhizoctonia* damping-off and other lovely blights. It hardly seems fair that with all the microfungi struggling to attack the Proteas, *Armillaria mellea* and *Polyporus gilvus* have joined the fray.

“**Montadial A, a cytotoxic metabolite from Bondarzewia montana** [sic]” [Sontag, Arnold, Steglich, Anke. 1999. *Journal of Natural Products* 62:1425-1426]; a potential toxin against cancerous tumors is isolated from the white-rot fungus, *B. mesenterica*. — “**Inhibition of interleukin-6 signaling by galiellalactone**” [Weidler, Rether, Anke, Erkel. 2000. *FEBS [Federation of European Biochemical Societies] Letters* 484: 2-6]. An inhibitor isolated from an unknown *Galiella* lead to the development of new therapeutic agents for autoimmune, inflammatory, and coronary diseases. — “**Secondary metabolites from a Gloeophyllum species**” [Rasser, Anke, Sterner. 2000. *Phytochemistry* 54:511-516]: 12 new compounds show antifungal, antibacterial and/or cytotoxic activities potentially useful against various illnesses. — “**Effects of maitake (Grifola frondosa) glucan in HIV-infected patients**” [Nanba, Kodama, Schar, Turner. 2000. *Mycoscience* 41:293-296]. While maitake may not cure HIV-infected patients, 85% of the respondents indicated that they felt better after using it. Maitake appears to inhibit the virus directly, stimulating the body’s defense system and making the body less vulnerable to opportunistic disease. — “**Activities of polysaccharides obtained from Grifola frondosa on insulin-dependent diabetes mellitus induced by streptozotocin in mice**” [Kurushima, Kodama, Nanba. 2000. *Mycoscience* 41:473-481]. If you’re a diabetic mouse, “maitake” infusions or injections may not hurt you, but they won’t cure you, either. — “**The Irpexans, a new group of biologically active metabolites produced by the basidiomycete Irpex sp. 93028**” [Silberborth, Erkel, Anke, Sterner. 2000. *Journal of Antibiotics* 53:1137-1144]. Inhibitors derived from *Irpex* have weak cytotoxic effects potentially useful against cancer.